Portland General Electric Company
Legal Department
121 SW Salmon Street • Portland, Oregon 97204
503-464-7181 • Facsimile 503-464-2200

V. Denise Saunders
Associate General Counsel

May 23, 2016

Via Electronic Filing

Oregon Public Utility Commission
Attention: Filing Center
PO Box 1088
Salem OR 97308-1088

Re: **UM 1773-** PGE Partial Waiver of Competitive Bidding Guidelines, Approval of RFP Schedule

Attention Filing Center:

Enclosed for filing is Portland General Electric Company's ("PGE") final draft 2016 Renewable Request for Proposals (RFP) along with a redline version showing changes made to the initial draft RFP.

On May 9, 2016, PGE issued the initial draft RFP (without appendices) to all parties and interested persons in the PGE's most recent general rate case, RFP and IRP dockets. On May 13, 2016, PGE filed the initial draft RFP with appendices with the Commission and served it on the same parties. On May 18, 2016, PGE conducted stakeholder and bidder workshops to review the initial draft RFP. The final draft RFP incorporates feedback received from the bidder and stakeholder workshops and clarifications of various aspects of the initial draft RFP.

PGE requests that the Commission approve the final draft RFP at its public meeting scheduled for June 7, 2016.

Sincerely,

V. Denise Saunders
Associate General Counsel

VDS:bop

Attachments

Portland General Electric Company

REQUEST FOR PROPOSALS – DRAFT**

Renewable Energy Resources

****NOTE: PGE's final issuance of the 2016 Request for Proposals (RFP) for Renewable Energy Resources is subject to Oregon Public Utility Commission approval of both the draft RFP and the Petition for Partial Waiver of the Competitive Bidding Guidelines, including the expedited RFP timeline.**

May 23, 2016

Table of Contents

1. Purpose and Scope 1
2. RFP Schedule 4
3. Guidelines for Submitting Proposals 6
4. Bid Evaluation Process 10
5. Requested Power Products 11
6. Contract Terms and Conditions 15
7. Bid Pre-Qualifications 17
8. Criteria Used for Scoring Qualified Bids 21
9. Final Short List Determination 28
10. Post-Bid Negotiations 29
11. Appendix A – Power Purchase Agreement Term Sheet 30
12. Appendix B – 1 Engineering, Procurement and Construction (EPC) Term Sheet 38
13. Appendix B – 2 Asset Purchase Agreement (APA) Term Sheet 43
14. Appendix C – Wholesale Renewable Power Purchase Agreement 52
15. Appendix D – Asset Purchase Agreement 53
16. Appendix E – Engineering, Procurement and Construction Agreement 54
17. Appendix F – Required Bidder Profile 55
18. Appendix G – Required Bid Information 56
19. Appendix H – 1 Technical Specifications for Owned Wind Resources 75
20. Appendix H - 2 Technical Specifications for Owned Solar Resource 76
21. Appendix K – Confidentiality and Non-Disclosure Agreement 77
22. Appendix L – Credit Guidance 82
23. Appendix M – Detailed Scoring Criteria 89

Tables

Table 1: Summary of Requested Renewable Energy Products 11
Table 2. Evaluation Criteria for Renewable Energy Products 21

Figures

Figure 1. PGE Service Territory 3
Figure 2. Resource Selection Process 10

1 Purpose and Scope

Portland General Electric Company (PGE), an investor-owned electric utility in Oregon, is soliciting bids through this Request for Proposals (RFP) for the renewable electric energy products described below.

The timing of the RFP is intended to enable resources to capture the full value of the federal renewable electricity Production Tax Credit (PTC). However, PGE will accept proposals for all renewable energy resources that comply with Oregon's Renewable Portfolio Standard (RPS).

1.1 Resource Targets

PGE is seeking to acquire approximately 175 average megawatts (MWa)[1] of long-term utility-scale renewable energy supply, bundled with the associated renewable energy credits (RECs). PGE desires resources that provide the best combination of lowest cost and lowest risk for its customers. PGE will consider proposals based on a variety of structures and commercially viable resource types. Acceptable bids for renewable resources include power purchase agreements (PPA), as well as a range of ownership structures, including sales of existing assets, acquisition of project development or natural resource rights and options, and build-own-transfer agreements. PGE will not submit a benchmark proposal for the renewable RFP. PGE will evaluate and select new renewable energy supplies consistent with the criteria and methodology contained herein.

Renewable resources must meet the requirements of Oregon's RPS, as defined in Oregon Revised Statutes (ORS) Section 469A. These requirements are described in further detail in the Requested Power Products section below. Prospective Bidders are required to notify the IE no later than May 27, 2016 if they plan on bidding something other than wind, solar, biomass/biogas, geothermal or hydro. PGE will review any such proposals as to their suitability for meeting our renewable requirements. The Independent Evaluator (IE) can be contacted through the RFP website. Refer to the Technology section for additional information.

Notwithstanding the above preferred target, PGE reserves the right to vary from this target energy quantity based on evaluation of price and risk factors of received bids.

This competitive RFP is being conducted in accordance with the OPUC Competitive Bidding Guidelines set forth in Appendix A of OPUC Order 14-149 (Docket UM-1182), dated April 30, 2014. PGE has obtained a partial waiver of

[1] An average megawatt is a unit of energy equal to 8,760 MWh during a common year.

two of the Competitive Bidding Guidelines to support the timeline required for this RFP.[2]

Bidders are required to complete and sign a non-negotiable confidentiality agreement prior to the bid submission. This requirement is discussed further in the Submitting Confidentiality and Non-Disclosure Agreements section below.

1.2 About PGE

Headquartered in Portland, Oregon, PGE serves approximately 856,000 retail customers within a 4,000 square mile service territory (see Figure 1).

- Service territory population 1.8 million, about 46% of the state's population.
- Serves 52 cities, the largest being Portland and Salem.
- 27,000 miles of transmission and distribution lines.
- Net plant-in-service, $6.2 billion.
- Forecast average annual demand in 2015, approximately 2,500 MWa.
- One-in-two peak load in 2015, 3,914 MW.
- Generation assets including eight hydro generation facilities, five gas-fired thermal plants, the Biglow Canyon and Tucannon River wind farms, majority ownership of one coal-fired thermal plant, and joint ownership in two units of another coal plant facility. PGE also holds long-term contracts for energy from the Mid-Columbia hydroelectric projects on the Columbia River, two wind farms, and regularly enter into short and mid-term wholesale power supply contracts.

[2] As of May 13th, the Oregon Public Utility Commission had not approved PGE's request for a partial waiver of the Competitive Bidding Guidelines. The final RFP will reference the OPUC's order approving PGE's request. If the Commission does not approve PGE's request for partial waiver and the subsequent final RFP, PGE will not proceed with the proposed RFP.

Figure 1. PGE Service Territory

For more information, see PGE's Internet site: www.portlandgeneral.com.

1.3 Independent Evaluator

PGE has selected Accion Group as an independent, third-party evaluator (IE), to help ensure the RFP is conducted in accordance with the applicable OPUC Competitive Bidding Guidelines and that all bids are evaluated consistently and impartially. Accion Group will:

- Consult with PGE in preparing the RFP and submit its assessment of the final draft RFP to the OPUC when PGE files for RFP approval.
- Review final scoring and evaluation criteria that are consistent with the OPUC Competitive Bidding Guidelines and PGE's waiver request including review of "mock bids" to test the integrity of the evaluation models.
- IE will confer with OPUC staff in accordance with the Competitive Bidding Guidelines and any waivers thereof that may be granted by the OPUC.
- Independently score a sample of the bids to determine whether the selections for the initial and final short-lists are consistent with the bid evaluation criteria.
- Compare the results of the IE's scoring with PGE's scoring and work with PGE to reconcile and resolve scoring differences, if any.
- Prepare a Closing Report for the OPUC after PGE has selected the final short-list.
- In its Closing Report, provide its assessment of all aspects of the solicitation process and the IE's involvement, including detailed bid scoring and evaluation results, to PGE, non-bidding parties and the OPUC subject to the terms of the Protective Order.

2 RFP Schedule

The tentative schedule listed below may be revised as the RFP process unfolds:

- May 4, 2016 — Provide draft Renewable RFP to IE.
- By May 13, 2016 — Provide draft Renewable RFP to all interested parties.
- May 18, 2016 — Stakeholder and Bidder RFP workshop.
- May 23, 2016 — PGE submits final draft renewable RFP to OPUC for approval.
- May 23, 2016 — IE submits assessment of the final draft renewable RFP to OPUC.
- June 7, 2016 — OPUC to approve PGE draft RFP and Petition for Partial Waiver.
- June 8, 2016 — PGE issues final RFP.
- June 10, 2016 – Bidder workshop on final RFP.
- June 24, 2016 — RFP proposals from bidders due.
- July 15, 2016* — PGE selects final short list of bids.

- July 29, 2016* — IE issues final closing report to OPUC.
- July 29, 2016* — PGE submits application of shortlist to OPUC.
- September 16, 2016* – OPUC rules on acknowledgment of shortlist
- October 10, 2016* – Final contracts with winning bidders.
- November-December 2016 – PGE issues notice to proceed (if necessary).

** These dates are subject to change depending on the quantity and complexity of bids received. However, given the time-sensitive nature of this RFP, PGE will use best efforts in working with Bidders, stakeholders, the IE and the OPUC to achieve the milestones in this timeline.*

3 Guidelines for Submitting Proposals

This section describes the guidelines that parties submitting bids under this RFP (Bidders) must follow when submitting proposals.

3.1 Registration on PGE's RFP Website

PGE's RFP website, managed by the IE, is intended to be the platform for communication and bid materials between Bidders and PGE. All prospective Bidders, stakeholders, and other interested parties may register on PGE's RFP website at PortlandGeneralRFP.accionpower.com. The website is secure and password protected so that confidential information can be posted and exchanged via the site.

Other features of the site include:

- The ability to download all public RFP documents, including copies of this document and all related contracts, term sheets and appendices.
- An announcement board for posting of information for the public and Bidders.
- The capability for Bidders to anonymously post questions and comments that can be seen by all users.
- The ability to anonymously post comments regarding PGE's draft RFP documents.
- Confidential bid folders for each bid, for the retention and exchange of bid-specific data.
- Confidential evaluation folders for bid evaluation and retention of data for use during regulatory review.

3.2 Procedural and Commercial Questions

All correspondence regarding procedural questions, bid submissions and questions related to product characteristics, terms and conditions should be submitted to PGE's RFP website at PortlandGeneralRFP.accionpower.com. PGE, in consultation with the IE, as needed, will post answers to questions from Bidders, stakeholders, and other interested parties on the site. Registered users will be notified by e-mail when the "Q&A" section of this website is updated, and answers are posted to questions.

3.3 Submitting Bids

Bidders may submit bids responding to one or more of the renewable energy products (see the Requested Power Products section below). All bids must be submitted online using the bid form provided on the RFP website,

PortlandGeneralRFP.accionpower.com, no later than 12:00 p.m. Pacific Time on June 24, 2016.

Bidders may edit their online bid form until the bid submission deadline. At 12:00 p.m. Pacific Time on June 24, 2016, bid forms will be closed to edits, and will be considered to be final submissions. After this time, any bid forms not submitted will be de-activated, and the corresponding bid books will be closed.

3.4 Bid Fee

To help defray costs of the IE and encourage high quality proposals and qualified Bidders, each Bidder in this RFP must pay a non-refundable bid fee. The fee will be based on nameplate capacity at a cost of $100 per MW. Projects at, or in excess of 100 MW will pay $10,000. A bid 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, in-service date, and/or pricing structure for the same resource at the same location.

A proposal for a different resource, at a different site or using a different technology, will be considered a separate proposal and will be subject to a separate bid fee. If different bid sizes are proposed, the maximum size will be used in calculating the bid fee.

Fees are to be remitted via electronic funds transfer to PGE through the IE website. For purposes of assessing bid fees, the IE, in consultation with PGE, shall confirm whether a Bidder's submission constitutes one or more proposals based on the criteria described above.

3.5 Submitting a Confidentiality and Non-Disclosure Agreement

The Confidentiality and Non-Disclosure Agreement is available for completion at PortlandGeneralRFP.accionpower.com (and are included as Appendix K to this RFP). Bidders are required to complete and sign the confidentiality agreement prior to the bid submission deadline (12:00 PM on June 24, 2016). The confidentiality agreement is to be submitted to PGE through the IE website. Due to the need to establish uniform procedures that safeguard all confidential information, PGE will not be able to accept changes to the Confidentiality and Non-Disclosure Agreement.

PGE will treat any proprietary and confidential information contained in a bid, in a manner consistent with the terms of the Confidentiality and Nondisclosure Agreement and any Protective Orders issued by the OPUC, provided that such information is clearly identified by the Bidder on each confidential page as "Confidential" or "Confidential Information." Each Bidder must execute and return a copy of the Confidentiality and Nondisclosure Agreement, as soon as possible, but no later than the time of the submission of its bid or bids. *It is the*

Bidder's responsibility to indicate clearly in its proposal what materials and what pages it deems to be proprietary and confidential.

3.6 Validity of Price and Offer

By submitting a bid, the Bidder acknowledges and agrees that the terms of its proposal shall remain irrevocable for the earlier of 140 days after the bid responses are due or when PGE issues a written release of the bid at or before the time the short list is issued.

3.7 Bid Evaluation Criteria

Price comprises 60 percent of our evaluation criteria, reflecting PGE's desire and commitment to obtain the best possible value for our customers. Non-price factors comprise the other 40 percent and primarily reflect various performance risks and operational attributes of the bid proposals. Additional evaluation description is provided in the Criteria Used for Scoring Qualified Bids section of this document.

3.8 Reservation of Rights

This RFP is not, and shall not be construed to be, an offer by PGE. PGE is not bound to enter into negotiations or execute an agreement with, or purchase any products from, any Bidder as a result of this RFP. No rights shall be vested in any Bidder, individual or entity by virtue of its preparation to participate in, or its participation in, this RFP. No binding commitment shall arise on the part of PGE to any Bidder under this RFP until and unless the parties execute definitive agreements that become effective in accordance with their terms.

Each Bidder shall be solely responsible for all costs it incurs in preparing to participate in, participating in, or responding to this RFP.

The bids received will be evaluated and selected based on the information supplied by each Bidder pursuant to this RFP. PGE reserves the right to modify or withdraw from this RFP process, or modify the schedule and any provisions contained herein, for any reason. As part of our normal course of business, PGE conducts bilateral discussions with developers and other electric energy providers. PGE also reserves the right, consistent with the Competitive Bidding Guidelines, to make purchase commitments at any time to suppliers not participating in this RFP process.

PGE reserves to itself:

- The selection of final short-listed bids and the awarding of contracts, if any, in the exercise of its sole discretion.
- The right to short-list project capacity in excess of its anticipated final contractual amount to ensure sufficient back-up proposals are available should other bidders materially depart from their bid during the negotiation

phase. PGE anticipates short-listing a minimum of 150% of anticipated final contracted capacity.

- The right to reject any and all bids, and any portion of a specific bid for any reason.
- The right to waive any immaterial non-conformity in any bid received.
- The right to award a contract to a Bidder based on a combination of price and non-price factors, a quantitative and qualitative assessment of portfolio fit, and post-bid negotiations.

PGE shall have no obligation to provide a reason for rejecting a bid.

3.9 Document Retention

All bids and exhibits supplied to PGE during the RFP process will become the property of PGE. PGE will retain all bid materials supplied to it and pertinent information generated internally by it in connection with the RFP process in accordance with PGE's document retention policies.

4 Bid Evaluation Process

This section describes PGE's process for evaluating bids received in response to this RFP. For details about our scoring criteria, see the sections, "Bid Pre-Qualifications," and "Criteria Used for Scoring Qualified Bids," below.

4.1 Reviewing, Ranking and Selecting Bids

In selecting the RFP short list, PGE will use a first-price, sealed-bid format. Under this format, Bidders may not update pricing during the scoring and evaluation period. We will use the first prices provided by Bidders, in conjunction with the non-price factors to select our short list of candidates, as stated in more detail below, and then negotiate contract terms and conditions during post-bid negotiations. PGE will not submit a self-build proposal (Benchmark resource) for the renewable RFP. The scoring process is illustrated in Figure 2, below.

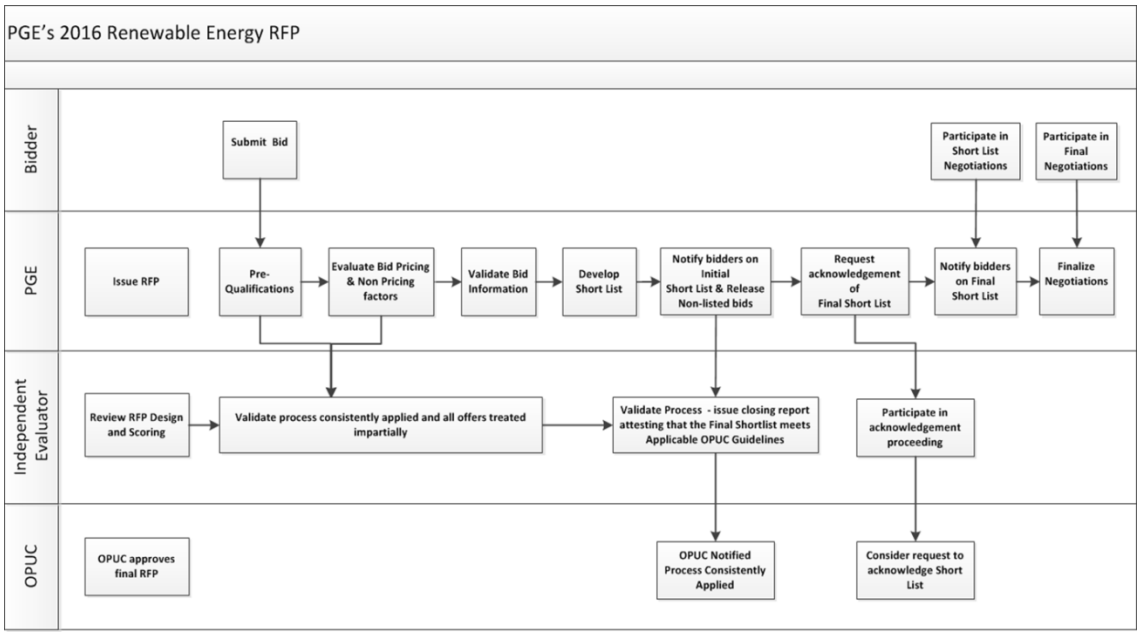

Figure 2. Resource Selection Process

Bids will be evaluated using a two-step process.

- *Assessment of Pre-Qualifications* – First, PGE will screen bids according to pre-established qualifying criteria, *i.e.*, minimum quantity and term, quality of credit, technology, and Bidder qualifications.
- *Evaluation of Scoring Factors* – Next, PGE will score bids that meet the pre-qualification standards. Overall scores will be comprised of price and non-price factors.

PGE reserves the right to request additional information regarding any proposal received.

5 Requested Power Products

PGE requests proposals for renewable electricity products, as described in this section, and this RFP.

Renewable resources must meet the requirements of Oregon's RPS, as defined in ORS 469A. In addition, renewable bids must include all environmental attributes, including Renewable Energy Certificates (RECs). Bidders will be responsible for ensuring RECs from projects are bundled as defined in ORS 469A.005. Owner will also be responsible to assure RECs are established through Western Renewable Energy Generation Information System (WREGIS) consistent with OAR 330-160-0020.

PGE is targeting approximately 175 MWa of renewable energy resources in this RFP, however, depending on bids received, we may also transact for more or less than the 175 MWa target. PGE recognizes that renewable resources can be developed in phases and will consider these proposals. PGE has expedited the RFP to enable capture of the PTC given its imminent planned decline. Preference will be given to RFP resources and bids that offer the ability to maximize cost savings to customers.

Table 1: Summary of Requested Renewable Energy Products

Product	**Capacity**	**Construction Start Date**		**Term**	
	Minimum	Preferred - No later than	No later than	Minimum	Target
Power Purchase Agreement	10 MW	Dec 2016	Dec 2018	10 years	20+ years
Ownership	10 MW	Dec 2016	Dec 2018	NA	NA

5.1 Renewable Electric Energy Products Requested

Physical Energy Purchase – PGE will consider proposals for the long-term purchase of renewable energy from an existing or to-be-constructed qualified renewable facility, with energy to be delivered to PGE's System (or load if the project is located within PGE's System). Renewable energy sold to PGE via a long-term agreement must be firm for the 15-minute scheduling intervals. Alternate firm proposals (i.e. hour ahead, day ahead, firm blocks, etc.) will also be considered if proposed. The minimum bid capacity under this RFP is 10 MW, and the minimum term duration is ten years. PGE will impute its cost for firming[3], regulation, or other ancillary services for integrating the power product beyond the 15-minute interval for purposes of bid evaluation.

For the purposes of this RFP, "firm" delivery means the only excuse for failure to deliver or receive is force majeure, as defined in the purchase agreement. Firm energy includes reserves and ancillary services to ensure that energy schedules are certain and delivered intact throughout the 15-minute interval.

Ownership Position in a Renewable Energy Resource – PGE will consider acquiring ownership positions in long-term renewable energy resources. Ownership proposals may include (but are not limited to) the sale of existing plants, acquisition of project development or natural resource rights and options, part ownership, and build-own-transfer agreements. We will also consider hybrid structures that include both an ownership component and a power purchase agreement (e.g. the sale of a phase or portion of a project with an off-take agreement for the remaining balance).

5.2 Point of Delivery and Transmission

PGE is electrically connected to both Bonneville Power Administration (BPA) and PacifiCorp. For Bidders with a project outside of PGE's System, it is the Bidders' responsibility to provide as part of the bid submittal a plan to obtain firm transmission from the resource to PGE's System. PGE's evaluation process will determine if there are additional costs or risks to deliver the resource from PGE System to PGE load.

Bidders proposing to interconnect a resource within PGE's system will need to include all incremental costs to deliver, or sink, energy from the resource to PGE's load. Bidders can determine these costs by requesting Network Resource Interconnection Service under PGE's Open Access Transmission Tariff (OATT) from PGE's Transmission and Reliability Services Department (T&RS) or a Bidder can request Energy Resource Interconnection Service and Point-to-Point Transmission Service under PGE's OATT from T&RS. Either process will enable T&RS to study whether any system upgrades are needed to accommodate transmission service for the bid. Questions concerning the

[3] Firming is provided to ensure that any deficiencies (or excesses) in the hourly actual generation compared to the scheduled energy will be made whole. For instance, if a project schedules 100 MWh but the actual production is 75 MWh, firming services will supply the 25 MWh not generated by the project.

various types of interconnection and transmission service available under PGE's OATT should be directed to T&RS. For price-scoring purposes PGE will assume no additional costs for system upgrades for bids delivering energy from outside of PGE's system to the BPAT.PGE POD with PGE Contiguous as the sink.

Secured transmission will not be a threshold determinant (submitting, at minimum a transmission plan, is a threshold requirement); however, if during the evaluation, PGE determines that the transmission proposal will be unable to achieve firm delivery to PGE's System, the proposal may be rejected. In addition, the status of firm delivery capability or rights to transmit the proposed energy supply to PGE's System, including status of participation in a BPA Transmission Service Expansion Project or satisfactory evidence of steps taken to perfect the rights to use firm transmission rights for delivery to PGE's System, will be the subject of negotiation and confirmation prior to execution of any contracts in connection with this RFP.

For the purposes of scoring bids in the RFP, "PGE System" shall be interpreted as the edge of the PGE Balancing Authority Area[4], excluding the PGE Balancing Authority Area boundaries surrounding PGE's Remote Resources.

"PGE System" includes the following:

- If a project is interconnected to BPA, PODs to PGE System may include:
- BPAT.PGE
  - PGE Contiguous
    - Pearl 230 kV (Sherwood)
    - McLoughlin 230 kV
    - Keeler 230 kV (St. Marys)
    - Rivergate 230 kV
  - Bethel 230 kV
  - Troutdale 230 kV (Blue Lake)
- If a project is interconnected to PAC, and delivering to PACW.PGE, PGE System PODs may include:
  - Bethel 230 kV
  - Gresham 230 kV
  - Linneman 230 kV

5.3 About the Term Sheets[5]

The term sheets in the appendices include material terms and conditions of the draft contracts. **Bidders are required to provide a complete and accurate mark up of these term sheets**.

[5] The term sheets attached in the appendices are drafts subject to revision before the final issuance of the RFP.

The term sheets are not intended to exclude alternative proposals for meeting PGE's renewable needs. If Bidders desire to propose an alternate structure, then a complete term sheet that mimics the formats provided must be submitted. Bids must include sufficient information for PGE to make a thorough evaluation of the proposals.

Failure to provide the term sheet as part of the proposal may result in PGE's rejection of the bid. As noted later, PGE strongly encourages submitting a redline mark-up of the applicable form agreement(s) in addition to the term sheet submittal.

6 Contract Terms and Conditions

6.1 Energy Purchase Agreement

The contract template for power purchases is included in Appendix C – Wholesale Renewable Power Purchase Agreement ("Form PPA"). The PPA term sheet is included in Appendix A. Bidders must review the Form PPA and PPA term sheet included in this RFP, and are required to include any proposed revisions to major contract terms by providing a redline mark up to the PPA term sheet. The full Form PPA has been provided as further reference for the term sheet and to provide the full and complete form contract associated with this transaction structure. To the extent Bidders have changes to the Form PPA, they are strongly encouraged as part of their response package to this RFP to submit a redline to the Form PPA in Appendix C as well. PGE will evaluate all proposed revisions, but is under no obligation to accept any revisions or adopt any changes. Changes, if any, to the terms and conditions of the term sheet and the Form PPA will be discussed with Bidders selected for final short list negotiations. PGE recognizes that alternative firm energy sale structures may be viable and Bidders proposing such alternatives must offer revisions to the PPA term sheet or propose a new term sheet. Bidders are also encouraged to mark up the Form PPA with the proposed changes.

6.2 Ownership Position in a Renewable Energy Resource

PGE invites Bidders to submit proposals for various types of asset sale and ownership transfer agreements. The contract templates are included in Appendix D and E – Asset Purchase Agreement ("Form APA") and Engineering Procurement and Construction Agreement ("Form EPC"). The APA and EPC term sheets are included in Appendix B. If Bidders have changes or detailed items to add to terms, they are required to redline the APA and EPC term sheets as part of their bid submittal. The Form APA and Form EPC have been provided as further reference for the term sheets and to provide the full and complete form contracts. To the extent Bidders have changes to the Form APA and/or Form EPC, they are strongly encouraged as part of their response package to provide redline changes to the Form APA and Form EPC. PGE recognizes that alternative ownership structures may be viable and invites Bidders proposing such alternatives to offer revisions of the terms or offer alternative terms and conditions to the extent necessary to reflect such alternative structures. Changes to terms and conditions and/or new terms and conditions will be discussed with Bidders selected for final short list negotiations.

Ownership proposals may include (but are not limited to) sales of existing assets, acquisition of project development or natural resource rights, build-own-transfer agreements or joint ownership. We will also consider hybrid structures that

include both an ownership component and a power purchase agreement (e.g. the sale of a phase or portion of a project with an off-take agreement for the remaining output).

Bidders submitting a proposal for either PGE ownership position or PPA will be required to provide, as part of their response package to this RFP, supporting information and documentation about the project.

7 Bid Pre-Qualifications

To be considered for evaluation, all proposals must meet the requirements specified below.

7.1 General

General pre-qualifications include minimum bid quantity, minimum bid bond, minimum bid term, Bidder credit qualifications and commercially viable technology.

7.1.1 Minimum Bid Quantity

The minimum bid amount is 10 MW. PGE has specified a low minimum bid size to encourage the submission of a variety of renewable bid technologies in this RFP. Renewable projects 10 MW or under may be eligible for PGE's Schedule 201 Qualifying Facilities Standard Contract Power Purchase Agreement. PGE is not accepting Schedule 201 Standard Contracts in this RFP. Entities wishing to enter into Schedule 201 Standard Contracts with PGE should contact Bruce True at 503-464-7491.

Qualifying Facilities (QFs) under the Public Utility Regulatory Policies Act of 1978, as amended, (PURPA) of 10 MW and above are welcome to bid into this RFP. However it should be noted that for this process, PGE's Schedule 202 will not apply to bidding QFs. Thus, QF bids in this RFP must include all associated environmental attributes, including but not limited to RECs; price will be based on the QF bid price, not PGE's Avoided Cost rates; and other Schedule 202 provisions, such as those concerning credit or transmission and scheduling will not apply. QFs, however, may still offer to sell to PGE outside the context of this RFP pursuant to Schedule 202.

7.1.2 Minimum Bid Bond

Upon bid submission, bidders that are of investment grade do not require a bid bond. Bidders who are not investment grade will need to show their ability to obtain a bid bond. A non-investment grade bidder can rely on a Qualified Institution to provide a Guaranty Commitment Letter, or, for PPAs, Letter of Credit Commitment Letter for ten percent of the project or PPA contract amount at the time of bid submission. Alternatively, Bidders may provide a bid bond or provide a cash deposit equal to 10 percent of the project, or PPA contract value upon bid submission.

Upon notification of final short list selection bidders are required to submit a bid bond executed by an entity acceptable to PGE and

authorized to issue such bond for not less than ten percent of the total bid price or total PPA contract value.

7.1.3 Minimum Bid Term

The minimum bid term is ten years.

7.1.4 Credit and Bidder Qualifications

All transactions are contingent upon the Bidder meeting and maintaining the credit requirements established by PGE's Credit Risk Management Department:

- Bidder's or Bidder's credit support provider's (if any) long-term, senior unsecured debt, that is not supported by third-party credit enhancement, must be rated by one or more of the following agencies as follows: BBB- or higher by Standard & Poor's and Fitch, BBB (low) by DBRS, or Baa3 or higher by Moody's Investor Services, Inc.
- If the Bidder or Bidder's credit support provider is rated by more than one agency, PGE will consider the lowest rating.
- All Bidders will be subject to review under PGE's internal guidelines by PGE's Credit Risk Management Department for qualification.

In addition, the Bidder must provide performance assurance in a form and amount acceptable to PGE based on PGE's assessment of the Bidder's and/or Guarantor's credit profile and the amount of expected financial exposure related to the bid (whether PPA or ownership), which may include one or more of the following: cash, a letter of credit, surety bond (payment and performance bond) or parental guarantee. Guidelines on PGE credit requirements are included in Appendix L.

7.1.5 Other Bidder Pre-qualification

As applicable, the Bidder must provide documentation, satisfactory to PGE, that it is authorized under the law to sell power, and able to schedule power and operate under industry standards established by the Federal Energy Regulatory Commission (FERC), Western Electricity Coordinating Council (WECC), and the North American Energy Reliability Council (NERC), or other applicable regulatory body or government agency.

7.2 For New Projects

7.2.1 Site Control and Commencement of Construction

Bidders must show site control (or clear evidence of ability to achieve site control) and other contractual terms that support the bids' Commercial Operation Date and, if considered in the pricing, a timeline to achieve the

associated federal tax benefit. Due to recently published Internal Revenue Service (IRS) guidance, preference is given to projects that can clearly demonstrate an ability to commence construction on or before December 31, 2016 but no later than December 31, 2018.

7.2.2 Technology

Proposals shall use utility-scale, commercially viable generation technology currently deployed in the western United States. For generation technologies that are not in common use by electric utilities, the Bidder shall identify utility-scale electric projects where the technology is already being used or provide documents describing the technology in reasonable detail. PGE will only consider bids that use widely deployed units with proven records of reliability and will provide its preferred equipment manufacturers as part of its technical specifications that will be attached as Appendix H to the RFP. PGE will not accept generation technology shown to have serial defects. Serial defects are considered to be a design or manufacturing problem that has affected 10% or more of the fleet. The Bidder shall specify the generation technology it proposes to use and provide preliminary design studies – completed in sufficient detail to identify all major equipment and components. Generation technology must comply with all current applicable Codes and Standards for a USA-based resource.

Bidders may contact the IE in the event that they are uncertain whether their choice of specific generation technology is acceptable to PGE. Such requests need to be received by the IE no later than May 27, 2016. PGE will review any such proposals as to their suitability for meeting our renewable energy requirements. The IE can be contacted through the RFP website. The notification should identify the manufacturer and model the Bidder intends to include in a bid.

The Bidder must provide a site layout plan and a project milestone schedule indicating critical path elements.

7.2.3 Suitability of Site

The Bidder must identify the project site location, show site control, and provide satisfactory evidence that the site is not otherwise committed or encumbered and is available for the full term of the proposed bid. The Bidder must have identified all required site-specific permits and have prepared a plan or schedule for obtaining all permits and licenses. For proposals to sell project development rights or lease options, the Bidder should identify any required permits and licenses that the Bidder has acquired or intends to acquire and those that PGE would be responsible to obtain. Although PGE will not make a threshold requirement to have

permits in-hand before signing a definitive agreement, PGE will assess the probability of successfully completing the permitting process as part of its evaluation. If at any point it is determined that a project cannot obtain the required permits as designed, PGE reserves the right to reject the bid.

Bidders must also provide enough information for PGE to assess the suitability of their site for the proposed project. The information should address permitting, annual and monthly energy projections (preferably from an independent source), site proposed layout, cost estimate from equipment manufacturer, and Engineering Procurement and Construction cost estimates.

For purposes of this RFP, PGE will not accept proposals that rely on PGE's assets (such as land and/or transmission rights). For example, Bidders must provide their own transmission rights as part of the bid package.

7.2.4 Fuel Supply (where applicable)

Bidder must demonstrate physical and commercial access to fuel supplies and fuel transportation for the term of the contract proposed in its bid. PGE will not accept bids for biomass or biogas projects that pass fuel risk to PGE because, among other things, unlike other fuel types (such as coal or natural gas), PGE does not have the ability to reasonably hedge biomass or biogas fuel costs.

8 Criteria Used for Scoring Qualified Bids

This section summarizes the criteria PGE will use to evaluate bids submitted in response to the RFP. The detailed scoring matrix will be disclosed to Bidders and other interested parties on the IE website. The following tables summarize these criteria. For details about information that should accompany each bid, see "Appendix F, Required Bidder Profile," and "Appendix G, Required Bidder Information."

Table 2. Evaluation Criteria for Renewable Energy Products

Factors	*Descriptions*	*Sub Total*	*Total*
Price Factors	Base prices adjusted for considerations described in the Price Factors section below.		60%
Non-Price Factors			
	Project Development ▪ Project financing ▪ Site control ▪ Developer experience ▪ Permitting status ▪ Environmental Factors ▪ Federal tax credit eligibility and capture risk	15%	
	Project Characteristics ▪ Fuel supply diversity ▪ Resource risk ▪ O&M reliability ▪ Project location ▪ Project and geographic diversity ▪ Curtailment and dispatch limitations ▪ Extension option or equity position	12%	
	Power Product Characteristics ▪ Performance guarantee and liquidated damages ▪ Amount (MW/h) ▪ Contract term ▪ Contract/Resource start date ▪ Variability of bid cost ▪ Technological Maturity	8%	
	Credit Factors	5%	
	Total Non-Price Factors:		40%
Total:			100%

8.1 Price Factors

Price represents a significant portion of the overall score. To evaluate bids containing different product characteristics on a comparable basis, prices submitted by the Bidder will be subject to adjustment for the following considerations:

- *Ancillary services, if not included in product pricing* – see discussion below.
- *Quality and firmness of energy.* – If the bid does not include integration for intermittent and non-dispatchable resources, we will estimate the cost and include it in our price analysis.
- *Generation output profile – i.e.* variable energy production vs. flat hourly market prices, etc.
- *Any other factor necessary to ensure bids are evaluated on a comparable basis.*

The price score will be calculated as the ratio of the bid's projected total cost per MWh to forecast market prices using real-levelized or annuity methods (per Guideline 9a. of the Competitive Bidding Guidelines).

PGE may require performance assurances in support of the Bidder's obligations, which may include one or more subordinate liens in combination with corporate guarantees, escrow accounts, cross-default thresholds, cash deposits, surety bond or letters of credit. Lower levels of performance assurances may be acceptable, if there are other compensating factors as determined by PGE in its sole discretion. PGE retains the right to adjust the bid price to include the cost to PGE of performance assurances, if the Bidder does not provide adequate performance assurance.

Point of Delivery (POD) – Applicable transmission service costs will be applied in order to capture the incremental cost of delivering energy to PGE's load. These costs include wheeling, losses, and required ancillary services as prescribed in applicable tariffs, as well as any incremental costs for transmission or distribution system improvements necessary to deliver the energy to PGE's load. However, for bids wherein the Bidder has the responsibility of securing and paying for point-to-point transmission services for delivery from the generation facility to the POD on PGE's system, no costs for those point-to-point services to PGE's system will be applied.

Ancillary Services – If ancillary services are not included in product pricing, power product bids for delivery to PGE System will, at a minimum, be adjusted to account for the following ancillary services (where applicable) to meet control area operations and transmission provider requirements:

- Operating and supplemental reserves
- Generation and energy imbalance
- Scheduling, system control and dispatch

- Reactive support and voltage control

Bidders shall provide a comprehensive list of all ancillary services they are planning to provide in delivering the power product to the point-of-delivery. To the extent that any of these required ancillary services are not being supplied by the Bidder, PGE will, for scoring purposes, adjust the price provided by the Bidder to reflect the cost of acquiring additional ancillary services required. We will use a cost estimate based on verifiable prices or regional standards whenever possible.

8.2 Non-Price Factors

8.2.1 Project Development

This category scores the likelihood that a project supporting a bid will be placed in commercial service. The evaluation criteria for this category generally address construction and development risks associated with the completion of projects that are not yet in commercial operation, and which are necessary to support bids. Plants that are already operating or are sufficiently advanced in construction may be deemed to earn the maximum possible score in this category.

For projects that are less advanced, we will consider the following criteria for scoring:

- Method and status of project financing
- Level of site control by developer
- Project team experience
- Status of required permits, licenses and environmental studies
- Status of equipment supply and engineering, procurement and construction (EPC) agreements
- Federal Tax Credit Eligibility and Capture Risk

8.2.2 Point of Delivery

Point-of-delivery (POD) is both a price and non-price factor. This category scores the risks associated with potential transmission constraints or curtailments in delivering the power from external PODs to PGE's load. When scoring for non-price factors, we will factor in the risks of transmission congestion.

The Pacific Northwest (PNW) transmission system currently has numerous constraints that can limit the firm delivery of power products for extended periods of time. The scoring process for this RFP assumes continuation of the status quo; however, PGE retains the right to adjust the delivery risk based upon the progress of any potential BPA Transmission System Expansion Project, other BPA transmission

expansion process, long term power transmission distribution factors, and available long term transfer capacity evaluations.

Interconnection and transmission service for projects using PGE's transmission system will be provided under the terms and conditions of PGE's federal Open Access Transmission Tariff (OATT), PGE's Generator Interconnection Guidelines, and all applicable orders and rules. Bidders should contact PGE's Transmission and Reliability Services Department at 503-464-7155 to discuss interconnection and transmission arrangements. Confirmation of firm delivery capability or rights to transmit the proposed energy supply to PGE's load will be required prior to execution of any contracts in connection with this RFP. Interconnection for QFs shall be governed by PURPA, applicable PGE tariffs, and applicable state orders and rules.

PGE's federal Open Access Transmission Tariff (OATT) is available at: https://www.oatioasis.com/PGE/PGEdocs/PGE-8_OATT.pdf

PGE's Generator Interconnection Guidelines are available at: https://www.oatioasis.com/PGE/PGEdocs/PGE_Gen_Requirements_(07-12-2013).pdf.

8.2.3 Physical Project Characteristics

This category captures the physical characteristic risks of the bid products. The evaluation criteria for this category generally address physical and operational risks associated with the production and delivery of power to PGE. Some of the characteristics that we will consider in our scoring are:

- Resource technological diversity– focused on the potential capacity value the project brings. This characteristic is intended to capture benefits offered by any diversity that the technology brings to PGE's supply portfolio.
- Point of delivery (as discussed above).
- Project location.
- Fuel supply diversity, resource risk and O&M reliability characteristics.
- Risk that the resource will not perform as expected (for variable and intermittent resources).
- Project life and extension options. Rights that allow PGE to extend the life of a resource beyond the initial term provide potential future risk mitigation. As a result, proposals that provide rights to long-

term access to the resource or energy supply will be scored higher than proposals that do not provide similar rights.
- Compliance with all applicable Codes & Standards.
- Fuel delivery.

Our non-price scoring criteria also values projects that provide benefits to Oregon and our local economy. The criteria include a benefit for location within Oregon, and a somewhat higher benefit for location within our service territory.

8.2.4 Power Product Characteristics

This category scores how well the bid product matches PGE's system operating needs. The evaluation criteria for this category generally address price risk, performance and supply portfolio concentration risks, along with the benefits of operational flexibility. Some of the characteristics that we will consider in our scoring are:

- Performance guarantees and compensation for failure to achieve them.
- Dispatchability
- Product flexibility
- Contract term
- Amount (MW per hour)
- Deviations from product term sheet.

8.2.5 Credit Evaluation

This category scores the creditworthiness of the Bidder. We will take into account the following credit considerations in our scoring:

- Debt and equity ratings
- Performance assurance
- Financial ratio analysis
- Default risk
- Credit concentration and liquidity
- Enforceability of contractual credit terms
- Evaluation of lawsuits and/or liens
- Bidder revisions to contract templates that may affect credit requirements

8.3 Additional Considerations for Renewable Resources

Physical Energy Purchases from Non-dispatchable, Variable Energy Resources – Integration costs represents the forecast error and generation firming services associated with a Variable Energy Resource (VER). Bids for energy from resources, such as wind, require integration services to ensure that the actual

minute-to-minute output of the resource throughout the 15-minute interval remains equal to its fixed, non-dynamic scheduled output for that same time period. Bidders have been asked to acquire integration services on their own behalf for the 15-minute interval. Details about these integration services and the cost of such services will be required as part of the bid. PGE may reject bids that do not include at minimum a 15-minute integration plan and the associated costs as part of the bid. PGE will impute its cost for firming, regulation, or other ancillary services for integrating the resource beyond the 15-minute interval for purposes of bid evaluation.

PGE will quantify the costs and benefits of the variability of each project separately. Price scoring will quantify the total energy of the project as bid and the value of the project's energy shape if the energy has not already been shaped to a flat output. Non-Price scoring will take into account annual availability and other variation in output of each project. Bidders may, in the interest of optimizing their bid, elect to provide pricing separately for optional components, such as shaping[6] and scheduling notice.

Another important element of integration services is the scheduling notice period. Longer notice periods provide load-serving entities higher supply certainty and reduced exposure to market risk by limiting reliance upon spot markets to absorb fluctuations in energy production. For the Non-Price scoring component, PGE prefers to know as far in advance as possible the amount of energy to be supplied in any given hour.

For clarity, a wind or other renewable resource directly interconnected into PGE's System will be assessed PGE's full integration cost (with current costs to be applied).

Additional weighting will be awarded as part of the Non-Price score to dispatchable products. Products which, after integration, provide a flat volume of power for all hours will be ranked second (when compared to dispatchable products) for non-price scoring purposes. However, we recognize that such certainty has an associated cost, and will score that as part of the price factor scoring. For example, we would expect the price of a product that is flat for all hours, *i.e.*, no variability, to be more expensive than a variable product provided with a 168-hour scheduling notice. Both of these products would likely be more expensive than one provided with a 24-hour scheduling notice. We expect the product with the combination of lowest price and the longest scheduling notice to achieve the highest overall score.

[6] Shaping is a service where actual generation is 'stored' either physically or financially and returned in a specific, predetermined shape.

Finally, PGE may consider bids proposing to deliver intermittent resources via dynamic transfer.

Production Tax Credit and Investment Tax Credit – Bidders should submit proposals that meet the most recent guidance to achieve the federal Production Tax Credit (PTC) and Investment Tax Credit for Solar (ITC) or advise of any exceptions. Bidders should make their assumptions for PTC and ITC clear.

9 Final Short List Determination

For the short list, PGE intends to include bids representing a minimum of 150% of the renewable energy requested in this RFP, subject to receipt of a sufficient quantity and quality of bids. Once the short list has been developed pursuant to the scoring criteria outlined above, PGE will refine bid evaluations in the following areas to determine the final short list:

Transmission - Explanations of transmission evaluations can be found in the section "Criteria Used for Scoring Qualified Bids". As stated above, PGE may adjust the delivery risk of external PODs based upon the progress of BPA's Transmission Service Expansion Process as may be appropriate at the time of the determination of the short list. PGE will perform a more detailed analysis of transmission for bids on the initial shortlist. Bids which do not provide for firm delivery capability or rights to transmit the proposed energy supply to PGE's load may be excluded from the final short list.

Review of capacity factor assumptions – PGE will contract with an independent third party expert to review capacity factor assumptions for intermittent resources.

Security for Performance Requirements – PGE will perform a detailed credit risk evaluation of all Bidders in the shortlist, and will refine performance assurance requirements during this stage. However, performance assurance will only be required at the execution of a definitive agreement with a successful Bidder.

Integration Costs – PGE will conduct further evaluation of integration and shaping costs. As stated earlier, PGE will input applicable costs from its wind integration study to all bids not providing integration services.

Impact to portfolio – PGE will also take overall system costs and risks into account in its selection of final short list bids.

10 Post-Bid Negotiations

PGE's goal is to conduct an efficient post-bid negotiation process. As part of this process, PGE requires comprehensive response to terms. A number of factors will be considered in the post-bid process to ensure an appropriate fit with our overall energy portfolio. These include performance risks, concentrations of risk, credit, response to contract terms, firmness of delivery, and fuel risk exposure. PGE will initiate negotiations with a short list of Bidders whose proposals rank highest in the evaluation process and whose proposed transactions, PGE believes in its sole discretion, offer value to PGE's energy supply portfolio for customers, and have a reasonable likelihood of being executed and performed.

The number of Bidders with whom negotiations will be held will depend upon the bids received, the size or quantity of the highest ranked bids as compared to our resource needs, the results of the scoring process, ability to access federal tax benefits and other factors described more fully in the sections "Bid Evaluation Process", "Criteria Used for Scoring Qualified Bids", and "Final Short List Determination." Selection for the final short-list and initiation of negotiations do not constitute a winning bid.

PGE shall have no obligation to enter into a definitive agreement with any Bidder to this RFP and, at its sole discretion, may terminate negotiations with any Bidder at any time without liability or obligation to any Bidder. Whether or not, and until, negotiations with Bidders produce final and fully executed contracts satisfactory to PGE for its resource targets under the RFP, PGE reserves the right to pursue any and all other resource options available to it.

11 Appendix A – Power Purchase Agreement Term Sheet

Term Sheet Mark Up Required for Bid

Wholesale Renewable Power Purchase Agreement (PPA) Term Sheet

Bidders are required as part of their RFP submission to review, comment upon and upload applicable term sheets for their transaction structures. Bidders are strongly encouraged to also upload a redline markup of the full PPA as part of their bid submissions. To the extent a Bidder fails to submit a redline of the Form PPA, PGE will deem the terms of the Form PPA to be accepted by the Bidder unless commented upon in the term sheet submission. Responses to the term sheets and applicable agreements will be considered as part of PGE's scoring process and evaluation of bids. This term sheet summarizes key terms of the PPA, but is not intended to provide an exhaustive summary of all contract provisions. Bidders should review the complete form of PPA, the terms of which shall control over this term sheet in the event of discrepancy.

Information shown as blank in the description area is where the Bidder is to provide exceptions to the terms in the Form PPA, if any, as part of its bid submission or in some cases the relevant information (i.e. Scheduled Commercial Operation Date, Expected Capacity) to support PGE's evaluation of the bid. If there is any difference between the submission on the Independent Evaluator [IE] website and this term sheet, the IE website will govern.

Term	Description (and area for Bidder Mark-Up)
Buyer (referred to as "PGE") (Introduction)	Portland General Electric Company (PGE)
Seller (Introduction)	
Commercial Operation (Section 1.1.12)	Commercial Operation is achieved when not less than the Required Capacity is fully operational and reliable and the Facility is fully interconnected, fully integrated, and synchronized with the Transmission System and certain specified events have occurred (see full description in 1.1.12): - Certificate from Licensed Professional Engineer - Start-up Testing complete; - Interconnection Facilities complete; certificate from Licensed Professional Engineer; - Transmission Provider confirmation of network resource interconnection service and required network upgrades are paid; - Transmission Provider confirmation of long-term, firm, point-to-point transmission service agreement with roll over rights for Energy delivery to the Delivery Point at no less than the Maximum Facility Delivery Rate; - Authorized officer certificate that Seller has obtained or entered into all Facility Documents (confidential or commercial terms may be redacted or omitted); - Opinion regarding Site provided;

	- All required Performance Assurance provided.
Contract Price (Section 1.1.14)	Please input proposal and any comments to term. Clarify if pricing is flat or escalating or if both options are presented. If escalating, please provide the annual escalation factor.
Expected Capacity (MW) (Section 1.1.38)	Please input proposal and comments to term (if any).
Expected Facility Output (MWh) (Section 1.1.39)	Please input proposal and comments to term (if any).
Required Capacity (Section 1.1.104)	Please input proposal and comments to term (if any).
Scheduled Commercial Operation Date (Section 1.1.109)	Please input proposal and comments to term (if any).
Term; Conditions Precedent (Section 2.1)	Please input any Seller Condition Precedents if applicable.
Test Energy (Definition and Section 2.2)	Test Energy is Energy from the Facility delivered to the Delivery Point before the Commercial Operation Date; it includes RECs and Capacity Rights associated with Facility Output. PGE will purchase Test Energy at 50% of the Contract Price.
Delivery Period (Section 2.3)	If Facility Output is equal to or greater than the Energy Scheduled and delivered to PGE at the Delivery Point, PGE will pay (i) the Contract Price for the quantity of Energy so Scheduled and delivered, and (ii) the REC Price Component only for RECs associated with Facility Output not Scheduled and delivered as Energy at the Delivery Point. If the Facility Output is less than the Energy Scheduled and delivered to PGE at the Delivery Point, PGE will pay to Seller (i) the Contract Price for the quantity of MWh equal to the Facility Output, and (ii) the relevant Transmission Provider's real time imbalance energy price index for the remaining MWh Scheduled and delivered at the Delivery Point.
Price Adjustment for Excess Output (Section 2.3.3)	In any Contract Year in which Facility Output exceeds 110% of Expected Output, the Contract Price for each MWh in excess of the Expected Output for the balance of such Contract Year will be [75%] of the price otherwise payable
Notice of Sale of Facility (Section 2.4)	If Seller or an Affiliate of Seller desire to sell the Facility during the Term, Seller will first notify PGE of its desire to sell the Facility. If PGE notifies Seller that it is interested in acquiring the Facility, the Parties shall engage in exclusive good faith negotiations to reach agreement for a period of 90 days thereafter.

[Option to Purchase/Option to Extend Term] (Section 2.5)	If a Bidder wishes to propose an end of Term or during Term option for PGE to purchase the Facility, or an option for PGE to extend the Term of the PPA, it should include its proposal here in its mark up of the Term Sheet.
Development and Construction of Facility (Section 3.1)	Seller is responsible for permitting, financing, construction of the Facility. *[Note: this provision will be deleted for an existing Facility.]*
Milestones (Section 3.1.7)	Seller is responsible for achieving each Milestone as of a specified date. Each Milestone will be extended on a day for day basis for any delay due solely to (i) PGE's delay in taking, or failure to take, any action required of it hereunder in breach of this Agreement, or (ii) an event of Force Majeure. If Seller fails to achieve a Milestone by the date specified, it is required to submit and implement a remedial action plan. If Seller fails to submit or timely implement the remedial plan, PGE reasonably concludes based on the report and proposed remedial action plan that the Facility is unlikely to achieve Commercial Operation on or before the Guaranteed Commercial Operation Date, a Seller Event of Default will be deemed to have occurred.
Delay Damages and Deficit Damages (Section 3.1.10)	If Commercial Operation is not achieved on or before the Scheduled Commercial Operation Date, Seller will pay Delay Damages from and after the Scheduled Commercial Operation Date up to the date that the Facility achieves Commercial Operation. If the Facility's Actual Capacity at Final Completion is less than the Expected Capacity, Seller will pay Deficit Damages.
Contract Termination Damages (Section 3.1.11)	If Seller does not achieve Commercial Operation on or before the Guaranteed Commercial Operation Date, PGE may terminate the PPA upon ten (10) Days notice to Seller, and Seller will pay Contract Termination Damages of $25 per kW of Expected Capacity in addition to all Delay Damages paid or payable.
Right of First Offer (Section 3.1.14)	If the PPA is terminated before the Commercial Operation Date, neither Seller nor Seller's Affiliates may sell, market or deliver any Product from the Facility to a party other than PGE for a period of two (2) years following the termination date the PPA, unless before selling or entering into an agreement to sell, Seller or Seller's Affiliates provides PGE with a written offer to sell the Product on terms and conditions materially similar to the terms and conditions contained in the PPA, and PGE fails to accept the offer within 45 days. With respect to any Expected Capacity that is not included in Actual Capacity upon Final Completion, neither Seller nor

	Seller's Affiliates may sell, market or deliver any Product from the Deficit Capacity to a party other than PGE for a period of two (2) years following Final Completion, unless before selling or agreeing to sell such Product , Seller or Seller's Affiliates provides PGE with a written offer to sell the Product on terms and conditions materially similar to the terms and conditions contained in the PPA, and PGE fails to accept the offer within 45 days.
Seller to Designate Third Party Forecasting and Scheduling Agents (Section 3.3.1)	At least 10 days before it begins to Schedule Test Energy, Seller will engage at its expense a third-party Scheduling Agent and a third-party forecasting agent (the "Forecasting Agent"), subject in each case to PGE's prior approval. The Scheduling Agent will perform Seller's pre-scheduling and Scheduling obligations based exclusively on forecasts supplied by the Forecasting Agent.
Transmission and Scheduling of Energy (Section 3.3)	Seller will arrange for, pay all costs of, and be responsible for Transmission Services relating to the transmission of the Facility Output generated by the Facility to and at the Delivery Point. Seller will designate at its expense a third-party entity reasonably acceptable to PGE to Schedule all Facility Output to the Delivery Point as firm energy in 15-minute intervals (firm at T-39) in accordance with applicable protocols, procedures and deadlines. Seller will obtain at its expense all integration and other services required to Schedule such Energy as firm in each 15-minute interval.
Measurement and Transfer of RECs (Section 3.4)	RECs will be deemed sold and delivered to PGE as they are produced and measured by the Facility Meter.
Output Guarantee (Section 3.5)	Seller will deliver an average quantity of Facility Output during each two-Contract Year Rolling Period equal to the sum of (i) 85% of the Expected Facility Output for the Rolling Period, less (ii) any quantities of Facility Output that were not delivered to the Facility Meter during periods constituting Seller Excused Minutes. If the average quantity of Facility Output delivered by the Facility during any Rolling Period is less than 50% of Expected Output, Seller will be in default under Section 5.1.8.
Curtailment (Section 3.7)	PGE will not be obligated to purchase, receive, pay for, or pay any damages associated with, Facility Output (or associated production tax credits or RECs) if such Facility Output (or associated production tax credits or RECs) is not delivered to the Delivery Point for any reason.
Force Majeure (Article 4)	Force Majeure means an event or circumstance that prevents one Party from performing its obligations to deliver or receive the Product under this Agreement, which event or circumstance was not anticipated as of the

	Effective Date, which is not within the reasonable control of, or the result of the negligence of, the Claiming Party, and which, by the exercise of due diligence, the Claiming Party is unable to overcome or avoid or cause to be avoided. If a Force Majeure event prevents a Party from performing its material obligations under the PPA for a period exceeding 180 consecutive days before the Commercial Operation Date or, after the Commercial Operation Date, for a period exceeding 240 consecutive days, then the Party not affected by the Force Majeure event may terminate the PPA.
Events of Default (Section 5.1)	
Declaration of an Early Termination Date and Calculation of Settlement Amounts (Section 5.2); Settlement Amount (Section 1.1.107)	The Gains or Losses resulting from the termination of this Agreement will be determined by calculating the amount that would be incurred or realized to replace or to provide the economic equivalent of the remaining payments or deliveries in respect of this Agreement. The Gains or Losses shall be calculated for a period equal to the remaining Term. Settlement Amount means the Losses or Gains, and Costs, that the Non-Defaulting Party incurs as a result of the termination of the PPA. If the Non-Defaulting Party's Costs and Losses exceed its Gains, then the Settlement Amount sis an amount owing to the Non-Defaulting Party. If the Non-Defaulting Party's Gains exceed its Costs and Losses, then the Settlement Amount is zero dollars ($0).
Post-Termination PURPA Status (Section 5.8)	If the PPA is terminated for Seller's default, neither Seller nor any Affiliate or successor may thereafter require or seek to require PGE to make any purchases from the Facility or any electric generation facility constructed on the Site under PURPA, or any other Law, for any periods that would have been within the Term had the PPA remained in effect.
Remedy for Seller's Failure to Deliver (Section 6.1)	If Seller fails to Schedule and/or deliver all or part of the Product, and such failure is not excused under the PPA, Seller will pay PGE within five (5) Business Days of invoice, an amount for such deficiency equal to the positive difference, if any, obtained by subtracting the Contract Price from the Replacement Price. Persistent or repeated failure to deliver is a default under Section 5.1.4.
Remedy for PGE's Failure to Receive (Section 6.2)	If PGE fails to receive all or part of the Product Scheduled and such failure is not excused, then PGE swill pay Seller an amount for such deficiency equal to the positive difference,

	if any, obtained by subtracting the Sales Price from the Contract Price associated with the amount of such Product. Persistent or repeated failure to receive is a default under Section 5.1.4.
Pre-COD Security (Section 9.1)	Seller will post and maintain Performance Assurance (guaranty, letter of credit or cash) in favor of PGE, equal in each case to $25 per kW of Expected Capacity. Amount is equivalent to $_____. Please input proposal and any comments to term (if any).
Delivery Period Security (Section 9.2)	Seller will post and maintain Performance Assurance as Delivery Period Security in an amount sufficient to provide replacement power and corresponding RECs for the next 18 calendar months of revenue. Amount is equivalent to $_____. Please input proposal and any comments to term (if any).
Representations and Warranties; Indemnity (Article 12)	
Dispute Resolution [Article 18]	In the event of a dispute related to the PPA, the parties will first address the dispute through mediation by their senior officers. If the dispute is not resolved by the senior officers, it will be submitted for mediation before a single mediator in accordance with the Commercial Mediation Procedures of the American Arbitration Association. All mediation will take place in Portland, Oregon. All aspects of the mediation will be treated as confidential information. Each party is responsible for its own expenses and 50% of any mediation expenses. If the dispute is not resolved through mediation, the parties consent to the exclusive jurisdiction of the courts of Oregon located in Portland or the courts of the U.S. for the District of Oregon having subject matter jurisdiction. Each party waives all rights to trial by jury. The prevailing party in any proceeding is entitled to receive the costs and expenses incurred by the prevailing party. The above provisions survive termination of the PPA.
Governing Law [Article 16]	State of Oregon

ADDITIONAL TERMS THAT BIDDER WOULD LIKE TO COMMENT UPON (IF NOT LISTED ABOVE)	
Term	**Description (and area for Bidder Mark-Up)**

12 Appendix B-1 – Engineering, Procurement and Construction (EPC) Term Sheet

Term Sheet Mark Up Required for Bid

Engineering, Procurement and Construction Agreement (EPC) Term Sheet

Bidders are required as part of their RFP submission to review, comment upon and upload applicable term sheets for their transaction structures. Bidders are strongly encouraged to also upload a redline markup of the full EPC as part of their bid submissions. Responses to the term sheets and applicable agreements will be considered as part of PGE's scoring process and evaluation of bids. This term sheet summarizes key terms of the EPC, but is not intended to provide an exhaustive summary of all contract provisions. Bidders should review the complete form of agreement, the terms of which shall control over this term sheet in the event of discrepancy.

Information shown as blank in the description area is to be provided by Bidder as part of its bid submission. It can also be entered here. If any difference between the submission on the Independent Evaluator (IE) website and this term sheet, the IE website shall govern.

Term	Description (and area for Bidder Mark-Up)
Contractor Scope of Work ["Scope of Work" and Exhibit A]	Exhibit A to be developed based on bidder's proposal with major equipment to be specified by manufacturer and model and a detailed explanation of engineering concepts, design and operational requirements. Work to include start-up and testing with performance test requirements and guaranteed performance to be specified in exhibits to be developed based on selected technology. Equipment delivery schedules, transportation and logistical details, and warranty provisions for major equipment to be developed and approved. Real property requirements to be identified and complied with.
Project Schedule [Section 2.5.2]	Contractor to submit a project schedule as an exhibit and update monthly in progress reports. Contractor to conduct weekly project meetings.
Credit Support [Section 2.12]	Contractor to provide adequate credit support for contractual obligations by way of a combination of payment and performance bonds, letter of credit and corporate guarantee.
Subcontractors [Article III]	Major Subcontractors to be pre-approved; subcontracts to contain certain provisions, including PGE's right to take assignment by written notice upon contractor termination.
Contract Price [Article IV]	To be expressed in a milestone payment schedule and paid based on project progress. Contract Price to include all applicable taxes. Ten percent retainage to be released after substantial completion, subject

	to punch list holdback. Undisputed amounts to be paid within 45 days after receipt of monthly invoices with proper documentation. Overdue amounts accrue interest at the rate of prime plus 2.0%.
Owner Responsibilities [Article V]	Owner to secure site access in accordance with real estate rights and shall be responsible for permits as listed that are required to be in Owner's name (but Contractor to provide assistance reasonably requested by Owner in connection with Owner's efforts to obtain and maintain permits).
Mechanical and Substantial Completion Requirements [Sections 6.2 and 6.3]	Mechanical Completion requirements to be established based on selected technology. Substantial Completion requirements to include completion of all work, other than punch list work, correction of known defects, achievement of all performance guarantees or payment of applicable performance LDs, payment of any delay LDs, delivery of spare parts, furnishing of permits, lien waivers, and other required submittals.
Liquidated Damages [Sections 6.1.1, 6.1.2 and 6.6.1]	Commencement of Construction Liquidated Damages to be in an amount and with timing as needed to support bidder's tax credit assumptions and Owner's risk of loss of tax credits back-to-back. Performance testing and Performance LDs to be established based on selected technology and in an amount as necessary to make Owner whole for economic consequences of performance shortfalls. Delay LDs at Substantial Completion to be established in an amount as necessary to make Owner whole for late completion, subject to a cap equal to a specified percentage of the Purchase Price.
Warranty [Article VII]	Bidders to specify the length of the warranty period, which should be no less than two years. Warranty to cover all Work defects, non-conformance with requirements, workmanlike services, compliance with law, standards and specifications, and non-infringement. Contractor to bear all costs and expenses associated with warranty services, including costs of transportation, disassembly, removal, replacement, reassembly, reinstallation, and retesting. Contractor to enforce subcontractor and equipment warranties during the warranty term and assign any unexpired equipment and subcontractor warranties to Owner at end of warranty period. Major equipment to be covered with long-term warranties consistent with best market terms for selected technology.
Force Majeure and Owner Caused Delay	Schedule and specified cost relief for Force Majeure Events affecting the Contractor's Work, subject to mitigation, notice, and

[Article VIII]	documentation requirements. Schedule and specified cost relief for Owner Caused Delay affecting the Contractor's Work, subject to mitigation, notice, and documentation requirements.
Changes [Article IX]	Process for owner-initiated, contractor-initiated and required changes. Schedule and specified cost relief for required changes (events of force majeure, Owner's suspension of the Work, Owner-caused delays, Unforeseen Site Conditions and pre-existing hazardous materials).
Indemnification [Article X]	Mutual indemnification with provisions for claims arising out of negligence and to the extent caused by comparative negligence. Contractor responsible to indemnify for claims and damages including those arising out of personal injury and property damages caused by Contractor, violations of law, defective work and warranty claims, liens and claims from subcontractors, intellectual property claims, and cancellation and invalidation of insurance.
Insurance [Article XI]	Insurance program to be established based on project specifics, as necessary to protect Owner's insurable interests. To be included as an exhibit.
Default, Termination, Suspension [Article XII]	Contractor events of default include bankruptcy, insolvency, failure to pay amounts due to Owner, breach of representations, failure to adhere to recovery plan, hitting LD caps, unapproved transfer or assignment, and failure to obtain and maintain insurance and credit support. Owner default event for non-payment of undisputed amounts following notice. Owner may terminate for cause upon contractor default or for convenience. Contractor may terminate for Owner default. Termination payment to include all amounts due to Contractor and for termination damages. Owner has a "cover" remedy in the event of Contractor default termination with option to take over and complete the project. Owner may suspend Work, subject to change order for additional costs and delay.
Title and Risk of Loss [Article XIII]	Title passes at earlier of payment or delivery of equipment to Project Site.

	Risk of Loss passes at substantial completion.
Disputes [Article XIV]	Three step process; negotiation, mediation, litigation. Oregon law applies with hearings to be conducted in Portland. Attorneys' fees recoverable by the prevailing party.
Reps and Warranties [Article XV]	Typical reciprocal representations and warranties.
Confidentiality [Article XVI]	Five year confidentiality requirement, subject to standard permitted disclosures. Publicity and press releases to be coordinated and mutually approved.
Limits of Liability [Sections 16.2 and 16.2]	Consequential damages waived. Contractor's liability capped at 100% of the contract price, except with respect to liability arising out of negligence, fraud, willful misconduct, illegal acts, indemnification obligations, warranty claims, taxes, project substantial completion and no cap on insurance.
Post-COD Operation and Maintenance and Performance Assurance	Bidders should outline a proposed long term service strategy that is appropriate to the technology and addresses PGE's need for performance assurances after the facility is placed in operation
ADDITIONAL TERMS THAT BIDDER WOULD LIKE TO COMMENT UPON (IF NOT LISTED ABOVE)	
Term	**Description (and area for Bidder Mark-Up)**

13 Appendix B-2 Asset Purchase Agreement (APA) Term Sheet

Term Sheet Mark Up Required for Bid

Asset Purchase Agreement [APA] Term Sheet

Bidders are required as part of their RFP submission to review, comment upon and upload applicable term sheets for their transaction structures. Bidders are strongly encouraged to also upload a redline markup of the full APA as part of their bid submissions. To the extent a Bidder fails to submit a redline of the Form APA, PGE will deem the terms of the Form APA to be accepted by the Bidder unless commented upon in the term sheet submission. Responses to the term sheets and applicable agreements will be considered as part of PGE's scoring process and evaluation of bids. This term sheet summarizes key terms of the APA, but is not intended to provide an exhaustive summary of all contract provisions. Bidders should review the complete form of APA, the terms of which shall control over this term sheet in the event of discrepancy.

Information shown as blank in the description area is to be provided by Bidder as part of its bid submission (see also required information on the website). If there is any difference between the submission on the Independent Evaluator [IE] website and this term sheet, the IE website will govern.

Term	Description and Area for Bidder Proposals
Buyer (referred to as "PGE") [Introduction]	Portland General Electric Company
Seller [Introduction]	
Project Description and Assets ["Project" and "Project Assets"]	Note: Bidders are advised that this form of APA was drafted contemplating the purchase of a development stage project that would not be constructed as of the effective date of the APA.
Purchase Price & Payment Terms [Section 2.3]	
PGE Conditions Precedent [Section 3.2]	PGE will not be obligated to close the transaction unless each of the following conditions has been met: 1. Receipt of all third-party consents required in connection with the transaction, and all required regulatory approvals.

	2. Receipt of Seller's officer's certificate, FIRPTA certificate, UCC search reports, assignment to PGE of each contract and real property interest, and an estoppel letter from each counterparty to each contract. 3. Seller's representations and warranties are true and correct as of the effective date and the closing date, and Seller has performed all of its obligations under the APA. 4. There is no current or threatened litigation that could (a) affect the closing, Seller, the project, or the project assets, or (b) challenge any permit. 5. There is no material adverse effect with respect to Seller, the project, or the project assets. 6. PGE has completed its due diligence review to its satisfaction. Note: PGE may require additional project-specific conditions precedent based on the nature and state of development of the project. Such conditions may include, but are not limited to, delivery of a title insurance policy, survey, permits, and environmental reports.
Seller Conditions Precedent [Section 3.3]	Seller will not be obligated to close the transaction unless each of the following conditions has been met: 1. PGE's representations and warranties are true and correct as of the effective date and the closing date, and PGE has performed its obligations under the APA. 2. There is no current or threatened litigation that could affect the closing. 3. Receipt of all required regulatory approvals.
Termination [Section 3.4]	Note: This section can be omitted for any transaction that contemplates a simultaneous signing and closing. The APA may be terminated by (a) mutual written consent, (b) PGE if the closing has not occurred by [_____], or (c) either party for breach or default with a 30-day cure period. The parties' obligations under Article 7 (Confidential Information) will survive for two years from and after the date of termination.
Representations and Warranties of Seller [Article 5]	Seller will represent and warrant the following are true and correct as of the effective date and as of the closing date, as applicable: 1. Seller is validly organized and has the authority to consummate the transaction. 2. There is no current or threatened litigation against Seller. 3. There are no conflicts or violations caused by Seller's consummation of the transaction. 4. No third-party consents are required to consummate the

	transaction other than those listed by Seller. 5. Seller has valid title to all project assets, free of liens. 6. The project assets transferred by Seller to PGE will constitute a complete project, other than as listed on a schedule of exceptions. 7. The real property scheduled by Seller comprises all property interests and rights necessary to own, operate, and maintain the project, and provide legal and practical ingress and egress rights. Each real property agreement is valid and binding and in full force and effect and will continue to be so after the closing. There is no breach or default under the agreements, disputes or repudiations of the agreements, or transfers of the agreements by Seller. No other payments are required for real property interests. 8. All tax returns have been filed, taxes paid, and tax liabilities recorded. There are no tax-related disputes pending or threatened. No tax return has been subject to examination or audit. Neither the project nor project assets constitute tax-exempt bond financed property or tax-exempt use property. None of Seller or its affiliates have applied for, claimed, or received a cash grant, production tax credit, or investment tax credit. At least 80% of the project assets constitute "new Section 38 property." Neither the project nor the project assets have been placed in service. Either (a) the project is a "qualified facility" that produces electricity using "qualified energy resources," (b) the project assets are "energy property," (c) the project assets are "qualified property" or a "qualified investment credit facility," or (d) the project assets are "specific energy property." Financial projections for the amount of depreciation deductions, tax credit, or grants are fair representations. Seller is not a "foreign person." There are no liens for unpaid taxes. 9. Seller has scheduled all project contracts, and each such contract is valid and binding and in full force and effect, and will remain so after the closing. There is no breach or default under any contract. 10. Neither Seller nor its affiliates have transferred, agreed to transfer, or granted rights to purchase energy or environmental attributes related to the electric power to be generated by the project after the closing. 11. Seller is in compliance with all applicable laws, including environmental laws, and there is no action pending or threatened against Seller for failure to comply. 12. All analyses in relation to the site, project assets, and real property interests have been delivered to PGE. 13. Seller has obtained all permits required for PGE to own, operate, and maintain the project. 14. Seller is solvent and has sufficient assets and capital to carry

	on its business as now conducted and to perform its obligations under the APA. 15. Seller has the right to use and transfer to PGE all intellectual property rights used in connection with the project assets. 16. Seller's representations and warranties contain no untrue statement of material fact, and omit no material fact necessary to make the representations and warranties not materially misleading. Note: PGE may require additional representations and warranties based on the nature and state of development of the project.
Confidential Information [Article 7]	Seller will not use, publish, disseminate, describe, or otherwise disclose any PGE confidential information without PGE's prior written consent. PGE confidential information includes all information provided by PGE to Seller and identified by PGE as confidential, and all information provided by PGE to Seller with respect to the project or the transaction. After the closing, PGE confidential information will include any information that is a project asset. PGE confidential information may be disclosed if required by a governmental authority, court, or law, but such information must be submitted under all applicable provision for confidential treatment and Seller must give PGE written notice promptly after such disclosure is required to allow PGE to take whatever action appropriate to prohibit such disclosure. Seller will not use any PGE confidential Information except in connection with the transaction. For breach, PGE is entitled to injunctive relief, in addition to any other remedy available at law or in equity. PGE will not use, publish, disseminate, describe, or otherwise disclose any Seller confidential information without Seller's prior written consent. Seller confidential information includes all information provided by Seller to PGE and identified by Seller as confidential, and all information provided by Seller to PGE with respect to the project or the transaction. Seller confidential information may be disclosed if required by a governmental authority, court, or law, or to the OPUC or independent evaluator retained by PGE and approved by OPUC, but such information must be submitted under all applicable provision for confidential treatment and PGE must give Seller written notice promptly after such disclosure is required to allow Seller to take whatever action appropriate to prohibit such disclosure. PGE will not use any Seller confidential Information except in connection with the transaction. For breach, Seller is entitled to injunctive relief, in addition to any other remedy available at law or in equity.
Covenants of PGE and Seller [Article 8]	Note: This section can be omitted for any transaction that contemplates a simultaneous signing and closing.

	During the period between the execution of the APA and the closing of the transaction, Seller will do the following: 1. Seller will continue to operate the project and conduct its business in the ordinary course of business. 2. Seller will maintain and keep the project and project assets in a condition as good as at the effective date. 3. Seller will maintain relationships with landowners and suppliers. 4. Seller will maintain the permits and comply with applicable law. 5. Seller will perform and comply with all contracts, real property agreements, and permits, and Seller will not amend any of the above, and Seller will not enter into any new contracts, real property agreements, or permits. 6. Seller will continue development of the project with the approval of PGE. 7. Seller will not transfer or lease any project assets. 8. Seller will not place in service the project or project assets. 9. Seller will not claim any tax credit or grant. 10. Seller will not permit the project or project assets to become tax-exempt bond financed property or tax-exempt use property. 11. Seller will not take any action that would preclude the project or project assets from being classified in the hands of PGE as "qualified energy resources" and "qualified facilities," "energy property," "qualified property" or a "qualified investment credit facility," or "specified energy property." 12. Seller will not solicit, initiate, encourage, entertain, make, or accept offers with respect to the sale of the project or project assets. 13. Seller will grant PGE reasonable access to the site, project, personnel, and books and records to allow PGE to perform its due diligence review. 14. Seller will promptly amend the schedules to the APA if necessary and notify PGE of any conditions that could have a material adverse effect.
Survival Periods [Sections 9.1 and 9.2]	All representations, warranties, and related indemnification obligations survive the closing for 24 months, with the following exceptions: 1. Sections 5.1 and 6.1 (Organization and Authority) and Section 5.7 (Project Assets) survive termination of the APA indefinitely. 2. Section 5.9 (Tax Matters) and Section 5.12 (Environmental Laws) survive the closing until the expiration of the applicable statute of limitations.

	3. Sections 9.3.1(d) and (e), and Sections 9.4.1(c) and (d): Indemnifications by Seller or PGE for fraud, intentional misrepresentation, willful misconduct by, or gross negligence of Seller or PGE in connection with the APA or the transaction, and any claims, actions, or suits made by third parties against PGE or Seller arising from the acts or omissions of PGE or Seller in connection with the development, ownership, or operation of the project or project assets, as applicable, survive the closing indefinitely. All claims for indemnification must be made no later than 90 days after the applicable survival period.
Indemnification by Seller [Section 9.3]	Seller will indemnify PGE for all losses arising from: (a) the failure of any representation or warranty or other Seller statement to be true and correct; (b) a material breach of a covenant or agreement of Seller; (c) a retained liability; (d) fraud, intentional misrepresentation, willful misconduct by, or gross negligence of Seller in connection with the APA or the transaction; (e) a third-party claim arising from Seller's acts or omissions in connection with the development, ownership, or operation of the project or project assets; and (d) liability for taxes imposed on PGE relating to a taxable period or portion thereof on or before the closing related to the project or project assets.
Indemnification by PGE [Section 9.4]	PGE will indemnify Seller for all losses arising from: (a) the failure of any representation or warranty or other PGE statement to be true and correct; (b) a material breach of a covenant or agreement of Seller; (c) a third-party claim arising from PGE's acts or omissions in connection with the ownership or operation of the project or project assets; (d) fraud, intentional misrepresentation, willful misconduct by, or gross negligence of PGE in connection with the APA or the transaction; (e) liability for taxes imposed on Seller relating to a taxable period or portion thereof on or after the closing related to the project or project assets; and (f) assumed liabilities.
Limitations on Liability [Section 9.7]	Seller's aggregate maximum liability for indemnity under the APA will not exceed 100% of the purchase price, but such cap will not apply to any breach by Seller of Sections 5.1 (Organization and Authority), 5.7 (Project Assets), 5.15 (Solvency), or 5.17 (Investment Company), any third-party claim, or any claim based on fraud or willful misconduct of Seller. PGE's aggregate maximum liability for indemnity under the APA will not exceed 100% of the purchase price, but such cap will not apply to any breach by PGE of Section 6.1 (Organization and Authority), any third-party claim, or any claim based on fraud or willful misconduct of PGE.

	No indemnified party is entitled to indemnification for losses to the extent caused by the willful misconduct, fraud, or negligent act of such indemnified party, or a breach by such indemnified party of any representation, warranty, covenant, or other agreement in the APA. An indemnified party making an indemnification claim must take commercially reasonable steps to mitigate its losses. Any claim or loss will be reduced to the extent the indemnified party recovers any insurance proceeds with respect to such claim or loss.
Tax Matters [Article 10]	The allocation of the purchase price will be agreed between Seller and PGE no later than 60 days after the closing date. Seller is responsible for all federal, state, and local sales, documentary, and other transfer taxes due as a result of the purchase, sale, or transfer of the project assets. All payments made under any indemnity provision of the APA will be treated as adjustments to the purchase price.
Assignment [Section 11.1]	Neither PGE nor Seller may assign their respective obligations under the APA without the prior written consent of the other party.
Dispute Resolution [Section 11.4]	In the event of a dispute related to the APA, the parties will first address the dispute through mediation by their senior officers. If the dispute is not resolved by the senior officers, it will be submitted for mediation before a single mediator in accordance with the Commercial Mediation Procedures of the American Arbitration Association. All mediation will take place in Portland, Oregon. All aspects of the mediation will be treated as confidential information. Each party is responsible for its own expenses and 50% of any mediation expenses. If the dispute is not resolved through mediation, the parties consent to the exclusive jurisdiction of the courts of Oregon located in Portland or the courts of the U.S. for the District of Oregon having subject matter jurisdiction. Each party waives all rights to trial by jury. The prevailing party in any proceeding is entitled to receive the costs and expenses incurred by the prevailing party. The above provisions survive termination of the APA.
Governing Law [Section 11.6]	State of Oregon

ADDITIONAL TERMS THAT BIDDER WOULD LIKE TO COMMENT UPON [IF NOT LISTED ABOVE]	
Term	**Description [and area for Bidder mark-up]**

14 Appendix C – Wholesale Renewable Power Purchase Agreement

Template provided in a separate document available for download on PortlandGeneralRFP.accionpower.com.

WHOLESALE RENEWABLE POWER PURCHASE AGREEMENT

Between

Portland General Electric Company

And

[*Seller*]

Table of Contents

Page

Article 1 DEFINITIONS AND INTERPRETATION 1

1.1 Definitions 1

1.2 Rules of Interpretation 15

1.3 Technical Meanings 16

Article 2 CONTRACT TERM; DELIVERY PERIOD; PRICE; SALE OF FACILITY 16

2.1 Term; [Conditions Precedent] 16

2.2 Test Energy 16

2.3 Delivery Period 17

2.4 Notice of Sale of Facility 17

2.5 **[**Option to Purchase/Option to Extend Term] 18

Article 3 FACILITY DEVELOPMENT, CONSTRUCTION AND OPERATION 18

3.1 Development and Construction of Facility 18

3.2 Facility Operations 22

3.3 Transmission and Scheduling of Energy 23

3.4 Measurement and Transfer of RECs 24

3.5 Output Guarantee 25

3.6 Access 26

3.7 Curtailment 27

Article 4 FORCE MAJEURE 27

4.1 Definition 27

4.2 Occurrence and Notice 27

4.3 Obligations 28

4.4 Right to Terminate. 28

Article 5 EVENTS OF DEFAULT; REMEDIES 28

5.1 Events of Default 28

5.2 Declaration of an Early Termination Date and Calculation of Settlement Amounts 29

5.3 Termination Payment 30

5.4 Notice of Payment of Termination Payment 30

5.5 Disputes with Respect to Termination Payment 30
5.6 Closeout Setoffs 31
5.7 Suspension of Performance 31
5.8 Post-Termination PURPA Status 31
Article 6 REMEDIES FOR FAILURE TO DELIVER/RECEIVE 32
6.1 Remedy for Seller's Failure to Deliver 32
6.2 PGE's Failure to Receive 32
6.3 Duty to Mitigate 33
6.4 Acknowledgement of the Parties 33
6.5 Survival 34
Article 7 PAYMENT AND NETTING 34
7.1 Billing Period 34
7.2 Timeliness of Payment 34
7.3 Disputes and Adjustments of Invoices 34
7.4 Netting of Payments 35
7.5 Payment Obligation Absent Netting 35
Article 8 LIMITATIONS 35
8.1 Essential Purposes 35
8.2 Exclusive Remedies 35
8.3 Direct Damages 35
8.4 No Consequential Damages 35
8.5 Causes Disregarded 35
8.6 Liquidated Damages 36
Article 9 CREDIT AND COLLATERAL REQUIREMENTS 36
9.1 Pre-COD Security 36
9.2 Delivery Period Security 36
9.3 Grant of Security Interest/Remedies 37
9.4 Holding Performance Assurance 38
9.5 Interest Rate on Cash Collateral 38
9.6 Performance Assurance is Not a Limit on Seller's Liability 38
9.7 Waiver 38
Article 10 GOVERNMENTAL CHARGES 39
10.1 Cooperation 39

10.2 Non-Sale Related Governmental Charges and Taxes 39
10.3 Sale-related Governmental Charges and Taxes 39
10.4 Indemnification 39
Article 11 RATES AND TERMS BINDING; FERC STANDARD OF REVIEW 39
11.1 Mobile-Sierra Doctrine 39
Article 12 REPRESENTATIONS AND WARRANTIES; INDEMNITY 40
12.1 Representations and Warranties 40
12.2 Indemnity 41
12.3 Additional Representations and Warranties of Seller 41
12.4 No Other Representations or Warranties 42
Article 13 Insurance 42
13.1 Insurance 42
13.2 Seller to Provide Certificate of Insurance 43
13.3 Seller to Notify PGE of Loss of Coverage 43
Article 14 TITLE AND RISK OF LOSS 43
Article 15 ASSIGNMENT; BINDING EFFECT 44
15.1 Assignment 44
15.2 Change in Control 44
15.3 Binding Effect 44
Article 16 GOVERNING LAW 44
Article 17 RECORDS AND AUDIT 44
17.1 Records 44
17.2 Audit Rights 45
Article 18 DISPUTE RESOLUTION 45
18.1 Referral to Senior Management 45
18.2 Mediation 45
18.3 Legal Action 46
18.4 Waiver of Jury Trial 46
18.5 Attorneys' Fees 46
18.6 Survival 46
Article 19 GENERAL PROVISIONS 46
19.1 Entire Agreement 46
19.2 Joint Efforts 47

19.3 Amendments in Writing 47
19.4 No Third Party Beneficiaries 47
19.5 Non-Waiver 47
19.6 Severability 47
19.7 Survival 47
19.8 Bankruptcy Matters 48
19.9 Relationships of Parties 48
19.10 Headings 48
19.11 Consolidation of Variable Interest Entities 48
Article 20 CONFIDENTIALITY 49
Article 21 NOTICES AND COUNTERPARTS 49
21.1 Notices 49
21.2 Counterparts 50

This WHOLESALE RENEWABLE POWER PURCHASE AGREEMENT for Energy ("Agreement") is entered into effective as of the _____ day of _____, 201_ ("Effective Date"), by and between [*Seller*], a [*STATE*] limited liability ("Seller"), and Portland General Electric Company, an Oregon corporation ("PGE"). PGE and Seller are also referred to in this Agreement individually as a "Party" and collectively as the "Parties."

ARTICLE 1
DEFINITIONS AND INTERPRETATION

1.1 Definitions.

As used in this Agreement, the following terms, when initially capitalized, shall have the meanings specified in this Section 1.1.

1.1.1 "AAA Procedures" has the meaning set forth in Section 18.2

1.1.2 "Actual Capacity" means the instantaneous generation capacity of the Facility, stated in MW, that has achieved Commercial Operation.

1.1.3 "Affiliate" means, with respect to a Party, any Person that, directly or indirectly, through one or more intermediaries, controls, or is controlled by, or is under common control with, such Party. For this purpose, "control" means the direct or indirect ownership of fifty percent (50%) or more of the outstanding capital stock or other equity interests having ordinary voting power.

1.1.4 "Agreement" means this Wholesale Renewable Power Purchase Agreement entered into between Seller and PGE and all incorporated appendices, exhibits, schedules and attachments to this Agreement, as the same may be amended by the Parties from time to time.

1.1.5 "Ancillary Services" means all ancillary products associated, in accordance with Prudent Electric Industry Practice, with the generation of electrical Energy, including, without limitation, spinning reserves, non-spinning reserves, reactive power and voltage control.

1.1.6 "Balancing Authority Area" means an electric power system or combination of electric power systems under the control of an operator who acts to (i) match, at all times, the power output of the electric generators within the electric power system(s) and the capacity and energy purchased from entities outside the electric power system(s), with the load within the electric power system(s), (ii) maintain scheduled interchange with other control areas, within the limits of Prudent Electric Utility Practice, (iii) maintain the frequency of the electric power system(s) within reasonable limits in accordance with Prudent Electric Utility Practice and (iv) provide sufficient generating capacity to maintain operating reserves in accordance with Prudent Electric Utility Practice.

1.1.7 "Bankrupt" means with respect to any entity, such entity (i) files a petition or otherwise commences, authorizes or acquiesces in the commencement of a proceeding

or cause of action under any bankruptcy, insolvency, reorganization or similar law, or has any such petition filed or commenced against it and such petition filed or commenced against it is not dismissed after one hundred and eighty (180) days, (ii) makes an assignment or any general arrangement for the benefit of creditors, (iii) otherwise becomes bankrupt or insolvent (however evidenced), (iv) has a liquidator, administrator, receiver, trustee, conservator or similar official appointed with respect to it or any substantial portion of its property or assets, or (v) is generally unable to pay its debts as they fall due.

1.1.8 "Business Day" means any day except a Saturday, Sunday, or a Federal Reserve Bank holiday. A Business Day shall open at 8:00 a.m. and close at 5:00 p.m. local time for the relevant Party's principal place of business. The relevant Party, in each instance unless otherwise specified, shall be the Party by whom the notice or payment or delivery is to be received.

1.1.9 "CAMD" means the Clean Air Markets Division of the Environmental Protection Agency or successor administrator, or any state or federal entity given jurisdiction over a program involving transferability of RECs.

1.1.10 "Capacity Attributes" means any current or future defined characteristic, certificate, tag credit, ancillary service or attribute thereof, or accounting construct, including any of the same counted towards any current or future resource adequacy or reserve requirements, associated with the electric generation capability and capacity of the Facility or the Facility's capability and ability to produce energy. Capacity Rights are measured in MW. Notwithstanding any other provision of this Agreement, "Capacity Attributes" do not include: (i) any PTCs, ITCs, or any other tax credits, deductions, or tax benefits associated with the Facility, or (ii) any state, federal, local, or private cash payments or grants relating in any way to the Facility or the electric power output of the Facility.

1.1.11 "Claiming Party" has the meaning set forth in Section 4.2.

1.1.12 "Commercial Operation" means that not less than the Required Capacity is fully operational and reliable and the Facility is fully interconnected, fully integrated, and synchronized with the Transmission System, all of which shall be Seller's responsibility to receive or obtain. Without limiting Seller's other obligations under this Agreement, Commercial Operation occurs when all of the following events (a) have occurred, and (b) remain simultaneously true and accurate as of the time at which Seller gives PGE notice that Commercial Operation has occurred:

(i) PGE has received a certificate addressed to PGE from a Licensed Professional Engineer stating: (1) the Actual Capacity of the Facility at the time of Commercial Operation, and (2) that the Facility is able to generate electric power reliably in amounts expected by this Agreement and in accordance with all other terms and conditions hereof;

(ii) Start-Up Testing of the Facility shall have been completed;

(iii) PGE has received a certificate addressed to PGE from a Licensed Professional Engineer stating that, in accordance with the Interconnection Agreement, all required Interconnection Facilities have been constructed, all required interconnection tests have been completed and the Facility is physically interconnected with the applicable Transmission System in conformance with the Interconnection Agreement and is able to deliver energy at no less than the Maximum Facility Delivery Rate.

(v) PGE has received confirmation from the Transmission Provider(s) that (a) Seller has obtained network resource interconnection service for the Facility, and (b) Seller has paid for any required network upgrades. ***[Note to bidders: Bidders may propose energy resource interconnection service. The quality of the proposed service will be considered in PGE's evaluation of the bid.]***

(vi) PGE has received confirmation from Seller and the applicable Transmission Provider(s) that Seller has obtained long-term, firm, point-to-point transmission service agreement with roll over rights, sufficient to enable Energy to be transmitted from the Facility and delivered to the Delivery Point at no less than the Maximum Facility Delivery Rate. ***[Note to bidders: Bidders may propose alternative transmission service arrangements. The quality of the proposed transmission service will be considered in PGE's evaluation of the bid.]***

(iv) PGE has received (1) a certificate addressed to PGE from an authorized officer of Seller stating that Seller has obtained or entered into all Facility Documents, and (2) copies of any Facility Documents requested by PGE; provided, however, that Seller may redact or omit confidential or commercial terms from non-public Facility Documents.

(v) PGE has received an opinion from a Licensed Professional Engineer, or an attorney, licensed to practice in the state in which the Site is situated stating that Seller has all Permits and all other rights and agreements required to operate the Facility as contemplated by this Agreement in accordance with Law.

(vi) PGE shall have received all Performance Assurance required by this Agreement.

Seller shall provide written notice to PGE stating when Seller believes that the Facility has achieved Commercial Operation accompanied by the certificates described above. PGE shall have 10 days after receipt of Seller's notice either to confirm to Seller that all of the conditions to Commercial Operation have been satisfied or have occurred, or to state with specificity what PGE reasonably believes has not been satisfied. If, within such 10 day period, PGE does not respond or notifies Seller confirming that the Facility has achieved Commercial Operation, the original date of receipt of Seller's notice shall be the Commercial Operation Date. If PGE notifies Seller within such 10 day period that

PGE reasonably believes the Facility has not achieved Commercial Operation, Seller shall address the concerns stated in PGE's notice to the mutual satisfaction of both Parties.

1.1.13 "Commercial Operation Date" means the date on which the Facility achieves Commercial Operation.

1.1.14 "Contract Price" means the price, expressed in USD per MWh, set forth on Exhibit B.

1.1.15 "Contract Termination Damages" has the meaning set forth in Section 3.1.11.

1.1.16 "Contract Year" means any consecutive 12-month period during the Term, commencing at 00:00 hours on the Commercial Operation Date or any of its anniversaries and ending at 24:00 hours on the last day of such 12-month period.

1.1.17 "Costs" means, with respect to a Party, brokerage fees, commissions and other similar third party transaction costs and expenses reasonably incurred by such Party in entering into new arrangements which replace this Agreement and all reasonable attorneys' fees and expenses incurred by a Party in connection with enforcing its rights under this Agreement. Costs shall not include any expenses incurred by such Party in either entering or terminating any arrangement pursuant to which it has hedged its obligations.

1.1.18 "Credit Rating" means (i) with respect to any entity other than a financial institution, the (a) current ratings issued or maintained by S&P or Moody's with respect to such entity's long-term senior, unsecured, unsubordinated debt obligations (not supported by third party credit enhancements) or (b) corporate credit rating or long-term issuer rating issued or maintained with respect to such entity by S&P or Moody's, or (ii) if such entity is a financial institution, the ratings issued or maintained by S&P or Moody's with respect to such entity's long-term, unsecured, unsubordinated deposits.

1.1.19 "Credit Requirements" means a senior, unsecured long term debt rating (or corporate rating if such debt rating is unavailable) of (a) BBB or greater from S&P, or (b) Baa2 or greater from Moody's, and if such ratings are split, the lower of the two ratings must be at least 'BBB' or 'Baa2' from S&P or Moody's, respectively.

1.1.20 "Critical Milestone" has the meaning set forth in Section Section 3.1.7.

1.1.21 "Daily" means any 24-Hour period commencing at 0000 Hours.

1.1.22 "Deficit Capacity" has the meaning set forth in Section 3.1.14(b).

1.1.23 "Deficit Damages" means a one-time payment equal to (a) the difference between (i) Expected Capacity and (ii) the Actual Capacity of the Facility on the 120th day after the Guaranteed Commercial Operation Date, stated in MWs, multiplied by (b) $25,000.

1.1.24 "Defaulting Party" has the meaning set forth in Section 5.1.

1.1.25 "Delay Damages" for any given day are equal to (a) the Expected Facility Output, expressed in MWhs per year, divided by 365, multiplied by (b) Replacement Price, but in no event less than [$___] per day.

1.1.26 "Delivery Period" has the meaning set forth in Section 2.3.

1.1.27 "Delivery Period Security" has the meaning set forth in Section 9.2.1.

1.1.28 "Delivery Point" means the following point of delivery on the PGE System: ***[bidder to propose]***.

1.1.29 "Dispute" has the meaning set forth in 18.1.

1.1.30 "Early Termination Date" has the meaning set forth in Section 5.2.1.

1.1.31 "Effective Date" has the meaning set forth in the first paragraph of this Agreement.

1.1.32 "Emissions Reduction Credit" is any credit, allowance or instrument issued or issuable pursuant to a state implementation plan under the Clean Power Plan promulgated by the Environmental Protection Agency under the Clean Air Act.

1.1.33 "Energy" means all electric energy, expressed in MWh, generated by the Facility and scheduled to PGE at the Delivery Point as required by this Agreement.

1.1.34 "Environmental Attributes" means any and all claims, credits, benefits, emissions reductions, offsets and allowances, however named, resulting from the avoidance of the emission of any gas, chemical, or other substance to the air, soil or water or otherwise arising as a result of the generation of electricity from the Facility, regardless of whether or not (i) such environmental attributes have been verified or certified, (ii) such environmental attributes are creditable under any applicable legislative or regulatory program, or (iii) such environmental attributes are recognized as of the Effective Date or at any time during the Term. Environmental Attributes include but are not limited to: (a) any avoided emissions of pollutants to the air, soil, or water such as (subject to the foregoing) sulfur oxides (SOx), nitrogen oxides (NOx), carbon monoxide (CO), and other pollutants; (b) all Emissions Reduction Credits; and (c) any avoided emissions of carbon dioxide (CO2), methane (CH4), and other greenhouse gases (GHGs) that have been determined by the United Nations Intergovernmental Panel on Climate Change to contribute to the actual or potential threat of altering the Earth's climate by trapping heat in the atmosphere. Notwithstanding any other provision of this Agreement, the term "Environmental Attributes" does not include: (i) any PTCs, ITCs, or any other tax credits, deductions, or tax benefits associated with the Facility, or (ii) any state, federal, local, or private cash payments or grants relating in any way to the Facility or the electric power output of the Facility.

1.1.35 "Equitable Defenses" means any bankruptcy, insolvency, reorganization and other laws affecting creditors' rights generally, and with regard to equitable remedies, the discretion of the court before which proceedings to obtain same may be pending.

1.1.36 "EWG" means an "exempt wholesale generator," as defined under PUHCA.

1.1.37 "Event of Default" has the meaning set forth in Section 5.1.

1.1.38 "Expected Capacity" means [__] MW, the instantaneous generation capacity that the Facility is expected to have at Final Completion.

1.1.39 "Expected Facility Output" means [__] MWh of Product expected to be generated by the Facility and measured at the Facility Meter during each Contract Year, as set forth in Exhibit C. Seller estimates that the Facility will generate Facility Output during each Contract Year according to the estimates of monthly Facility Output set forth in Exhibit C. If at Final Completion the Facility's Actual Capacity is less than the Expected Capacity, Expected Facility Output shall be reduced by [___] MWh per Contract Year for each full MW of Actual Capacity below Expected Capacity.

1.1.40 "Facility" means the ***[describe renewable energy technology]*** facility more fully described in attached Exhibit D, and includes all generators, equipment, devices and associated appurtenances owned, controlled, operated and managed by Seller in connection with, or to facilitate, the production, generation, transmission, delivery, or furnishing of Product to PGE in accordance with this Agreement (including the Interconnection Facilities).

1.1.41 "Facility Documents" means the Permits and other authorizations, rights and agreements now or hereafter necessary for (i) construction, ownership, operation, and maintenance of the Facility in accordance with Prudent Electric Industry Practices, and (ii) transmission of Energy from the Facility to the PGE System, including those documents listed in Exhibit E; provided, however, that nothing set forth in Exhibit E limits the obligations of Seller to obtain all Facility Documents required to enable Seller to perform this Agreement in accordance with its terms.

1.1.42 "Facility Meter" means the metering equipment designed, furnished, installed, owned, inspected, tested, maintained and replaced as provided in the Interconnection Agreement.

1.1.43 "Facility Output" means all electric energy, RECs and Capacity produced by the Facility, less station use, if any, all as measured at the Facility Meter.

1.1.44 "FERC" means the Federal Energy Regulatory Commission or any successor government agency.

1.1.45 "FIN 46" has the meaning set forth in Section 19.11.

1.1.46 "Final Completion" means the Facility is fully operational and reliable, at or greater than the Required Capacity, and fully interconnected, fully integrated, and synchronized with the Transmission Provider's System, as evidenced (to the reasonable satisfaction of PGE) by the completion of all items set forth on the Final Completion Punch List, modified if necessary to reflect the Actual Capacity.

1.1.47 "Final Completion Punch List" means, as of Commercial Operation, a list of all items to be completed in order to achieve Final Completion.

1.1.48 "Forecasting Agent" shall have the meaning set forth in Section 3.3.1.

1.1.49 "Force Majeure" is defined in Section 4.1.

1.1.50 "Gains" means, with respect to a Party, an amount equal to the present value of the economic benefit to it, if any (exclusive of Costs), resulting from the termination of its obligations with respect to this Agreement determined in a commercially reasonable manner.

1.1.51 "Governmental Authority" means any national, state, provincial or local government, any political subdivision thereof or any other governmental, regulatory, quasi-governmental, judicial, public or statutory instrumentality, authority, body, agency, department, bureau, or entity with authority to bind a Party at law; provided, however, that "Governmental Authority" shall not in any event include either Party.

1.1.52 "Governmental Charges" means any charges or costs that are assessed or levied by any entity, including local, state or federal regulatory or taxing authorities that would affect sale and purchase of a Product contemplated by this Agreement, either directly or indirectly.

1.1.53 "Guaranteed Commercial Operation Date" means the date that is 90 days after the Scheduled Commercial Operation Date.

1.1.54 "Guarantor" means, with respect to Seller, [_____].

1.1.55 "Guaranty" means an instrument or agreement pursuant to which the Guarantor guarantees the performance of each and all of the obligations of Seller, which instrument or agreement is reasonably acceptable in form and substance to PGE.

1.1.56 "Guaranty Default" means with respect to a Guaranty or the Guarantor thereunder, the occurrence of any of the following events: (i) any representation or warranty made or deemed to be made or repeated by such Guarantor in connection with such Guaranty shall be false or misleading in any material respect when made or when deemed made or repeated; (ii) such Guarantor fails to pay, when due, any amount required pursuant to such Guaranty; (iii) the failure of such Guarantor to comply with or timely perform any other material covenant or obligation set forth in such Guaranty if such failure is not capable of remedy or shall not be remedied in accordance with the terms and conditions of such Guaranty; (iv) a Merger Event occurs with respect to such Guarantor; (v) such Guaranty shall expire or terminate, or shall fail or cease to be in full

force and effect and enforceable in accordance with its terms against such Guarantor, prior to the satisfaction of all obligations of the guaranteed Party under this Agreement, in any such case without replacement; (vi) such Guarantor shall repudiate, disaffirm, disclaim, or reject, in whole or in part, or challenge the validity of, its Guaranty, or (vii) such Guarantor becomes Bankrupt; provided, however, that no Guaranty Default shall occur or be continuing in any event with respect to a Guaranty after the time such Guaranty is required to be canceled or returned to Seller in accordance with the terms of this Agreement.

1.1.57 "Indemnitee" has the meaning set forth in Section 12.2.

1.1.58 "Indemnitor" has the meaning set forth in Section 12.2.

1.1.59 "Indemnity Claims" means all third party claims or actions, threatened or filed, whether groundless, false, fraudulent or otherwise, that directly or indirectly relate to the subject matter of an indemnity, and the resulting losses, damages, expenses, attorneys' fees and court costs, whether resulting from a settlement or otherwise, and whether such claims or actions are threatened or filed prior to or after the termination of this Agreement.

1.1.60 "Interconnection Agreement" means the generator interconnection agreement between Seller and ***[identify applicable Transmission Provider*] [*if already executed:*** dated [_____, 20__].***]***

1.1.61 "Interest Rate" means, for any date, the lesser of (a) the per annum rate of interest equal to the prime lending rate as may from time to time be published in The Wall Street Journal under "Money Rates" on such day (or if not published on such day on the most recent preceding day on which published), plus 200 basis points, and (b) the maximum rate permitted by applicable law.

1.1.62 "Interconnection Facilities" means all the facilities installed, or to be installed, for the purpose of interconnecting the Facility to the Transmission System, including electrical transmission lines, upgrades, transformers and associated equipment, substations, relay and switching equipment, and safety equipment.

1.1.63 "ITCs" means the investment tax credits established pursuant to Section 48 of the Internal Revenue Code, as such law may be amended or superseded.

1.1.64 "Law" means any law, rule, regulation, order, writ, judgment, rulings or orders by or before any court or any governmental authority.

1.1.65 "Letter(s) of Credit" means one or more irrevocable, transferable, standby letters of credit issued by a major U.S. commercial bank or a U.S. branch office of a major foreign commercial bank with such bank having shareholders' equity of at least $10 billion USD and a Credit Rating of at least A1 from Moody's or A+ from S&P, in a form and substance reasonably acceptable to PGE. The costs of a Letter of Credit shall be borne by Seller.

1.1.66 "Letter of Credit Default" means with respect to a Letter of Credit, the occurrence of any of the following events: (i) the issuer of such Letter of Credit shall fail to be a major U.S. commercial bank or a U.S. branch office of a major foreign commercial bank with such bank having shareholders' equity of at least $10 billion USD and a Credit Rating of at least A1 from Moody's or A+ from S&P; (ii) the issuer of the Letter of Credit shall fail to comply with or perform its obligations under such Letter of Credit; (iii) the issuer of such Letter of Credit shall disaffirm, disclaim, repudiate or reject, in whole or in part, or challenge the validity of, such Letter of Credit; (iv) such Letter of Credit shall be within 15 Business Days of expiration or terminate, or shall fail or cease to be in full force and effect at any time during the Term, in any such case without replacement; (v) the issuer of such Letter of Credit shall become Bankrupt; or (vi) a Merger Event occurs with respect to the issuer of such Letter of Credit; provided, however, that no Letter of Credit Default shall occur or be continuing in any event with respect to a Letter of Credit after the time such Letter of Credit is required to be canceled or returned in accordance with the terms of this Agreement.

1.1.67 "Licensed Professional Engineer" means a Person proposed by Seller and acceptable to PGE in its reasonable judgment who (a) to the extent mandated by Law is licensed to practice engineering in the appropriate engineering discipline for the required certification being made, in the United States, and in all states for which the person is providing a certification, evaluation or opinion with respect to matters or Law specific to such state, (b) has training and experience in the engineering disciplines relevant to the matters with respect to which such person is called upon to provide a certification, evaluation or opinion, (c) has no economic relationship, association, or nexus with Seller or its members or Affiliates, other than with the prior written consent of PGE, services previously or currently being rendered to Seller or its members or Affiliates, and (d) 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 Seller of any equipment installed in the Facility.

1.1.68 "Losses" means, with respect to a Party, an amount equal to the present value of the economic loss to it, if any (exclusive of Costs), resulting from termination of its obligations with respect to this Agreement determined in a commercially reasonable manner.

1.1.69 "Market Price Index" means (a) the average price reported on the Intercontinental Exchange ("ICE") Day-Ahead Mid-Columbia ("Mid-C") On-Peak Index, for On-Peak Hours, and (b) the average price reported on the ICE Day-Ahead Mid-C Off-Peak Index, for Off-Peak Hours.

1.1.70 "Material Adverse Change" means (i) with respect to PGE, PGE shall have a Credit Rating below BBB- by S&P and below Baa3 by Moody's or both ratings are withdrawn or terminated on a voluntary basis by the rating agencies, (ii) with respect to Seller, Seller or Seller's Guarantor, if applicable, shall have a Credit Rating below BBB- by S&P and below Baa3 by Moody's or both ratings are withdrawn or terminated on a voluntary basis by the rating agencies, if rated by both services. If Seller or Seller's Guarantor is rated by only one service, a Material Adverse Change shall occur if the

rating falls below the pertinent level specified above or if such rating is withdrawn or terminated on a voluntary basis by the rating agency.

1.1.71 "Maximum Delivery Rate" means the maximum hourly rate of delivery of Energy in MWh from the Facility to the applicable Transmission System measured at the Facility Meter, calculated on the basis of the Energy delivered in an hour accruing at an average rate equivalent to the Actual Capacity.

1.1.72 "Merger Event" means, with respect to a Party or an Affiliate of a Party that such Party or Affiliate consolidates or amalgamates with, or merges into or with, or transfers all or substantially all of its assets to another entity, and (i) the resulting, surviving or transferee entity fails, at the time of such consolidation, amalgamation, merger or transfer, to assume each and all of the obligations of such Party or Affiliate under this Agreement or under any Guaranty, Letter of Credit or other Performance Assurance, either by operation of law or pursuant to an agreement reasonably satisfactory to the other Party, or (ii) the benefits of any Guaranty, Letter of Credit, or other Performance Assurance or credit support provided pursuant to this Agreement fail, at any time following such consolidation, amalgamation, merger or transfer, to extend to the performance by such Party or such resulting, surviving or transferee entity of its obligations under this Agreement, or (iii) the Credit Rating (from any of S&P or Moody's) of the resulting, surviving or transferee entity is not equal to or higher than that of such Party or Affiliate immediately prior to such consolidation, amalgamation, merger, or transfer.

1.1.73 "Mid-Columbia" means an area which includes points at any of the switchyards associated with the following four hydro projects: Rocky Reach, Rock Island, Wanapum and Priest Rapids. These switchyards include: Rocky Reach, Rock Island, Wanapum, McKenzie, Valhalla, Columbia, Midway and Vantage. Mid-Columbia shall also include points in the "Northwest Hub," as defined by BPA. For scheduling purposes, the footprint described above shall dictate the delivery point name for the then current WECC scheduling protocols. If the footprint changes during the Term, a mutually agreed upon footprint that describes an area containing the most liquidity for trading purposes shall apply.

1.1.74 "Milestone" and "Milestones" have the meaning assigned to those terms in Section 3.1.7(a)(i).

1.1.75 "Month" means a calendar month commencing at hour ending 0100 PPT on the first day of such month through hour ending 2400 PPT on the last day of such month.

1.1.76 "Moody's" means Moody's Investor Services, Inc. or its successor.

1.1.77 "MW" means megawatt.

1.1.78 "MWh" means megawatt hour.

1.1.79 "NERC" means the North American Electric Reliability Corporation.

1.1.80 "Non-Defaulting Party" has the meaning set forth in Section 5.2.1.

1.1.81 "Off-Peak Hours" shall mean all hours ending 01:00:00 through 06:00:00 and hours ending 23:00:00 through 24:00:00, PPT, Monday through Saturday and hours ending 01:00:00 through 24:00:00, PPT, on Sundays and NERC designated holidays, as such definition may be changed by [NAESB] from time to time.

1.1.82 "On-Peak Hours" shall mean all hours ending 07:00:00 through 22:00:00 PPT, Monday through Saturday, excluding NERC designated holidays, as such definition may be changed by [NAESB] from time to time.

1.1.83 "Output Guarantee" has the meaning given to that term in Section 3.5.1.

1.1.84 "Output Shortfall" has the meaning given to that term in Section 3.5.2(b).

1.1.85 "Party" or "Parties" are defined in the preamble of this Agreement.

1.1.86 "Performance Assurance" means collateral in the form of cash, Letter(s) of Credit, or a Guaranty.

1.1.87 "Permits" means the permits, licenses, approvals, certificates, entitlements and other authorizations issued by Governmental Authorities required for the construction, ownership or operation of the Facility or occupancy or use of the Site, including those specified in Exhibit E, and all amendments, modifications, supplements, general conditions and addenda thereto.

1.1.88 "Person" means an individual, partnership, corporation, limited liability company, joint venture, association, trust, unincorporated organization, Governmental Authority, or other form of entity.

1.1.89 "PGE's Cost to Cover" means, for purposes of calculating Output Shortfall, the positive difference, if any, between (a) the sum of (i) the time weighted average of the Market Price Index for each day for which the determination is being made, plus (ii) the RECs Price Component, minus (b) the Contract Price in effect on such days, stated as an amount per MWh. If for a given Contract Year, the difference between (a) minus (b) referenced above is zero or negative, then PGE's Cost to Cover shall be zero dollars ($0).

1.1.90 "PGE Representatives" has the meaning set forth in Section 3.6.

1.1.91 "PGE System" means the edge of PGE's Balancing Authority Area, excluding the Balancing Area Authority Area boundaries surrounding PGE's Remote Resources.

1.1.92 "PPT" means Pacific Prevailing Time (i.e., prevailing Standard Time or Daylight Savings Time in the Pacific Time Zone).

1.1.93 "Pre-COD Security" has the meaning given in Section 9.1.1.

1.1.94 "Product" means (a) the Energy Scheduled and delivered to the Delivery Point as required by this Agreement, (b) RECs, and (c) any Capacity Attributes.

1.1.95 "Prudent Electric Industry Practice" means those practices, methods, standards and acts engaged in or approved by a significant portion of the electric power generation industry in the Western Interconnection that at the relevant time period, in the exercise of reasonable judgment in light of the facts known or that should reasonably have been known at the time a decision was made, would have been expected to accomplish the desired result in a manner consistent with good business practices, reliability, economy, safety and expedition, and which practices, methods, standards and acts reflect due regard for operation and maintenance standards recommended by the Facility's equipment Sellers and manufacturers, operational limits, and all applicable laws and regulations. Prudent Electric Industry Practice is not intended to be limited to the optimum practice, method, standard or act to the exclusion of all others, but rather to those practices, methods and acts generally acceptable or approved by a significant portion of the electric power generation industry in the Pacific Northwest region, during the relevant period, as described in the immediately preceding sentence.

1.1.96 "PURPA" means the Public Utility Regulatory Policies Act of 1978.

1.1.97 "QF" means "Qualifying Facility," as that term is defined in the FERC regulations (codified at 18 CFR Part 292) in effect on the Effective Date.

1.1.98 "PTCs" means production tax credits under Section 45 of the Internal Revenue Code, as such law may be amended or superseded.

1.1.99 "REC" means (a) the Environmental Attributes associated with all Facility Output, together with (b) the REC Reporting Rights associated with such Facility Output and Environmental Attributes, however commercially transferred or traded under any or other product names, such as "green tags," "Green-e Certified," or otherwise. One REC represents the Environmental Attributes made available by the generation of one MWh of Facility Output.

1.1.100 "REC Price Component" means [$_____] per MWh; provided that if after the Effective Date a liquid market for RECs emerges in a form and location that PGE determines reasonably states the market value of the RECs delivered hereunder, PGE may in its discretion replace such [$____] per MWh with such designated market price reports for RECs, effective as of the time specified by PGE.

1.1.101 "REC Reporting Rights" means the exclusive right of a purchaser of Environmental Attributes to report ownership of Environmental Attributes in compliance with federal or state law, if applicable, and to federal or state agencies or other parties at such purchaser's discretion, and include reporting under Section 1605(b) of the Energy Policy Act of 1992, or under any present or future domestic, international, or foreign emissions trading program or renewable portfolio standard.

1.1.102 "Regulatory Event" has the meaning given to that term in Section 19.6.

1.1.103 "Replacement Price" is described in Section 6.1.2.

1.1.104 "Required Capacity" means [__] MW ***[Note to bidders: this should be a whole number of MWs equal to or greater than 96% of the Facility's Expected Capacity]***

1.1.105 "Rolling Period" has the meaning given to that term in Section 3.5.1.

1.1.106 "S&P" means the Standard & Poor's, a division of McGraw-Hill Companies, Inc., or any successor thereto.

1.1.107 "Sales Price" is described in Section 6.2.2.

1.1.108 "Schedule," "Scheduled" or "Scheduling" means the act of each Party or its designated representatives, if applicable, notifying, requesting and confirming to each other the scheduling of Energy in 15 minute intervals at the Delivery Point.

1.1.109 "Scheduled Commercial Operation Date" means [____, 20__].

1.1.110 "Scheduling Agent" has the meaning set forth in Section 3.3.1.

1.1.111 "Seller" is defined in the Preamble of this Agreement.

1.1.112 "Seller Excused Minutes" means, for the Facility in any Contract Year, the total number of minutes during such Contract Year during which the Facility was unable to deliver Facility Output at the Facility Meter due to one or more of the following events, each as recorded by Seller's SCADA and indicated by Seller's electronic fault log: (a) an emergency or Force Majeure event; (b) to the extent not caused by Seller's actions, a curtailment in accordance with Section 3.7; (c) the Transmission System operating outside the voltage or frequency limits defined in the applicable operating manual for inverters installed at the Facility; (d) scheduled maintenance under Section 3.2.6, but in no event exceeding 36 hours per Contract Year consistent with such operating manual; (e) a default by PGE; provided, however, that if any of the events described above in items (a) through (e) occur simultaneously, then the relevant period of time shall only be counted once in order to prevent double counting. Seller Excused Minutes shall not include minutes when (i) the Facility or any portion thereof was unavailable due to Seller's non-conformance with the Interconnection Agreement or (ii) the Facility or any portion thereof was paused or withdrawn from use by Seller for reasons other than those covered in this definition.

1.1.113 "Settlement Amount" means, with respect to this Agreement and the Non-Defaulting Party, the Losses or Gains, and Costs, expressed in USD, which such Party incurs as a result of the termination and liquidation of this Agreement pursuant to Article 5. If the Non-Defaulting Party's Costs and Losses exceed its Gains, then the Settlement Amount shall be an amount owing to the Non-Defaulting Party. If the Non-Defaulting Party's Gains exceed its Costs and Losses, then the Settlement Amount shall be zero dollars ($0). The Settlement Amount shall not include consequential, punitive, exemplary or indirect or business interruption damages.

1.1.114 "Settlement Period" has the meaning set forth in Section 5.2.2.

1.1.115 "Settlement Energy" has the meaning set forth in Section 5.2.2.

1.1.116 "Site" means the real property on which the Facility is or will be located, as more fully described on Exhibit F.

1.1.117 "Start-Up Testing" means the start-up tests for the Facility as set forth in Exhibit G.

1.1.118 "Taxes" means all taxes, rates, levies, adders, assessments, surcharges, duties and other fees and charges of any nature, including but not limited to ad valorem, consumption, excise, franchise, gross receipts (including any [*State Name*] business and occupation tax and [*State Name*] public utility tax and any successor tax thereto), import, export, license, property, sales, stamp, storage, transfer, turnover, use, or value-added taxes, and any and all items of withholding, deficiency, penalty, addition to tax, interest, or assessment related thereto.

1.1.119 "Term" means the period of time referenced in Section 2.1.

1.1.120 "Test Energy" means Facility Output Scheduled and delivered as Energy to the Delivery Point during periods before the Commercial Operation Date, and all RECs and Capacity Rights associated with Facility Output.

1.1.121 "Termination Payment" has the meaning set forth in Section 5.3.

1.1.122 "Transmission Provider(s)" means any entity (including any FERC-authorized regional transmission organization) transmitting Energy on behalf of Seller to and at the Delivery Point; or on behalf of PGE at and from the Delivery Point.

1.1.123 "Transmission Services" means any and all services (including but not limited to Ancillary Services and control area services) required for the transmission and delivery of Energy to the Delivery Point or at and from the Energy Delivery Point.

1.1.124 "Transmission System(s)" means the transmission system(s) of the Transmission Provider(s) to be used by Seller for the purpose of transmitting Energy to and at, the Delivery Point; or by PGE for the purpose of transmitting Energy at and from, the Delivery Point.

1.1.125 "USD" means United States Dollars.

1.1.126 "WECC" means the Western Electricity Coordinating Council or any successor thereto.

1.1.127 "Western Interconnection" means the network of subsystems of generators, transmission lines, transformers, switching stations, and substations owned or operated by members of the WECC and including 14 western states, British Columbia, Alberta and parts of Baja, Mexico.

1.1.128 "WREGIS" means the Western Renewable Energy Generation Information System.

1.2 Rules of Interpretation.

Unless the context otherwise requires:

1.2.1 Words singular and plural in number shall be deemed to include the other and pronouns having masculine or feminine gender shall be deemed to include the other.

1.2.2 Subject to Article 15, any reference in this Agreement to any Person includes its successors and assigns and, in the case of any Governmental Authority, any Person succeeding to its functions and capacities.

1.2.3 Any reference in this Agreement to any Section, Exhibit or Appendix means and refers to the Section contained in, or Exhibit or Appendix attached to, this Agreement.

1.2.4 Other grammatical forms of defined words or phrases have corresponding meanings.

1.2.5 A reference to writing includes typewriting, printing, lithography, photography, email and any other mode of representing or reproducing words, figures or symbols in a lasting and visible form.

1.2.6 Unless otherwise expressly provided in this Agreement, a reference to a specific time for the performance of an obligation is a reference to that time in the place where that obligation is to be performed.

1.2.7 A reference to a Party to this Agreement includes that Party's successors and permitted assigns.

1.2.8 Unless otherwise expressly provided in this Agreement, a reference to a document or agreement, including this Agreement, includes a reference to that document or agreement as modified, amended, supplemented or restated from time to time.

1.2.9 References in this Agreement to "or" shall be deemed to be disjunctive but not necessarily exclusive (i.e., unless the context dictates otherwise, "or" shall be interpreted to mean "and/or" rather than "either/or").

1.2.10 If any payment, act, matter or thing hereunder would occur on a day that is not a Business Day, then such payment, act, matter or thing shall, unless otherwise expressly provided for herein, occur on the next Business Day.

1.3 Technical Meanings.

Words not otherwise defined herein that have well known and generally accepted technical or trade meanings are used in this Agreement in accordance with such recognized meanings.

ARTICLE 2
CONTRACT TERM; DELIVERY PERIOD; PRICE; SALE OF FACILITY

2.1 Term; [Conditions Precedent].

2.1.1 Term. The term of this Agreement shall begin on the Effective Date and shall continue through [***existing facility:*** _____[*Date*]] [***facility to be built:*** the [__] anniversary of the Commercial Operation Date] (the "Term"), unless otherwise terminated in accordance with its terms; provided, however, that (a) such termination shall not affect or excuse the performance of either Party under any provision of this Agreement that by its terms survives any such termination, and (b) this Agreement and any other documents executed and delivered under this Agreement shall remain in effect until both Parties have fulfilled all of their obligations with respect to this Agreement.

2.1.2 PGE's Conditions Precedent. PGE's obligations under this Agreement are subject to the following conditions precedent, each of which may be waived by PGE in its sole discretion:

If these conditions precedent have not been satisfied or waived by PGE on or before [_____, 20__], either Party shall have the right to terminate this Agreement by giving five days' prior notice of termination to the other Party. Neither Party shall have any liability for such a termination.

2.1.3 Seller's Conditions Precedent. PGE's obligations under this Agreement are subject to the following conditions precedent, each of which may be waived by Seller in its sole discretion: ***[Note to bidders: conditions precedent, if any, to Seller's obligations under the PPA should be set out here]***

If these conditions precedent have not been satisfied or waived by Seller on or before [_____, 20__], either Party shall have the right to terminate this Agreement by giving five days' prior notice of termination to the other Party. Neither Party shall have any liability for such a termination.

2.2 Test Energy.

Before the Commercial Operation Date, Seller shall sell and deliver to PGE all Test Energy generated by the Facility at the Delivery Point in accordance with this Agreement. PGE shall pay 50% of the Contract Price for each MWh of Test Energy scheduled to the Delivery Point in accordance with this Agreement.

2.3 Delivery Period.

2.3.1 Delivery Period. Starting on [_____[*Date*]] [the Commercial Operation Date], Seller shall Schedule all of the Facility Output to PGE as Energy at the Delivery Point and shall continue such deliveries for the Term (the "Delivery Period").

2.3.2 Contract Price.

(a) During the Delivery Period, if the Facility Output is equal to or greater than the Energy Scheduled and delivered to PGE at the Delivery Point, PGE shall pay to Seller (i) the Contract Price for the quantity of Energy so Scheduled and delivered, and (ii) the REC Price Component only for RECs associated with Facility Output not Scheduled and delivered as Energy at the Delivery Point.

(b) During the Delivery Period, if the Facility Output is less than the Energy Scheduled and delivered to PGE at the Delivery Point, PGE shall pay to Seller (i) the Contract Price for the quantity of MWh equal to the Facility Output, and (ii) a price per MWh equal to the relevant Transmission Provider's real time imbalance energy price index for the quantity, stated in MWhs, by the Scheduled Energy exceeds Facility Output. If no such index exists, PGE shall designate a sub-hourly index that most closely represents the market price for real-time imbalance energy.

2.3.3 Price Adjustment for Excess Output. In any Contract Year in which Facility Output exceeds 110% of Expected Output, the Contract Price for each MWh in excess of the Expected Output for the balance of such Contract Year shall be [75%] of the price otherwise payable under Section 2.3.2.

2.4 Notice of Sale of Facility.

If Seller or an Affiliate of Seller desire to sell the Facility during the Term, either by a sale of the Facility's assets or by a direct or indirect transfer of the membership interest(s) in Seller, Seller shall first, before it or its Affiliate enters into any substantive discussions with other parties, notify PGE of its desire to sell the Facility. PGE agrees to notify Seller if it is interested in acquiring the Facility within 20 days following receipt of Seller's notice. If PGE so notifies Seller, the Parties shall engage in exclusive good faith negotiations to reach agreement with respect to such a transaction for a period of 90 days thereafter. If during this period the Parties execute a letter of intent, or other document similarly confirming the Parties' intent to enter into a transaction for the purchase and sale of the Facility, then such exclusive negotiation period shall be automatically extended for an additional 90 day period, during which time the Parties may execute a purchase and sale agreement for the Facility. Any purchase and sale agreement executed within the time frame stated in this Section 2.4, shall remain subject to regulatory approval beyond such time frame, as applicable. Seller may pursue any transaction for the sale of the Facility with one or more third parties at any time and from time to time and shall have no obligation to PGE under this Section 2.4 following an occurrence of any of the following: (i) PGE expressly declines interest in acquiring the Facility after receipt of Seller's notice provided

pursuant to the first sentence of this Section 2.4, (ii) PGE fails to respond to Seller's notice pursuant to the first sentence of this Section 2.4, within 20 days after receipt thereof; (iii) PGE and Seller fail to execute a letter of intent or other similar document with respect to the sale of the Facility within 90 days after PGE's receipt of notice from Seller provided pursuant to the first sentence of this Section 2.4; or (iv) PGE and Seller fail to execute a purchase and sale agreement for the Facility within 180 days after PGE's receipt of Notice from Seller provided pursuant to the first sentence of this Section 2.4; provided, however, that with respect to clause (iv), if Seller rejects a firm price delivered by PGE in the course of such negotiations, any sale of the Facility to a third party during the subsequent two (2)-year period must be at a price higher than such rejected price or Seller shall be required to re-engage in negotiations with PGE as otherwise set forth in this Section 2.4 for the sale of the Facility.

2.5 [Option to Purchase/Option to Extend Term]

[Note to bidders: if a Bidder wishes to propose an end of Term or during Term option for PGE to purchase the Facility, or an option for PGE to extend the Term of the PPA, it should include its proposal here in its mark up of the Agreement.]

ARTICLE 3
FACILITY DEVELOPMENT, CONSTRUCTION AND OPERATION

3.1 Development and Construction of Facility. ***[Note to bidders: Section 3.1 will be "intentionally omitted" for a Facility that has already been built.]***

3.1.1 Permitting. Seller shall obtain all Permits necessary to construct, own and operate the Facility in accordance with this Agreement.

3.1.2 Financing. Seller shall obtain any and all financing necessary to construct and operate the Facility during the Delivery Period and the Term on a schedule consistent with the requirements of this Agreement.

3.1.3 Facility Design. Seller shall be responsible for designing and building the Facility in compliance with all Permits and according to Prudent Electric Industry Practice with respect to project design, engineering and selection and installation of equipment to be used at or installed in the Facility. At PGE's request, Seller shall provide PGE with copies of the site plan for the Facility and descriptions, for the project design of the Facility. Any review by PGE of the design, construction, operation or maintenance of the Facility is solely for PGE's information, and PGE shall have no responsibility to Seller or any third party in connection with such review. Seller is solely responsible for the economic and technical feasibility, operational capability and reliability of the Facility.

3.1.4 Construction and Testing. Seller shall, at its cost, for construct and test the Facility and obtain all necessary transmission and interconnection rights, all in compliance with the Permits, the Interconnection Agreement, any other agreements with any Transmission Provider, and Prudent Electric Industry Practice.

3.1.5 Monthly Reports. After the Effective Date, Seller shall provide PGE with monthly written reports regarding Seller's progress in completing the Facility and shall, at PGE's request, meet with PGE's representatives to discuss such progress.

3.1.6 Equipment Supply. Not later than [____] Seller shall provide PGE with written evidence of Seller's commitment from [_____] for the supply of the Facility equipment in a timeframe which reasonably would allow Seller to achieve the Commercial Operation Date of the Facility on or before the Scheduled Commercial Operation Date.

3.1.7 Milestones.

(a) Time is of the essence in the performance of this Agreement. Seller shall therefor achieve each milestone set forth in this Section 3.1.7 (each, a "Milestone" and collectively the "Milestones") at the date indicated for that Milestone.

(i) On or before the 30th day following the Effective Date, Seller shall post the Pre-COD Security in the amount described in Section 9.1;

(ii) On or before the 90th day after the Effective Date, Seller shall provide to PGE a fully executed copy of the Interconnection Agreement confirming that the Facility will receive [Network Resource Interconnection Service] [Energy Resource Interconnection Service];

(iii) On or before the [__] day after the Effective Date, Seller shall provide to PGE copies of all Permits in final, nonappealable form;

(iv) By the Commercial Operation Date, Seller shall provide Delivery Period Security required under Section 9.2;

(v) [***Wind:*** Seller shall commence construction of the Facility on or before December 31, 2016 so as to vest the full amount of the PTCs available as of the Effective Date***]***;

(vi) Seller shall cause the Facility to achieve Commercial Operation on or before the Guaranteed Commercial Operation Date; and

(vii) If Commercial Operation of the Facility is achieved based on less than 100 percent of the Expected Capacity, Seller shall cause the Facility to achieve Final Completion on or before the 90th day after the Commercial Operation Date;

provided, however, that the date for achieving each Milestone other than the dates for posting Pre-COD Security and Delivery Security) shall be extended on a day for day basis for any delay due solely to (i) PGE's delay in taking, or failure to

take, any action required of it hereunder in breach of this Agreement, or (ii) an event of Force Majeure. .

(b) When Seller achieves a Milestone, Seller shall provide to PGE documentation reasonably satisfactory to PGE demonstrating Milestone completion. Seller shall provide such documentation to PGE within thirty (30) days of such completion but not later than the date specified above for such Milestone. PGE shall acknowledge receipt of the documentation provided under this Section 3.1.7 and shall provide Seller with written acceptance or denial of each Milestone within fifteen (15) Business Days of receipt of the documentation.

(c) Seller shall notify PGE promptly (and in any event within ten (10) Business Days) after Seller becomes aware of information that leads to a reasonable conclusion that a Milestone will not be met. Seller shall convene a meeting with PGE to discuss the situation not later than fifteen (15) Business Days after becoming aware of this information.

(d) If any Milestone (other than a Critical Milestone) is not completed on or before the deadline specified for that Milestone in this Section 3.1.7, Seller shall (i) inform PGE of a revised projected date for the achievement of the Milestone, (ii) inform PGE of any impact on the timing of the Commercial Operation Date and on each other Milestone, and (iii) provide PGE with a written report containing Seller's analysis of the reasons behind the failure to meet the original Milestone deadline and describing the remedial actions that the Seller agrees to undertake to ensure the achievement of the Commercial Operation Date by the Scheduled Commercial Operation Date and in any event no later than the Guaranteed Commercial Operation Date. If (1) Seller fails to submit such a report and remedial action plan within 30 days after a Milestone deadline is missed, or (2) Seller timely submits the required report and remedial action plan but thereafter fails to implement the remedial action plan with diligence, or (3) PGE reasonably concludes based on the report and proposed remedial action plan that the Facility is unlikely to achieve Commercial Operation on or before the Guaranteed Commercial Operation Date, a Seller Event of Default shall be deemed to have occurred.

(e) The Milestones described in Sections 3.1.7(a)(i), 3.1.7(a)(iv), 3.1.7(a)(vi), and 3.1.7(a)(vii) are "Critical Milestones" that are separately addressed in Section 5.1 (Events of Default), Section 3.1.11(failure to achieve the Guaranteed Commercial Operation Date), and Section 3.1.10(b) (Deficit Damages).

3.1.8 Notice of Commercial Operation. Seller shall notify PGE not less than five (5) Business Days in advance of the anticipated date of Commercial Operation and shall confirm to PGE in writing when Commercial Operation has been achieved.

3.1.9 Final Completion. If Seller achieves Commercial Operation at less than 100 percent of the Expected Capacity and Seller notifies PGE that Seller intends to bring

the Facility to 100 percent of the Expected Capacity, Seller shall provide PGE with a Final Completion Punch List. Seller must complete all items on the Final Completion Punch List on or before the 90th day after the Commercial Operation Date.

3.1.10 Delay Damages and Deficit Damages.

(a) If Commercial Operation is not achieved on or before the Scheduled Commercial Operation Date, Seller shall pay to PGE Delay Damages from and after the Scheduled Commercial Operation Date up to, but not including, the date that the Facility achieves Commercial Operation.

(b) If the Facility's Actual Capacity at Final Completion is less than the Expected Capacity, Seller shall pay to PGE Deficit Damages.

3.1.11 Contract Termination Damages. If Seller does not achieve Commercial Operation on or before the Guaranteed Commercial Operation Date, PGE may terminate this Agreement upon ten (10) Days notice to Seller, and Seller shall pay to PGE Contract Termination Damages of $25 per kW of Expected Capacity (the "Contract Termination Damages") in addition to all Delay Damages paid or payable pursuant to Section 3.1.10.

3.1.12 Damages Invoicing. By the 10th day following the end of the calendar month in which Delay Damages begin to accrue or Deficit Damages are incurred, as applicable, and continuing on the 10th day of each calendar month during the period in which Delay Damages accrue (and the following months, if applicable), PGE shall deliver to Seller an invoice showing PGE's computation of such damages and any amount due PGE in respect thereof for the preceding calendar month. No later than 10 days after receiving such an invoice and subject to Section 7.2 and Section 7.3, Seller shall pay to PGE, by wire transfer of immediately available funds to an account specified in writing by PGE 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.

3.1.13 PGE's Exclusive Remedies. PGE's exclusive remedies for the Facility's failure to achieve Commercial Operation by the Scheduled Commercial Operation Date or by the Guaranteed Commercial Operation Date, as applicable, shall be (i) the payment by Seller of Delay Damages and, if applicable, Contract Termination Damages, as provided in Sections 3.1.10 and Section 3.1.11, and (ii) the right of first offer set forth in Section 3.1.14. PGE's exclusive remedies for the Facility's failure to reach the Expected Capacity at Final Completion shall be (1) the payment of Deficit Damages, and (2) the right of first offer set forth in Section 3.1.14. Delay Damages. Contract Termination Damages and Deficit Damages are liquidated damages subject to Section 8.6.

3.1.14 Right of First Offer.

(a) If PGE terminates this Agreement under Section 3.1.11 or this Agreement is otherwise terminated before the Commercial Operation Date, neither Seller nor Seller's Affiliates may sell, market or deliver any Product associated with or attributable to the Facility to a party other than PGE for a period of two (2) years following the termination date of this Agreement, unless

before selling, marketing or delivering such Product, or entering into an agreement to sell, market or deliver such Product, Seller or Seller's Affiliates provide PGE with a written offer to sell the Product on terms and conditions materially similar to the terms and conditions contained in this Agreement (including price), and PGE fails to accept such offer within forty-five (45) days of PGE's receipt thereof.

(b) With respect to any Expected Capacity that is not included in Actual Capacity upon Final Completion ("Deficit Capacity"), neither Seller nor Seller's Affiliates may sell, market or deliver any Product associated with or attributable to the Deficit Capacity to a party other than PGE for a period of two (2) years following Final Completion, unless before selling, marketing or delivering such Product, or entering into an agreement to sell, market or deliver such Product to a party other than PGE, Seller or Seller's Affiliates provide PGE with a written offer to sell such Product on terms and conditions materially similar to the terms and conditions contained in this Agreement (including price), and PGE fails to accept such offer within forty-five (45) days of PGE's receipt thereof.

(c) Neither Seller nor Seller's Affiliates may sell or transfer the Facility, or any part thereof, or land rights or interests in the Site so long as the limitations contained in this Section 3.1.14 apply, unless the transferee agrees to be bound by the terms set forth in this Section 3.1.14 pursuant to a written agreement approved by PGE.

(d) Seller shall indemnify and hold PGE harmless from all benefits lost and other damages sustained by PGE as a result of any breach by Seller of its covenants contained within this Section 3.1.14.

3.1.15 Tax Credits. Seller shall bear all risks, financial and otherwise throughout the Term, associated with Seller's or the Facility's eligibility to receive PTCs, ITCs or other tax credits, or to qualify for accelerated depreciation for Seller's accounting, reporting or tax purposes. Seller's obligations under this Agreement shall be effective regardless of whether the sale of Facility Output from the Facility is eligible for, or receives, PTCs, ITCs or other tax credits during the Term.

3.2 Facility Operations.

3.2.1 Commitment; Prudent Electric Industry Practice. Seller hereby commits one hundred percent (100%) of the Facility Output to PGE as provided under this Agreement, except only in the limited cases where Seller is required to deliver Facility Output to the provider of integration services.

3.2.2 Site Control. At all times during the Term, Seller shall control the Site through ownership or lease and shall provide PGE with prompt notice of any change in control of the Site.

3.2.3 Operation and Maintenance. Seller shall operate and maintain the Facility, the Facility Meter and that portion of the Interconnection Facilities and related equipment and systems owned by Seller in accordance with Prudent Electric Industry Practice in a manner that is reasonably likely to: (i) maximize the Facility Output, and (ii) result in an expected useful life for such facilities of not less than thirty (30) years.

3.2.4 Facility Meter Inspection and Correction. PGE shall have the right to periodically inspect, test, repair and replace the Facility Meter, without PGE assuming any obligations the Interconnection Agreement. If any of the inspections or tests disclose an error exceeding 0.5 percent, either fast or slow, proper correction, based upon the inaccuracy found, shall be made of previous readings for the actual period during which the Facility Meter rendered inaccurate measurements if that period can be ascertained. If the actual period cannot be ascertained, the proper correction shall be made to the measurements taken during the time the metering equipment was in service since last tested, but not exceeding three months, in the amount the Facility Meter shall have been shown to be in error by such test. Any correction in billings or payments resulting from a correction in the meter records shall be made in the next monthly billing or payment rendered. Such correction, when made, shall constitute full adjustment of any claim between Seller and PGE arising out of such inaccuracy of metering equipment.

3.2.5 Inspection and Records. Seller shall inspect, maintain and repair the Facility and the components thereof in order to maintain such equipment in accordance with Prudent Electric Industry Practice and shall keep records with respect to inspections, maintenance and repairs thereto consistent with Seller's reasonable business judgment. The records of such activities shall be available for inspection by PGE during Seller's regular business hours upon reasonable notice.

3.2.6 Scheduled Maintenance. Seller shall notify PGE, on or before November 1 of each calendar year, of Facility's scheduled maintenance for the next calendar year, and shall use commercially reasonable efforts to plan scheduled maintenance (i) to maximize the productive output of the Facility and (ii) not to occur between July and September or between December and February.

3.3 Transmission and Scheduling of Energy.

3.3.1 Seller to Designate Forecasting and Scheduling Agents. At least 10 days before it begins to Schedule Test Energy under this Agreement, Seller shall engage at its expense a third-party Scheduling Agent (the "Scheduling Agent") and a third-party forecasting agent (the "Forecasting Agent"), subject in each case to PGE's prior approval. The Scheduling Agent shall perform Seller's pre-scheduling and Scheduling obligations under this Section 3.3 based exclusively on forecasts supplied by the Forecasting Agent.

3.3.2 Preschedules. The Scheduling Agent shall provide pre-Schedules for all deliveries of Energy to the Delivery Point under this Agreement, including identification of receiving and generating Balancing Authority Areas, according to WECC Scheduling practices in effect from time to time during the Term. The Scheduling Agent shall provide the pre-schedule to PGE when it is submitted. Scheduling Agent shall also

provide PGE with an estimated pre-Schedule no later than 5pm PPT on the Day before the pre-Schedule is submitted.

3.3.3 Seller's Responsibility for Transmission and Scheduling to and at Delivery Point. Seller shall arrange for, pay all costs of, and be responsible for Transmission Services, including but not limited to Balancing Authority Area services, Ancillary Services, reserves, imbalance or inadvertent energy flows, integration services or charges, and transmission losses and loss charges relating to the transmission of the Facility Output generated by the Facility to, and the delivery of such Energy at, the Delivery Point. The Scheduling Agent shall Schedule all Facility Output to the Delivery Point as firm energy in 15-minute intervals (firm at T-39) in accordance with protocols, procedures and deadlines set by NERC, WECC, the open access transmission tariff or relevant business practices and manuals of the applicable Transmission Service Provider(s), and the open access transmission tariff of the California Independent System Operation, in each case as such protocols, procedures and deadlines may be changed from time to time. Seller shall obtain at its expense all integration and other services required to Schedule such Energy as firm in each 15-minute interval. Scheduling Agent shall provide the Schedule to PGE when it is submitted. An outline of the expected Scheduling protocol, as of the Effective Date, is set forth in Exhibit H.

3.3.4 PGE's Responsibility for Transmission from the Delivery Point. PGE shall arrange for, pay all costs, and be responsible for Transmission Services, including but not limited to Balancing Authority Area services, spinning and supplemental reserves, imbalance or inadvertent energy flows, and transmission losses and loss charges relating to the transmission of the Product from the Delivery Point. Notwithstanding the foregoing, Seller shall provide at its cost all reserves required by WECC for Energy that is Scheduled to the Delivery Point.

3.3.5 Authorized Scheduling Representatives. Each Party shall designate by notice to the other Party its authorized representatives responsible for Scheduling.

3.3.6 Maximum Delivery Amounts. Seller shall sell and deliver, and PGE shall buy and receive, all Energy Scheduled and delivered pursuant to this Agreement, up to the Maximum Delivery Rate. If Seller increases, at its own expense, the ability of the Facility to deliver Facility Output in quantities in excess of the Maximum Delivery Rate through any means, including replacement or modification of equipment or related infrastructure, PGE shall not be required to purchase any Product in excess of the Maximum Delivery Rate.

3.3.7 Title to Energy. Title to Energy shall pass to PGE at the Delivery Point.

3.4 Measurement and Transfer of RECs.

RECs shall be deemed sold and delivered to PGE under this Agreement as they are produced and measured by the Facility Meter. Title to such RECs shall pass to PGE when generated. PGE shall own or be entitled to claim all RECs during the Term (including any value in the ownership, use or allocation of RECs created by legislation or regulation after the

Effective Date). The Facility Meter shall serve as the record source for purposes of calculating, certifying, and auditing RECs. Seller shall cause the Facility to implement all necessary generation information communications in WREGIS, and report generation information to WREGIS pursuant to a WREGIS-approved meter that is dedicated to the Facility and only the Facility. Seller shall deliver to PGE by the 10th day of the current Month a certificate in the form of Exhibit E for the RECs generated by the Facility during the preceding Month. Seller shall cause delivery and transfer to PGE's WREGIS account to be perfected in accordance with WREGIS rules. Seller shall hold the RECs in trust for PGE until such delivery and transfer is perfected. Each Party shall take such steps and further actions as may be required by WREGIS or applicable Law in order to effect and confirm the sale and delivery of the RECs to PGE for all purposes.

3.5 Output Guarantee.

3.5.1 Output Guarantee. Seller shall deliver an average quantity of Facility Output during each Rolling Period which is equal to the Output Guarantee. For purposes of this Agreement, "Output Guarantee" for any Rolling Period means the sum of (i) 85% of the Expected Facility Output of the Facility for such Rolling Period, less (ii) any quantities of Facility Output that were not delivered to the Facility Meter in such Rolling Period during periods constituting Seller Excused Minutes (such quantity calculated on the basis of the Net Output capable of being delivered in an hour at an average rate equivalent to the actual Nameplate Capacity Rating). For purposes of this Agreement, "Rolling Period" means any two consecutive Contract Years occurring during the Term.

3.5.2 Liquidated Damages for Output Shortfall.

(a) If the average quantity of Facility Output delivered by the Facility during any Rolling Period is equal to or greater than the Output Guarantee for such Rolling Period, Seller's delivery obligation for such Rolling Period shall be deemed satisfied for such Rolling Period.

(b) If the average quantity of Facility Output generated by the Facility during any Rolling Period is less than the Output Guarantee for such Rolling Period, the Seller shall determine the resulting shortfall, if any, for the first Contract Year occurring during such Rolling Period (the "Output Shortfall"). The Output Shortfall shall be expressed in MWh and calculated in accordance with the following formula:

Output Shortfall = (85% of the Expected Output for the Contract Year).

less

Any quantities of Facility Output that were not delivered to Facility Metter in such Contract Year during periods constituting Seller Excused Minutes (such quantity calculated on the basis of the Facility Output capable of being delivered in an hour at an average rate equivalent to the Actual Capacity),

less

The Facility Output for the Contract Year

(c) If the product of the Output Shortfall calculation set forth in Section 3.5.2(b) is a positive number, Seller shall pay PGE liquidated damages equal to the product of (a) the Output Shortfall for that Contract Year, multiplied by (b) PGE's Cost to Cover for that Contract Year. If the product of the Output Shortfall calculation set forth in Section 3.5.2(b) is zero or a negative number, Seller shall not be obligated to pay PGE liquidated damages for such Contract Year.

3.5.3 Annual Invoicing. On the 30th day following the end of each Rolling Period, Seller shall deliver to PGE a report (and supporting data) detailing whether Seller achieved the Output Guarantee for the most recently completed Rolling Period. If Seller has failed to achieve the Output Guarantee in the prior Rolling Period, Seller shall also provide a report (and supporting data) to PGE detailing the Output Shortfall for the first Contract Year occurring during such Rolling Period. Seller shall provide documentation to support all data and calculations used in each report to calculate the percent Expected Output. Thirty days after PGE has received the report and all support data, if there is an Output Shortfall, PGE shall deliver to Seller an invoice showing PGE's computation of liquidated damages calculated pursuant to Section 3.5.2. In preparing such invoices, PGE shall utilize the Facility Meter data provided to PGE for the Contract Year in question, but may also rely on historical averages and such other information as may be available to PGE at the time of invoice preparation, if the Facility Meter data for such Contract Year is then incomplete or otherwise not available. To the extent required, PGE shall true up any such invoice as promptly as practicable following its receipt of actual results for the relevant Contract Year. Seller shall pay to PGE, by wire transfer of immediately available funds to an account specified in writing by PGE 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, and shall within 30 days after receiving the invoice raise any objections regarding any disputed portion of the invoice. All disputes regarding such invoices shall be subject to Article 18. Objections not made by Seller within the 30-day period shall be deemed waived.

3.6 Access.

Upon reasonable prior notice and subject to the prudent safety requirements of Seller, and Law relating to workplace health and safety, Seller shall provide PGE and its authorized agents, employees and inspectors ("PGE Representatives") with reasonable access to the Facility: (a) for the purpose of reading or testing metering equipment, (b) as necessary to witness any acceptance tests, (c) to provide tours of the Facility to customers and other guests of PGE (not more than 12 times per year), (d) for purposes of implementing Section 17.2 (Audit Rights), and (e) for other reasonable purposes at the reasonable request of PGE. PGE shall release Seller against and from any and all Liabilities resulting from actions or omissions by any of the PGE Representatives in connection with their access to the Facility, except to the extent that such damages are caused or by the intentional or grossly negligent act or omission of Seller.

3.7 Curtailment. PGE shall not be obligated to purchase, receive, pay for, or pay any damages associated with, Facility Output (or associated PTCs or RECs) if such Facility Output (or associated PTCs or RECs) is not delivered to the Delivery Point for any reason, including any of the following: (a) the interconnection between the Facility and the Transmission System is disconnected, suspended or interrupted, in whole or in part, consistent with the terms of the Interconnection Agreement, (b) the Transmission Provider(s) directs a general curtailment, reduction, or redispatch of generation in the area, (c) the Facility Output is not delivered to the Transmission System because the Facility is not fully integrated or synchronized with the Transmission System, or (d) an event of Force Majeure prevents either Party from delivering or receiving Energy.

ARTICLE 4
FORCE MAJEURE

4.1 Definition.

"Force Majeure" means an event or circumstance that prevents one Party from performing its obligations to deliver or receive the Product under this Agreement, which event or circumstance was not anticipated as of the Effective Date, which is not within the reasonable control of, or the result of the negligence of, the Claiming Party, and which, by the exercise of due diligence, the Claiming Party is unable to overcome or avoid or cause to be avoided. Force Majeure shall not be based on: (a) the loss of PGE's markets; (b) PGE's inability economically to use or resell the Product purchased under this Agreement; (c) the loss or failure of Seller's supply or equipment; or (d) Seller's ability to sell the Product at a price greater than the Contract Price. Neither Party may raise a claim of Force Majeure based in whole or in part on curtailment by a Transmission Provider unless: (i) such Party has contracted for firm transmission with a Transmission Provider for the Product to be delivered to or received at the Delivery Point, and (ii) such curtailment is due to "force majeure" or "uncontrollable force" or a similar term as defined under the Transmission Provider's tariff; provided, however, that existence of the foregoing factors shall not be sufficient to conclusively or presumptively prove the existence of a Force Majeure absent a showing of other facts and circumstances which in the aggregate with such factors establish that a Force Majeure as defined in the first sentence of this Section 4.1 has occurred.

4.2 Occurrence and Notice.

To the extent either Party is prevented by Force Majeure from carrying out, in whole or part, its obligations under this Agreement and such Party (the "Claiming Party") gives notice and details of the Force Majeure to the other Party as soon as practicable, then, unless the terms of this Agreement specify otherwise, the Claiming Party shall be excused from the performance of its obligations related thereto. The Claiming Party shall remedy the Force Majeure with all reasonable dispatch. The non-Claiming Party shall not be required to perform or resume performance of its obligations to the Claiming Party corresponding to the obligations of the Claiming Party excused by Force Majeure.

4.3 Obligations.

No Party shall be relieved by operation of this Article 4 of any liability to pay for Products delivered hereunder or to make payments then due or which the Party is obligated to make with respect to performance which occurred prior to the Force Majeure.

4.4 Right to Terminate.

If a Force Majeure event prevents a Party from performing its material obligations under this Agreement for a period exceeding 180 consecutive days before the Commercial Operation Date or, after the Commercial Operation Date, for a period exceeding 240 consecutive days (despite the affected Party's effort to take all reasonable steps to remedy the effects of the Force Majeure with all reasonable dispatch), then the Party not affected by the Force Majeure event, with respect to its obligations under this Agreement, may terminate this Agreement by giving 10 days' prior notice to the other Party. Upon such termination, neither Party will have any liability to the other with respect to periods following the effective date of such termination, except for the right of first offer set forth in Section 3.1.14 and as otherwise expressly provided in this Agreement; 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.

ARTICLE 5
EVENTS OF DEFAULT; REMEDIES

5.1 Events of Default.

An "Event of Default" shall mean, with respect to a Party (a "Defaulting Party"), the occurrence of any of the following:

5.1.1 in the case of the Seller, the occurrence of a Material Adverse Change with respect to Seller or its Guarantor; provided, such Material Adverse Change shall not be considered an Event of Default if Seller establishes and maintains for so long as the Material Adverse Change is continuing, Performance Assurance to PGE in an amount equivalent to the Termination Payment as determined under Section 5.3 and in accordance with Section 9.3;

5.1.2 the failure to make, when due, any payment required pursuant to this Agreement if such failure is not remedied within 10 Business Days after written notice;

5.1.3 any representation or warranty made by such Party in this Agreement is false or misleading in any material respect when made or when deemed made or repeated if such inaccuracy is not cured within 30 days after the non-defaulting Party gives the defaulting Party a notice of default;

5.1.4 if a Party fails to deliver or receive Product as required by this Agreement, and such failure occurs for more than five consecutive Days or on 10 Days out of any Contract Year (it being the intent of the Parties that other failures to deliver or receive Product in any Contract Year will be governed by Article 6);

5.1.5 such Party becomes Bankrupt;

5.1.6 the occurrence of a Merger Event with respect to such Party or its Guarantor that is not cured within 10 Business Days of notice by the other Party;

5.1.7 in the case of Seller, Seller's failure to establish, maintain, extend or increase Performance Assurance when required pursuant to this Agreement;

5.1.8 in the case of Seller, if the average quantity of Facility Output delivered by the Facility during any Rolling Period is less than 50% of Expected Output;

5.1.9 in the case of Seller, the occurrence of a Letter of Credit Default;

5.1.10 with respect to Seller's Guarantor, if any, the occurrence of a Guaranty Default;

5.1.11 in the case of Seller, the occurrence of an Event of Default under Section 3.1.7(d); or

5.1.12 the failure to perform any material covenant or obligation set forth in this Agreement for which an exclusive remedy is not provided in this Agreement and which is not addressed in any other Event of Default, if the failure is not cured within 30 days after the non-defaulting Party gives the defaulting Party notice of the default; provided that if such default is not reasonably capable of being cured within the 30 day cure period but is reasonably capable of being cured within a 60 day cure period, the defaulting Party will have such additional time (not exceeding an additional 30 days) as is reasonably necessary to cure, if, prior to the end of the thirty (30) day cure period the defaulting Party provides the non-defaulting Party a remediation plan, the non-defaulting party approves such remediation plan, and the defaulting Party promptly commences and diligently pursues the remediation plan.

5.2 Declaration of an Early Termination Date and Calculation of Settlement Amounts.

5.2.1 Early Termination Date. If an Event of Default with respect to a Defaulting Party shall have occurred at any time during the Term and be continuing, the other Party (the "Non-Defaulting Party") shall have the right to (i) designate a day, no earlier than the day such notice is effective and no later than 20 days after such notice is effective, as an early termination date ("Early Termination Date") on which to liquidate, terminate, and accelerate all amounts owing between the Parties, (ii) withhold any payments due to the Defaulting Party under this Agreement and (iii) suspend performance. If an Early Termination Date has been designated, the Non-Defaulting Party shall calculate, in a commercially reasonable manner, its Gains or Losses and Costs resulting from the termination of this Agreement as of the Early Termination Date and the Termination Payment (hereinafter defined) payable hereunder shall be calculated in accordance with Section 5.2.2 below.

5.2.2 Calculation of Settlement Amounts. The Gains or Losses resulting from the termination of this Agreement shall be determined by calculating the amount that would be incurred or realized to replace or to provide the economic equivalent of the remaining payments or deliveries in respect of this Agreement. The Gains or Losses shall be calculated for a period equal to the remaining Term ("Settlement Period"). The quantity of Energy in each month of the Settlement Period shall be equal to the hours in such month (or portion thereof) multiplied by the Expected Capacity ("Settlement Energy"). The Non-Defaulting Party (or its agent) may determine its Gains and Losses by reference to information either available to it internally or supplied by one or more third parties including, without limitation, quotations (either firm or indicative) of relevant rates, prices, yields, yield curves, volatilities, spreads or other relevant market data in the relevant markets. Third parties supplying such information may include, without limitation, dealers in the relevant markets, end-users of the relevant product, information vendors and other sources of market information. However, it is expressly agreed that (a) a Party shall not be required to enter into a replacement agreement in order to determine the Termination Payment and (b) a Party's Gains, Losses or Costs will in no event include any penalties, ratcheted demand or similar charges.

5.3 Termination Payment.

The "Termination Payment" shall equal the sum of all amounts owed by the Defaulting Party to the Non-Defaulting Party under this Agreement, including a Settlement Amount (if any), less any amounts owed by the Non-Defaulting Party to the Defaulting Party determined as of the Early Termination Date.

5.4 Notice of Payment of Termination Payment.

As soon as practicable after calculating the Termination Payment, the Non-Defaulting Party shall give notice to the Defaulting Party of the amount of the Termination Payment and whether the Termination Payment is due to or due from the Non-Defaulting Party. The notice shall include a written statement explaining in reasonable detail the calculation of such amount. If the Termination Payment is due from the Defaulting Party, the Termination Payment shall be made by the Defaulting Party within two (2) Business Days after such notice is effective. Notwithstanding any provision to the contrary contained in this Agreement, the Non-Defaulting Party shall not be required to pay to the Defaulting Party any amount under this Article 5 until the earlier of (i) the date the Non-Defaulting Party receives confirmation satisfactory to it in its reasonable discretion (which may include an opinion of its counsel) that all other obligations of any kind whatsoever of the Defaulting Party to make any payments to the Non-Defaulting Party under this Agreement or otherwise which are due and payable as of the Early Termination Date have been fully and finally performed, or (ii) 180 days after the Early Termination Date.

5.5 Disputes with Respect to Termination Payment.

If the Defaulting Party disputes the Non-Defaulting Party's calculation of the Termination Payment in whole or in part, the Defaulting Party shall, within 10 Business Days of receipt of Non-Defaulting Party's calculation of the Termination Payment provide to the Non-

Defaulting Party a detailed written explanation of the basis for such dispute; provided, however, that if the Termination Payment is due from the Defaulting Party, the Defaulting Party shall pay the non-disputed amount of the Termination Payment as provided in Section 5.4 and transfer, within two (2) Business Days, Performance Assurance to the Non-Defaulting Party in an amount equal to the disputed amount of the Termination Payment.

5.6 Closeout Setoffs.

After calculation of a Termination Payment in accordance with Section 5.3, if the Defaulting Party would be owed the Termination Payment, the Non-Defaulting Party shall be entitled, at its option and in its discretion, to set off against such Termination Payment any amounts due and owing by the Defaulting Party to the Non-Defaulting Party under any other agreements, instruments or undertakings between the Defaulting Party and the Non-Defaulting Party. The remedy provided for in this Section 5.6 shall be without prejudice and in addition to any right of setoff, combination of accounts, lien or other right to which the Non-Defaulting Party is at any time otherwise entitled (whether by operation of law, contract or otherwise).

5.7 Suspension of Performance.

Notwithstanding any other provision of this Agreement, if an Event of Default shall have occurred and be continuing, the Non-Defaulting Party, upon written notice to the Defaulting Party, shall have the right (i) to suspend performance under this Agreement; provided, however, in no event shall any such suspension continue for longer than ten (10) Business Days with respect to any single Scheduled Product unless an early Termination Date shall have been declared and notice thereof pursuant to Section 5.2 given, and (ii) to the extent an Event of Default shall have occurred and be continuing to exercise any remedy available at law or in equity.

5.8 Post-Termination PURPA Status.

If this Agreement is terminated because of a default by Seller, neither Seller nor any Affiliate of Seller, nor any successor to Seller with respect to the ownership of the Facility or Site, on whose behalf Seller acts herein as agent, may thereafter require or seek to require PGE to make any purchases from the Facility or any electric generation facility constructed on the Site under PURPA, or any other Law, for any periods that would have been within the Term had this Agreement remained in effect. Seller, on behalf of itself and on behalf of any other entity on whose behalf it may act, hereby waives its rights to require PGE to do so. On or before the Effective Date, the Parties shall execute and record, in the appropriate real property records of the Counties in which the Facility or Site is situated, and any federal agency as applicable, a memorandum in form acceptable to PGE to provide constructive notice to third parties of Seller's agreements under this Section 5.8.

ARTICLE 6
REMEDIES FOR FAILURE TO DELIVER/RECEIVE

6.1 Remedy for Seller's Failure to Deliver.

6.1.1 Liquidated Damages Due to PGE. If Seller fails to Schedule and/or deliver all or part of the Product pursuant to this Agreement, and such failure is not excused under the terms of this Agreement or by PGE's failure to perform, then Seller shall pay PGE within five (5) Business Days of invoice receipt, an amount for such deficiency equal to the positive difference, if any, obtained by subtracting the Contract Price from the Replacement Price. The invoice for such amount shall include a written statement explaining in reasonable detail the calculation of such amount.

6.1.2 Calculation of Replacement Price. The "Replacement Price" in regard to any Product Scheduled but not delivered to PGE, or generated by the Facility but not Scheduled to the Delivery Point, shall be the price at which PGE either:

(a) purchased a replacement for any such Product in a commercially reasonable manner, adding any:

(i) costs reasonably incurred by PGE in replacing such Product; and

(ii) additional transmission charges, if any, reasonably incurred by PGE in delivering such Product to the Delivery Point;

(b) or, absent a purchase, then the market price at Mid-Columbia plus the REC Price Component, for such Product not delivered, as determined by PGE in a commercially reasonable manner.

However, in no event shall such price include any penalties, ratcheted demand or similar charges, nor shall PGE be required to utilize or change its utilization of its owned or controlled assets, including contractual assets, or market positions to minimize Seller's liability.

6.2 PGE's Failure to Receive.

6.2.1 Liquidated Damages Due to Seller. If PGE fails to receive all or part of the Product Scheduled pursuant to this Agreement and such failure is not excused under the terms of this Agreement or by Seller's failure to perform, then PGE shall pay Seller, on the date payment would otherwise be due in respect of the Month in which the failure occurred or within five (5) Business Days of invoice receipt, an amount for such deficiency equal to the positive difference, if any, obtained by subtracting the Sales Price from the Contract Price associated with the amount of Product Scheduled by Seller but not received by PGE. The invoice for such amount shall include a written statement explaining in reasonable detail the calculation of such amount.

6.2.2 Calculation of Sales Price. The Sales Price in regard to any Product Scheduled to the Delivery Point but not received by PGE shall be the price at which Seller:

(a) resells for delivery any such Product in a commercially reasonable manner, deducting from such proceeds any:

(i) costs reasonably incurred by Seller in reselling such Product; and

(ii) additional transmission charges, if any, reasonably incurred by Seller in delivering such Product to third party purchasers at the Mid-Columbia.

(b) or, absent a sale, the market price at the Delivery Point for such Product not received as determined by Seller in a commercially reasonable manner.

However, in no event shall such price include any penalties, ratcheted demand or similar charges, nor shall Seller be required to utilize or change its utilization of its owned or controlled assets, including contractual assets, or market positions to minimize PGE's liability.

6.3 Duty to Mitigate.

Subject to Sections 6.1.2 and 6.2.2, each Party agrees that it has a duty to mitigate damages and covenants that it will use commercially reasonable efforts to minimize any damages it may incur as a result of the other Party's performance or non-performance of this Agreement.

6.4 Acknowledgement of the Parties.

The Parties stipulate that the payment obligations set forth in this Article 6 are reasonable in light of the anticipated harm and the difficulty of estimation or calculation of actual damages and waive the right to contest such payments as an unreasonable penalty. If either Party fails to pay undisputed amounts in accordance with this Article 6 when due, the other Party shall have the right to: (i) suspend performance until such amounts plus interest at the Interest Rate have been paid, and/or (ii) exercise any remedy available at Law or in equity to enforce payment of such amount plus interest at the Interest Rate. With respect to the amount of such damages only, the remedy set forth in this Article 6 shall be the sole and exclusive remedy of the Parties for the failure of Seller to sell and deliver, and PGE to purchase and receive the Product and all other damages and remedies are hereby waived. Disagreements with respect to the calculation of damages pursuant to this Article 6 may be submitted by either Party for resolution in accordance with applicable law.

6.5 Survival.

The provisions of this Article 6 shall survive the expiration or termination of this Agreement for any reason.

ARTICLE 7
PAYMENT AND NETTING

7.1 Billing Period.

Unless otherwise specifically agreed upon by the Parties, the Month shall be the standard period for all payments under this Agreement (other than for Seller or PGE failure under Sections 6.1 and 6.2 respectively and for termination under Section 5.4). On or before the tenth (10th) day of each Month, each Party shall render to the other Party an invoice for the payment obligations, if any, incurred hereunder during the preceding Month.

7.2 Timeliness of Payment.

Unless otherwise agreed by the Parties, all invoices under this Agreement shall be due and payable in accordance with each Party's invoice instructions on or before the later of the twentieth (20th) day of each Month, or the tenth (10th) day after receipt of the invoice or, if such day is not a Business Day, then on the next Business Day. Each Party will make payments by electronic funds transfer, or by other mutually agreeable method(s), to the account designated by the other Party. Any amounts not paid by the due date will be deemed delinquent and will accrue interest at the Interest Rate, such interest to be calculated from and including the due date to but excluding the date the delinquent amount is paid in full.

7.3 Disputes and Adjustments of Invoices.

A Party may, in good faith, dispute the correctness of any invoice or any adjustment to an invoice, rendered under this Agreement or adjust any invoice for any arithmetic or computational error within twenty-four (24) months of the date the invoice, or adjustment to an invoice, was rendered. In the event an invoice or portion thereof, or any other claim or adjustment arising hereunder, is disputed, payment of the undisputed portion of the invoice shall be required to be made when due, with notice of the objection given to the other Party. Any invoice dispute or invoice adjustment shall be in writing and shall state the basis for the dispute or adjustment. Payment of the disputed amount shall not be required until the dispute is resolved. Upon resolution of the dispute, any required payment shall be made within 10 Business Days of such resolution along with interest accrued at the Interest Rate from and including the due date to but excluding the date paid. Inadvertent overpayments shall be returned upon request or deducted by the Party receiving such overpayment from subsequent payments, with interest accrued at the Interest Rate from and including the date of such overpayment to but excluding the date repaid or deducted by the Party receiving such overpayment. Any dispute with respect to an invoice is waived unless the other Party is notified in accordance with this Section 7.3 within twenty-four (24) months after the invoice is rendered or any specific adjustment to the invoice is made. If an invoice is not rendered within twelve (12) months after the close of the Month during which performance of this Agreement occurred, the right to payment for such performance is waived.

7.4 Netting of Payments.

The Parties hereby agree that they shall discharge mutual debts and payment obligations due and owing to each other on the same date through netting, in which case all amounts owed by one Party to the other Party during the monthly billing period under this Agreement, including any related damages calculated pursuant to Article 5 (unless one of the Parties elects to accelerate payment of such amounts as permitted by Article 6), interest, and payments or credits, shall be netted so that only the excess amount remaining due shall be paid by the Party who owes it.

7.5 Payment Obligation Absent Netting.

If no mutual debts or payment obligations exist and only one Party owes a debt or obligation to the other during the monthly billing period, including, but not limited to, any related damage amounts calculated pursuant to Article 6, interest, and payments or credits, that Party shall pay such sum in full when due.

ARTICLE 8
LIMITATIONS

8.1 Essential Purposes. THE PARTIES CONFIRM THAT THE EXPRESS REMEDIES AND MEASURES OF DAMAGES PROVIDED IN THIS AGREEMENT SATISFY THE ESSENTIAL PURPOSES OF THIS AGREEMENT.

8.2 Exclusive Remedies. FOR BREACH OF ANY PROVISION FOR WHICH AN EXPRESS REMEDY OR MEASURE OF DAMAGES IS PROVIDED, SUCH EXPRESS REMEDY OR MEASURE OF DAMAGES SHALL BE THE SOLE AND EXCLUSIVE REMEDY, THE OBLIGOR'S LIABILITY SHALL BE LIMITED AS SET FORTH IN SUCH PROVISION AND ALL OTHER REMEDIES OR DAMAGES AT LAW OR IN EQUITY ARE WAIVED.

8.3 Direct Damages. IF NO REMEDY OR MEASURE OF DAMAGES IS EXPRESSLY PROVIDED HEREIN, THE OBLIGOR'S LIABILITY SHALL BE LIMITED TO DIRECT ACTUAL DAMAGES ONLY, SUCH DIRECT ACTUAL DAMAGES SHALL BE THE SOLE AND EXCLUSIVE REMEDY AND ALL OTHER REMEDIES OR DAMAGES AT LAW OR IN EQUITY ARE WAIVED.

8.4 No Consequential Damages. EXCEPT AS PROVIDED IN SECTION 6 OR AS OTHERWISE EXPRESSLY PROVIDED IN THIS AGREEMENT, NEITHER PARTY SHALL BE LIABLE FOR CONSEQUENTIAL, INCIDENTAL, PUNITIVE, EXEMPLARY OR INDIRECT DAMAGES, LOST PROFITS OR OTHER BUSINESS INTERRUPTION DAMAGES, BY STATUTE, IN TORT OR CONTRACT, UNDER ANY INDEMNITY PROVISION OR OTHERWISE.

8.5 Causes Disregarded. IT IS THE INTENT OF THE PARTIES THAT THE LIMITATIONS IMPOSED IN THIS AGREEMENT ON REMEDIES AND THE MEASURE OF DAMAGES BE WITHOUT REGARD TO THE CAUSE OR CAUSES RELATED

THERETO, INCLUDING THE NEGLIGENCE OF ANY PARTY, WHETHER SUCH NEGLIGENCE BE SOLE, JOINT OR CONCURRENT, OR ACTIVE OR PASSIVE.

8.6 Liquidated Damages. TO THE EXTENT ANY DAMAGES REQUIRED TO BE PAID UNDER THIS AGREEMENT ARE LIQUIDATED, THE PARTIES ACKNOWLEDGE THAT THE DAMAGES ARE DIFFICULT OR IMPOSSIBLE TO DETERMINE, OR OTHERWISE OBTAINING AN ADEQUATE REMEDY IS INCONVENIENT, AND THE DAMAGES CALCULATED UNDER THIS AGREEMENT CONSTITUTE A REASONABLE APPROXIMATION OF THE HARM OR LOSS.

ARTICLE 9
CREDIT AND COLLATERAL REQUIREMENTS

9.1 Pre-COD Security.

9.1.1 Amount of Pre-COD Security. On or before the date specified in Section 3.1.7(a)(i), Seller shall post and maintain Performance Assurance in favor of PGE, equal in each case to $25 per kW of Expected Capacity (the "Pre-COD Security"). Any Person providing a guaranty for Seller shall provide within five Business Days from receipt of a written request from PGE all reasonable financial records necessary for PGE to confirm Seller and/or the guarantor satisfies the Credit Requirements.

9.1.2 Use of Pre-COD Security to Pay Delay Damages. If the Commercial Operation Date occurs after the Expected Commercial Operation Date and Seller has failed to pay any Delay Damages when due under Section 3.1.12, PGE shall be entitled to and shall draw upon the Pre-COD Security an amount equal to the Delay Damages until such time as the Pre-COD Security is exhausted. PGE shall also be entitled to draw upon the Pre-COD Security for Contract Termination Damages.

9.1.3 Termination of Pre-COD Security. Seller shall no longer be required to maintain the Pre-COD Security (or the remaining balance thereof) after the Commercial Operation Date, if at such time no damages are owed to PGE under this Agreement. However, as of the Commercial Operation Date, Seller may elect to apply the Pre-COD Security toward the Delivery Period Security required by Section 9.2, including by the automatic continuation (as opposed to the replacement) thereof.

9.2 Delivery Period Security.

9.2.1 Duty to Post Delivery Period Security. Beginning on the Commercial Operation Date, at any time during the Term when Seller does not satisfy the Credit Requirements, Seller shall post and maintain Performance Assurance in favor of PGE as provided in this Section 9.2 (the "Delivery Period Security"). If Seller posts Delivery Period Security and thereafter satisfies the Credit Requirements, as demonstrated to the reasonable satisfaction of PGE, then Seller shall be entitled to a release by PGE of the Delivery Period Security for so long as Seller continues to satisfy the Credit Requirements. Seller and any party providing a guaranty for Seller shall provide within five Business Days from receipt of a written request from PGE all reasonable financial

records necessary for PGE to confirm Seller and/or the guarantor satisfies the Credit Requirements.

9.2.2 Amount of Delivery Period Security. The amount of the Delivery Period Security required by Section 9.2.1 shall be sufficient to provide replacement power and corresponding RECs under this Agreement for the next 18 calendar months. This amount shall be deemed equal to the positive difference between (a) the forward power prices at Mid-Columbia (as determined by PGE in good faith using information from a commercially reasonable independent source) for the next 18 calendar months (or, if the remaining Term is less than 18 calendar months), then for the remainder of the Term), multiplied by 110 percent, plus the REC Price Component, minus (b) the Contract Price, multiplied by the MWhs that would be delivered for such period under this Agreement (assuming Facility Output based on the total of the estimated monthly output set forth on Exhibit C for that period); provided, however, that the Delivery Period Security shall in no event be less than an amount equal to the Facility's expected gross revenues for the next 12 months (assuming Facility Output based on the total of the estimated monthly output set forth on Exhibit C for that period).

9.2.3 Adjustments to Delivery Period Security. On or before January 31st of each year during the Term, Seller shall (a) adjust the Delivery Period Security by increasing or decreasing the Delivery Period Security to correspond to the amount reasonably determined by PGE under Section 9.2.2 and (b) deliver such adjusted Delivery Period Security to PGE. PGE shall notify Seller of the determination of such amount on or before the preceding December 1.

9.3 Grant of Security Interest/Remedies.

To secure its obligations under this Agreement and to the extent Seller delivers Performance Assurance, Seller hereby grants to PGE a present and continuing security interest in, and lien on (and right of setoff against), and assignment of, all cash collateral and cash equivalent collateral and any and all proceeds resulting therefrom or the liquidation thereof, whether now or hereafter held by, on behalf of, or for the benefit of, PGE, and Seller agrees to take such action as PGE reasonably requires in order to perfect PGE's first-priority security interest in, and lien on (and right of setoff against), such collateral and any and all proceeds resulting therefrom or from the liquidation thereof.

Upon or at any time after the occurrence and during the continuation of an Event of Default or an Early Termination Date affecting the Seller, PGE may do any one or more of the following: (i) exercise any of the rights and remedies of a secured party with respect to all Performance Assurance, including any such rights and remedies under law then in effect; (ii) exercise its rights of setoff against any and all property of the Seller in the possession of PGE or its agent; (iii) draw on any outstanding Letter of Credit issued for its benefit; and (iv) liquidate all Performance Assurance then held by or for the benefit of PGE free from any claim or right of any nature whatsoever of Seller, including any equity or right of purchase or redemption by Seller. PGE shall apply the proceeds of the collateral realized upon the exercise of any such rights or remedies to reduce the Seller's obligations under this Agreement (the Seller remaining

liable for any amounts owing to PGE after such application), subject to PGE's obligation to return any surplus proceeds remaining after such obligations are satisfied in full.

9.4 Holding Performance Assurance.

PGE will be entitled to hold Performance Assurance in the form of cash provided that the following conditions are satisfied: (i) PGE is not a Defaulting Party and a Material Adverse Change has not occurred and is continuing with respect to such Party and (ii) Performance Assurance is held only in a jurisdiction within the United States.

9.5 Interest Rate on Cash Collateral.

Performance Assurance in the form of cash shall bear interest at the Interest Rate on Cash Collateral and shall be paid to the Seller on the third Business Day of each Month. "Interest Rate on Cash Collateral" means the lesser of (i) the maximum amount allowed by applicable law and (ii) the Federal Funds Rate for the holding period. The "Federal Funds Rate" means the effective Federal Funds Rate as published daily by the Federal Reserves Bank H.15 Statistical Release website for each day of the holding period. Such interest shall be calculated on the basis of the actual number of days elapsed over a year of 360 days.

9.6 Performance Assurance is Not a Limit on Seller's Liability.

The Performance Assurance contemplated by this Article 9: (a) constitutes security for, but is not a limitation of, Seller's obligations under this Agreement, and (b) shall not be PGE's exclusive remedy for Seller's failure to perform in accordance with this Agreement. To the extent that PGE draws on any Pre-COD Security or Delivery Period Security, Seller shall replenish or reinstate the Pre-COD Security or Delivery Period Security to the full amount then required under this Article 9.

9.7 Waiver.

This Agreement sets forth the entire agreement of the Parties regarding credit, collateral, financial assurances and adequate assurances. Except as expressly set forth in this Agreement, including this Article 9, neither Party:

(a) has or will have any obligation to post margin, provide letters of credit, pay deposits, make any other prepayments or provide any other financial assurances, in any form whatsoever, or

(b) will have reasonable grounds for insecurity with respect to the creditworthiness of a Party that is complying with the relevant provisions of Article 9 of this Agreement; and all implied rights relating to financial assurances arising from Section 2-609 of the Uniform Commercial Code or case law applying similar doctrines, are hereby waived.

ARTICLE 10
GOVERNMENTAL CHARGES

10.1 Cooperation.

Each Party shall use reasonable efforts to implement the provisions of and to administer this Agreement in accordance with the intent of the Parties to minimize all taxes, so long as neither Party is materially adversely affected by such efforts.

10.2 Non-Sale Related Governmental Charges and Taxes.

Seller shall pay or cause to be paid all charges or taxes imposed by any government authority ("Governmental Charges") on or with respect to the Product arising prior to the Delivery Point. PGE shall pay or cause to be paid all Governmental Charges on or with respect to the Product at and from the Delivery Point (other than those related to the sale of the Product, which are the responsibility of Seller). In the event Seller is required by law or regulation to remit or pay Governmental Charges which are PGE's responsibility hereunder, PGE shall promptly reimburse Seller for such Governmental Charges. If PGE is required by law or regulation to remit or pay Governmental Charges which are Seller's responsibility hereunder, PGE may invoice Seller for the amount of any such Governmental Charges or, in its sole discretion, deduct the amount of any such Governmental Charges from the sums due to Seller under Article 7 of this Agreement. Nothing in this Agreement shall obligate or cause a Party to pay or be liable to pay any Governmental Charges for which it is exempt under the Law.

10.3 Sale-related Governmental Charges and Taxes.

In addition to all other payments required under this Agreement, Seller shall be solely responsible for all existing and any new sales, use, excise, ad valorem, and any other similar taxes imposed or levied by any federal, state or local governmental agency on the Product sold and delivered hereunder (including any taxes imposed or levied with respect to the transmission of such energy) up to the delivery of such Product to the Delivery Point.

10.4 Indemnification.

Each Party shall indemnify, release, defend and hold harmless the other Party from and against any and all liability for taxes imposed or assessed by any taxing authority with respect to the Product sold, delivered and received hereunder that are the responsibility of such Party pursuant to this Article 10.

ARTICLE 11
RATES AND TERMS BINDING;
FERC STANDARD OF REVIEW

11.1 Mobile-Sierra Doctrine.

Absent the agreement of all Parties to the proposed change, the standard of review for changes to any rate, charge, classification, term or condition of this Agreement, proposed by a Party (to the extent that any waiver in subsection (2) below is unenforceable or ineffective as to

such Party), or FERC acting *sua sponte*, shall solely be the "public interest" application of the "just and reasonable" 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) and clarified by Morgan Stanley Capital Group, Inc. v. Public Util. Dist. No. 1 of Snohomish 554 U.S. __ (2008) (the "Mobile-Sierra" doctrine).

In addition, and notwithstanding the foregoing subsection (1), to the fullest extent permitted by applicable law, each Party, for itself and its successors and assigns, hereby expressly and irrevocably waives any rights it can or may have, now or in the future, whether under §§ 205 and/or 206 of the Federal Power Act or otherwise, to seek to obtain from FERC by any means, directly or indirectly (through complaint, investigation or otherwise), and each hereby covenants and agrees not at any time to seek to so obtain, an order from FERC changing any Section of this Agreement specifying the rate, charge, classification, or other term or condition agreed to by the Parties, it being the express intent of the Parties that, to the fullest extent permitted by applicable law, neither Party shall unilaterally seek to obtain from FERC any relief changing the rate, charge, classification, or other term or condition of this Agreement, notwithstanding any subsequent changes in applicable law or market conditions that may occur. In the event it were to be determined that applicable law precludes the Parties from waiving their rights to seek changes from FERC to their market-based power sales contracts (including entering into covenants not to do so) then this subsection (2) shall not apply, provided that, consistent with the foregoing subsection (1), neither Party shall seek any such changes except solely under the "public interest" application of the "just and reasonable" standard of review and otherwise as set forth in the foregoing subsection (1).

ARTICLE 12
REPRESENTATIONS AND WARRANTIES; INDEMNITY

12.1 Representations and Warranties.

On the Effective Date and throughout the Term, each Party represents and warrants to the other Party that:

12.1.1 it is duly organized, validly existing and in good standing under the laws of the jurisdiction of its formation;

12.1.2 it has all regulatory authorizations necessary for it to legally perform its obligations under this Agreement;

12.1.3 the execution, delivery and performance of this Agreement are within its powers, have been duly authorized by all necessary action and do not violate any of the terms and conditions in its governing documents, any contracts to which it is a party or any law, rule, regulation, order or the like applicable to it;

12.1.4 this Agreement, and each other document executed and delivered in accordance with this Agreement constitutes its legally valid and binding obligation enforceable against it in accordance with its terms; subject only to any Equitable Defenses;

12.1.5 it is not Bankrupt and there are no proceedings pending or being contemplated by it or, to its knowledge, threatened against it which would result in it being or becoming Bankrupt;

12.1.6 there is not pending or, to its knowledge, threatened against it or any of its Affiliates any legal proceedings that could materially adversely affect its ability to perform its obligations under this Agreement;

12.1.7 no Event of Default with respect to it has occurred and is continuing and no such event or circumstance would occur as a result of its entering into or performing its obligations under this Agreement;

12.1.8 it is acting for its own account, has made its own independent decision to enter into this Agreement and as to whether this Agreement is appropriate or proper for it based upon its own judgment, is not relying upon the advice or recommendations of the other Party in so doing, and is capable of assessing the merits of and understanding, and understands and accepts, the terms, conditions and risks of this Agreement;

12.1.9 it has entered into this Agreement in connection with the conduct of its business and it has the capacity or ability to make or take delivery of all Products referred to in this Agreement;

12.1.10 the material economic terms of this Agreement were subject to individual negotiation by the Parties;

12.1.11 it, and any guarantor of its obligations under this Agreement, is an "eligible contract participant" within the meaning of the Commodity Exchange Act.

12.2 Indemnity.

To the fullest extent permitted by law, each Party (the "Indemnitor") hereby indemnifies and agrees to defend and hold harmless the other Party (the "Indemnitee") from and against any Indemnity Claims caused by, resulting from, relating to or arising out of any act or incident involving or related to the Product and occurring at any time when such Product is under the Indemnitor's possession and control; provided, however, that the Indemnitor shall not have any obligation to indemnify the Indemnitee from or against any Indemnity Claims caused by, resulting from, relating to or arising out of the gross negligence or intentional misconduct of the Indemnitee.

12.3 Additional Representations and Warranties of Seller.

Seller hereby further represents and warrants to PGE that:

12.3.1 Seller has the right to sell the Product to PGE free and clear of liens of encumbrances;

12.3.2 Seller has title to the Product sold under this Agreement free and clear of liens and encumbrances;

12.3.3 Seller is authorized to sell power at market-based rates pursuant to FERC Dockets Number ER [_____];

12.3.4 The Facility is either an EWG or a QF;

12.3.5 Seller has obtained, or will obtain as and when required by this Agreement, all Permits and all other rights and agreements required to construct, own, operate and maintain the Facility, and they will be in full force and effect for the Term;

12.3.6 All leases of real property and other real property rights and agreements required for the operation of the Facility or the performance of any obligations of Seller under this Agreement have been obtained and are owned by Seller, free and clear of liens and encumbrances;

12.3.7 Except as disclosed on Exhibit E, neither Seller nor any Affiliate of Seller has entered into any document, arrangement, understanding, promise or agreement or the like with any Person concerning, with respect to the Facility, (i) remediation or mitigation of environmental impacts, (ii) endangered species, (iii) migratory birds (including eagles), (iv) wildlife and species of conservation concern (state and federal), (v) environmentally, culturally or historically sensitive property or resources, (vi) a military facility, or (vii) national security. In addition, neither Seller nor any Affiliate of Seller has entered into any agreement where public disclosure of the agreement or the subject matter of the agreement could reasonably be expected to negatively affect the Facility's reputation.

12.3.8 Except as disclosed in Exhibit J, there is no litigation, legal action or administrative action pending with respect to the Facility nor, to Seller's knowledge, is any such litigation. legal action or administrative action threatened.

12.3.9 Seller has at all times been fully compliant with the requirements of the Federal Trade Commission's "Green Guides," 77 F.R. 62122, 16 C.F.R. Part 260, as amended or restated in any communication concerning Facility Output, the Facility or the RECs.

12.4 No Other Representations or Warranties. Each Party acknowledges that it has entered into this Agreement in reliance upon only the representations and warranties set forth in this Agreement, and that no other representations or warranties have been made by the other Party with respect to the subject matter of this Agreement.

ARTICLE 13 INSURANCE

13.1 Insurance. During the Term, Seller shall secure and continuously carry the following insurance coverage:

13.1.1 Commercial general liability insurance with a minimum combined single limit of $1,000,000 per occurrence and in the annual aggregate, with coverage for bodily injury, personal injury and broad form property damage, contractual liability, products and completed operations.

13.1.2 Workers' compensation insurance to cover statutory limits of the worker's compensation laws and employers liability insurance with a minimum limit of $1,000,000.

13.1.3 Business automobile liability insurance (including coverage for owned, non-owned, and hired automobiles) used in connection with the Facility in an amount not less than $1,000,000 per accident for combined bodily injury, property damage or death. To the extent that the Seller does not own automobiles, coverage for non-owned and hired automobiles may be combined with commercial general liability.

13.1.4 Umbrella/excess insurance covering claims in excess of the underlying insurance described in Sections 13.1.1, 13.1.2 (employers liability only) and 13.1.3 with a $5,000,000 minimum per occurrence and annual aggregate.

13.1.5 All-risk property insurance including boiler & machinery coverage insuring Seller's property at replacement cost value.

13.2 Seller to Provide Certificate of Insurance. All policies required, with the exception of workers' compensation employers liability and business automobile liability, shall include (i) endorsement(s) naming PGE as an additional insured but only to the extent of Indemnitee's indemnifications as stated in Section 13.1, and (ii) a cross-liability and severability of interest clause. Said policies shall also contain provisions that such insurance is primary insurance without right of contribution of any other insurance carried by or on behalf of PGE with respect to its interests as additional insured. A certificate of insurance showing that the above-required insurance is in full force and effect (on Accord or similar form) shall be furnished to PGE. All policies shall be placed with companies with a minimum A.M. Best rating of A- IX. Seller shall deliver copies of all certificates of insurance to PGE within thirty (30) days of the Effective Date.

13.3 Seller to Notify PGE of Loss of Coverage. Seller or Seller's insurers shall endeavor to provide PGE thirty (30) days notice (or ten (10) days in the case of cancellation due to non-payment of premiums) in the event of any material change to, cancellation or non-renewal of the required insurance.

ARTICLE 14
TITLE AND RISK OF LOSS

Title and risk of loss related to the Product shall transfer from Seller to PGE at the Delivery Point, except that title to RECs shall transfer to PGE when generated and shall be measured at the Facility Meter. Seller represents and warrants that it will deliver all Product to PGE free and clear of all liens, security interests, claims and encumbrances or any interest therein or thereto by any Person arising prior to the Delivery Point.

ARTICLE 15
ASSIGNMENT; BINDING EFFECT

15.1 Assignment.

Neither Party shall assign this Agreement or its rights hereunder to any entity whose Credit Rating is not equal to or higher than that of such Party and is at least above BBB- by S&P and Baa3 by Moody's. No assignment may be made without the prior written consent of the other Party, which consent shall not be unreasonably withheld or delayed; provided, however, either Party may, without the consent of the other Party (and without relieving itself from liability hereunder), (i) transfer, sell, pledge, encumber or assign this Agreement or the accounts, revenues or proceeds hereof in connection with any financing or other financial arrangements, (ii) transfer or assign this Agreement to an Affiliate of such Party which Affiliate's Credit Rating is equal to or higher than that of such Party, or (iii) transfer or assign this Agreement to any person or entity succeeding to all or substantially all of its assets whose Credit Rating is equal to or higher than that of such Party; provided, however, that in each such case, any such assignee shall agree in writing to be bound by the terms and conditions hereof and so long as the transferring Party delivers such tax and enforceability assurance as the non-transferring Party may reasonably request.

15.2 Change in Control.

No direct or indirect change in the control of Seller may occur without PGE's prior written consent, not to be unreasonably withheld, conditioned or delayed.

15.3 Binding Effect.

This Agreement shall inure to the benefit of and be binding upon the Parties and their respective successors and permitted assigns. No assignment or transfer permitted hereunder shall relieve the assigning or transferring Party of any of its obligations under this Agreement.

ARTICLE 16
GOVERNING LAW

THIS AGREEMENT AND THE RIGHTS AND DUTIES OF THE PARTIES HEREUNDER SHALL BE GOVERNED BY AND CONSTRUED, ENFORCED AND PERFORMED IN ACCORDANCE WITH THE LAWS OF THE STATE OF OREGON, WITHOUT REGARD TO ITS PRINCIPLES OF CONFLICTS OF LAW.

ARTICLE 17
RECORDS AND AUDIT

17.1 Records.

Each Party shall keep proper books of records and account, in which full and correct entries shall be made of all dealings in relation to this Agreement in accordance with generally accepted accounting principles, consistently applied.

17.2 Audit Rights.

Each Party has the right, at its sole expense and during normal working hours, to examine the records of the other Party to the extent reasonably necessary to verify the accuracy of any statement, charge or computation made pursuant to this Agreement. If requested, a Party shall provide to the other Party statements evidencing the quantity of Product delivered at the Delivery Point. If any such examination reveals any inaccuracy in any statement, the necessary adjustments in such statement and the payments thereof will be made promptly and shall bear interest calculated at the Interest Rate from the date the overpayment or underpayment was made until paid; provided, however, that no adjustment for any statement or payment will be made unless objection to the accuracy thereof was made prior to the lapse of twenty-four (24) months from the rendition thereof, and thereafter any objection shall be deemed waived.

ARTICLE 18
DISPUTE RESOLUTION

18.1 Referral to Senior Management

In the event of any controversy, claim or dispute between the Parties arising out of or related to this Agreement ("Dispute"), the Parties' representatives will first attempt to resolve the Dispute informally through negotiation and consultation. If they are unable to do so, then within three (3) Business Days following the date of delivery of a written request by either Party, (i) each Party shall appoint as its representative a senior officer, and (ii) such senior officers shall meet, negotiate and attempt in good faith to resolve the Dispute quickly, informally and inexpensively.

18.2 Mediation.

Any Dispute that is not resolved pursuant to Section 18.1 may be submitted for mediation before a single mediation in accordance with the provisions contained herein and in accordance with the Commercial Mediation Procedures of the AAA in effect at the time of the mediation ("AAA Procedures"); provided, however, that in the event of any conflict between the procedures herein and the AAA Procedures the procedures herein shall control. The mediator will be named by mutual agreement of the Parties or by obtaining a list of five (5) qualified Persons from the Parties and alternately striking names. All mediation shall be administered by the AAA. All mediation shall take place in the City of Portland, Oregon, unless otherwise agreed to by the Parties. Each Party shall be required to exchange documents to be used in the mediation not less than five (5) Business Days prior to the mediation. The Parties shall use all commercially reasonable efforts to conclude the mediation as soon as practicable. All aspects of the mediation shall be treated as confidential. Neither the Parties nor any mediator may disclose the content or results of the mediation, except as necessary to comply with legal, audit or regulatory requirements. Before making any such disclosure, a Party shall give written notice to the other Party and shall afford such Party a reasonable opportunity to protect its interests. Each Party shall be responsible for its own expenses and one-half of any mediation expenses incurred to resolve the dispute. The mediator will provide the Parties with a fee and expense schedule in advance of mediation. Mediation will terminate by: (a) written agreement signed by both Parties, (b) determination by the mediator that the Parties are at an unresolvable impasse, or (c)

two unexcused absences by either Party from the mediation sessions. The mediator will never participate in any claim or controversy covered by this Article as a witness, collateral contract, or attorney and may not be called as a witness to testify in any proceeding involving the subject matter of mediation. O.R.S. §§ 36.100 to 36.238 will apply to the entire process of mediation.

18.3 Legal ActionIf the Parties are still unable to resolve their differences after good faith consideration of a resolution through mediation pursuant to Section 18.2, then each of the Parties hereby irrevocably consents and agrees that any legal action or proceedings with respect to this Agreement may be brought in any of the courts of the State of Oregon located in the City of Portland or the courts of the United States of America for the District of Oregon having subject matter jurisdiction. By execution and delivery of this Agreement and such other documents executed in connection herewith, each Party hereby (a) accepts the exclusive jurisdiction of the aforesaid courts, (b) irrevocably agrees to be bound by any final judgment (after any and all appeals) of any such court with respect to such documents, (c) irrevocably waives, to the fullest extent permitted by law, any objection it may now or hereafter have to the laying of venue of any action or proceeding with respect to such documents brought in any such court, and further irrevocably waives, to the fullest extent permitted by law, any claim that any such action or proceeding brought in any such court has been brought in any inconvenient forum, (d) agrees that services of process in any such action or proceeding may be effected by mailing a copy thereof by registered or certified mail (or any substantially similar form of mail), postage prepaid, to such Party at its address set forth in Exhibit A, or at such other address of which the Parties have been notified.

18.4 Waiver of Jury Trial. EACH PARTY IRREVOCABLY WAIVES, TO THE FULLEST EXTENT PERMITTED BY APPLICABLE LAW, ANY AND ALL RIGHTS TO TRIAL BY JURY IN ANY LEGAL PROCEEDING ARISING OUT OF OR RELATING TO THIS AGREEMENT OR THE TRANSACTIONS CONTEMPLATED HEREBY.

18.5 Attorneys' Fees. If either Party institutes any legal suit, action or proceeding against the other party arising out of or relating to this Agreement, including, but not limited to, contract, equity, tort, fraud and statutory claims, the prevailing party in the suit, action or proceeding will be entitled to receive, in addition to all other remedies to which the prevailing party may be entitled, the costs and expenses incurred by the prevailing party in conducting the suit, action or proceeding, including reasonable attorneys' fees and expenses, court costs and other legal expenses such as expert witness fees, and all fees, taxes, costs and expenses incident to appellate, bankruptcy and post-judgment proceedings.

18.6 Survival. The provisions set forth in this Article 18 shall survive the termination or expiration of this Agreement.

ARTICLE 19
GENERAL PROVISIONS

19.1 Entire Agreement.

This Agreement (including the attached exhibits and schedules), any designated collateral, credit support or margin agreement or similar arrangement between the Parties and all

transactions under this Agreement constitute the entire agreement between the Parties relating to the subject matter. There are no prior or contemporaneous agreements or representations affecting the same subject matter other than those herein expressed. Any and all Exhibits referred to in this Agreement are, by such reference, incorporated herein and made a part hereof for all purposes.

19.2 Joint Efforts.

This Agreement shall be considered for all purposes as prepared through the joint efforts of both Parties and shall not be construed against one Party or the other as a result of the preparation, substitution, submission or other event of negotiation, drafting or execution hereof.

19.3 Amendments in Writing.

No amendment or modification to this Agreement shall be enforceable unless reduced to writing and executed by both Parties.

19.4 No Third Party Beneficiaries.

This Agreement shall not impart any rights enforceable by any third party (other than a permitted successor or assignee bound to this Agreement), it being the intent of the Parties that this Agreement shall not be construed as a third party beneficiary contract.

19.5 Non-Waiver.

No waiver by any Party of any one or more defaults by the other Party in the performance of any of the provisions of this Agreement shall be construed as a waiver of any other default or defaults whether of a like kind or different nature. No failure or delay by either Party in exercising any right, power, privilege, or remedy hereunder shall operate as a waiver thereof.

19.6 Severability.

Any provision of this Agreement declared or rendered invalid, unlawful, or unenforceable by any applicable court of law or regulatory agency or deemed unlawful because of a statutory change (individually or collectively, such events referred to as "Regulatory Event") will not otherwise affect the remaining lawful obligations that arise under this Agreement; and provided, further, that if a Regulatory Event occurs, the Parties shall use their best efforts to reform this Agreement in order to give effect to the original intention of the Parties.

19.7 Survival.

All indemnity and audit rights shall survive the termination of this Agreement. All obligations provided in this Agreement shall remain in effect, after the expiration or termination for any reason of this Agreement, for the purpose of complying herewith.

19.8 Bankruptcy Matters.

The Parties acknowledge and agree that this Agreement constitutes a "forward contract" within the meaning of the United States Bankruptcy Code. Bankruptcy Code Matters. The Parties acknowledge and intend that this Agreement, the transactions contemplated in this Agreement, and any instruments that may be provided by either Party under this Agreement (including any Guaranty) will each, and together, constitute one and the same "forward contract," "forward agreement" and "master netting agreement" within the meaning of the Bankruptcy Code, and that PGE and Seller are "forward contract merchants" within the meaning of the Bankruptcy Code. Each Party agrees that it will not make any assertion or claim, or otherwise take any position to the effect that this Agreement, the transactions contemplated under this Agreement, and any instrument(s) that may be provided by either Party under this Agreement (including the Guaranty) do not each, and together, constitute one and the same "forward contract," "forward agreement" and "master netting agreement" within the meaning of the Bankruptcy Code, or that PGE and Seller are not "forward contract merchants" within the meaning of the Bankruptcy Code.

19.9 Relationships of Parties.

The Parties shall not be deemed in a relationship of partners or joint venturers by virtue of this Agreement, nor shall either Party be deemed an agent, representative, trustee or fiduciary of the other. Neither Party shall have any authority to bind the other to any agreement. This Agreement is intended to secure and provide for the services of each Party as an independent contractor.

19.10 Headings.

The headings used for the Sections and Articles herein are for convenience and 19.11of this Agreement.

19.11 Consolidation of Variable Interest Entities.

If PGE or one of its Affiliates determines that, under Accounting Standards Codification 810 ("ASC 810") Consolidation of Variable Interest Entities ("VIE's"), formerly referred to as the Financial Accounting Standards Board's revised Interpretation No. 46 ("FIN 46"), it may hold a controlling financial interest in Seller, but it lacks the information necessary to make a definitive conclusion, Seller hereby agrees to provide, upon PGE's written request, sufficient financial and ownership information so that PGE or its Affiliate may assess whether a controlling financial interest in a VIE does exist under FIN 46. If PGE or its Affiliate determines that, under FIN 46, it holds a variable interest in Seller, Seller hereby agrees to provide, upon PGE's written request, sufficient financial and other information to PGE or its Affiliates so that PGE may properly consolidate the entity in which it holds the controlling financial interest and present the required disclosures. PGE shall reimburse Seller for Seller's reasonable costs and expenses, if any, incurred in connection with PGE's requests for information under this Section 19.11.

ARTICLE 20
CONFIDENTIALITY

Neither Party shall disclose the terms or conditions of this Agreement to a third party except (i) as may become generally available to the public, (ii) as may be required or appropriate in response to any summons, subpoena, or otherwise in connection with any litigation or to comply with any applicable law, order, regulation, ruling, or accounting disclosure rule or standard, (iii) as may be obtained from a non-confidential source that disclosed such information in a manner that did not violate its obligations to the non-disclosing Party in making such disclosure, (iv) to an index publisher or rating agency who has executed a confidentiality agreement with such Party, (v) in order to comply with any applicable law, regulation, order, or directive, including an order or directive of the Oregon Public Utility Commission, or (vi) in connection with any court or regulatory proceeding, including a proceeding of the Oregon Public Utility Commission; provided, however, that in the case of a disclosure under paragraphs (ii), (v) or (vi), each Party shall, to the extent practicable, use reasonable efforts to prevent or limit the disclosure. The parties shall be entitled to all remedies available at law or in equity to enforce, or seek relief in connection with, this confidentiality obligation. Before Seller issues any news release or publicly distributed promotional material regarding the Facility that mentions the Facility or PGE, Seller shall first provide a copy thereof to PGE for its review and approval, which approval shall not be unreasonably withheld, conditioned or delayed.

ARTICLE 21
NOTICES AND COUNTERPARTS

21.1 Notices.

21.1.1 All notices, requests, statements or payments shall be made to the addresses and persons specified in Exhibit A. All notices, requests, statements or payments shall be made in writing except where this Agreement expressly provides that notice may be made orally. Notices required to be in writing shall be delivered by hand delivery, overnight delivery, facsimile, e-mail (so long as a copy of such e-mail notice is provided immediately thereafter by hand delivery, overnight delivery, or facsimile), or other documentary form. Notice by facsimile shall (where confirmation of successful transmission is received) be deemed to have been received on the day on which it was transmitted (unless transmitted after 5:00 p.m. at the place of receipt or on a day that is not a Business Day, in which case it shall be deemed received on the next Business Day); provided that Scheduling and Dispatch notifications and notifications of changes in availability of the Facility sent by facsimile shall be treated as received when confirmation of successful transmission is received. Notice by hand delivery or overnight delivery shall be deemed to have been received when delivered. Notice by e-mail shall be deemed to have been received when delivered, so long as a copy of such e-mail notice is provided immediately thereafter by hand delivery, overnight delivery, courier or facsimile. Notice by telephone shall be deemed to have been received at the time the call is received.

21.1.2 A Party may change its address by providing notice of the same in accordance with the provisions of Section 21.1.

21.2 Counterparts.

This Agreement may be executed in counterparts, each of which is an original and all of which constitute one and the same instrument.

IN WITNESS WHEREOF, the Parties have caused this Wholesale Renewable Energy Purchase and Sale Agreement to be duly executed as of the Effective Date. This Agreement shall not become effective as to either Party unless and until executed by both Parties.

PORTLAND GENERAL ELECTRIC COMPANY		**[*Seller*]**	
Signature:	_____	Signature:	_____
Name:	_____	Name:	_____
Title:	_____	Title:	_____

EXHIBIT A

NOTICES

Portland General Electric Company ("PGE")

All Notices:

Street: 121 SW Salmon Street

City: Portland, Oregon 97204

Attn: Power Contracts; 3WTCBR06
Phone: (503) 464-___
Facsimile: (503) 464-2605
Duns: 00-790-9054
Federal Tax ID Number: 93-0256820

Invoices:
Attn: Accounts Payable
Phone: (503) 464-7126
Facsimile: 464-7006

Scheduling:
Attn: Manager Power Coordination
Phone: (503) 464-7241
Facsimile: (503) 464-2605

Wire Transfer:
BNK: United States National Bank of Oregon-Portland
ABA: 123000220
ACCT: #153600063512
NAME: Portland General Electric Company

Credit and Collections:
Attn: Credit Manager
Phone: (503) 464-_____
Facsimile: (503) 464-2605

With additional Notices of an Event of Default to:
Attn: General Counsel
Phone: (503) 464-7822
Facsimile: (503) 464-2200

Seller ("Seller" or "Name")

All Notices:

Street: _____

City: _____ Zip: _____

Attn: Contract Administration
Phone: _____
Facsimile: _____
Duns: _____
Federal Tax ID Number: _____

Invoices:
Attn: _____
Phone: _____
Facsimile: _____

Scheduling:
Attn: _____
Phone: _____
Facsimile: _____

Wire Transfer:
BNK: _____
ABA: _____
ACCT: _____

Credit and Collections:
Attn: _____
Phone: _____
Facsimile: _____

With additional Notices of an Event of Default to:
Attn: _____
Phone: _____
Facsimile: _____

EXHIBIT B

Contract Price

Contract Year	Contract Price

EXHIBIT C

EXPECTED FACILITY OUTPUT AND ESTIMATES OF MONTHLY FACILITY OUTPUT

EXHIBIT D

FACILITY DESCRIPTION

EXHIBIT E

FACILITY DOCUMENTS

EXHIBIT F

SITE

EXHIBIT G

START-UP TESTING

EXHIBIT H

OUTLINE OF SCHEDULING PROTOCOL AS OF EFFECTIVE DATE

1. T – 75 minutes Seller submits a base schedule to the California Independent System Operator (CAISO) Base Schedule Aggregation Portal (BSAP) for the upcoming operating hour.

2. T – 57 minutes Seller makes any final adjustments to base schedule and adjusts the NERC e-tag energy profile to match the base schedule amount for the upcoming operating hour.

3. By T-39 of each 15-minute interval within the operating hour, Seller updates NERC e-tag energy profile to reflect the firm delivered output for the relevant 15-minute interval. The schedule will become the final, firm 15-minute firm value to PGE.

EXHIBIT I

REC CERTIFICATE

_____ ("Seller") hereby sells, transfers and delivers to PGE all RECs associated with the generation of Energy under the Wholesale Renewable Power Purchase Agreement between Seller and PGE dated [_____] (the "PPA"), as described below, in the amount of one Environmental Attribute for each megawatt hour generated. Defined terms used in this RECs Certificate (as indicated by initial capitalization) shall have the meaning set forth in the PPA.

Facility name and location: _____ Fuel Type:
Capacity (MW): Operational Date:
Energy Admin. ID no.: _____

Dates	MWh generated
_____	_____

Seller further attests, warrants and represents, under penalty of perjury, as follows:

i) to the best of its knowledge, the information provided herein is true and correct;

ii) its sale to PGE is its one and only sale of the RECs referenced in this certificate;

iii) the Facility generated Energy in the amount indicated above;

iv) Seller has at all times complied with the requirements of the Federal Trade Commission's "Green Guides," 77 F.R. 62122, 16 C.F.R. Part 260, as amended or restated.

iv) to the best of Seller's knowledge, each of the RECs associated with the generated Energy have been generated and sold by the Facility.

This RECs Certificate confirms, in accordance with the PPA, the transfer from Seller to PGE all of Seller's right, title and interest in and to the RECs, as set forth above.

SECTION 1 Seller's Contact Person: [_____]
SECTION 2WITNESS MY HAND,
SECTION 3_____
SECTION 4a _____limited liability company
SECTION 5 By _____
SECTION 6 Its _____
SECTION 7 Date: _____

This Attestation may be disclosed by Seller and PGE to others, including the Center for Resource Solutions and the public utility commissions having jurisdiction over PGE, to substantiate and verify the accuracy of PGE's advertising and public

communication claims, as well as in PGE's advertising and other public communications.

EXHIBIT J

LITIGATION

15 Appendix D – Asset Purchase Agreement

Template provided in a separate document available for download on PortlandGeneralRFP.accionpower.com.

APPENDIX D

ASSET PURCHASE AGREEMENT[1]

by and between

PORTLAND GENERAL ELECTRIC COMPANY

and

_____

Dated _____

[1] NTD: Bidder is advised that this form of Asset Purchase Agreement was drafted contemplating the purchase of a development stage project that would not be constructed as of the Effective Date. Terms will be adjusted to accommodate assets that are operating or in further stages of development.

TABLE OF CONTENTS

Page

ARTICLE 1 DEFINITIONS AND CONSTRUCTION 1

1.1 Specific Definitions 1
1.2 Construction 8

ARTICLE 2 PURCHASE AND SALE OF ASSETS; PURCHASE PRICE AND PAYMENT 9

2.1 Purchase and Sale 9
2.2 Instruments of Conveyance 9
2.3 Payments 10
2.4 Late Payments 10
2.5 Further Assurances; Cooperation 10

ARTICLE 3 CONDITIONS PRECEDENT 11

3.1 Conditions Generally 11
3.2 PGE Conditions Precedent to the Closing 11
3.3 Seller Conditions Precedent to the Closing 13
3.4 Term; Termination 14
3.5 Effect of Termination; Remedies 14

ARTICLE 4 CLOSING 15

4.1 Place of Closing 15
4.2 Closing Deliveries 15

ARTICLE 5 REPRESENTATIONS AND WARRANTIES OF SELLER 16

5.1 Organization and Authority 16
5.2 Binding Agreement 16
5.3 No Adverse Order or Injunctions 16
5.4 Litigation 17
5.5 No Conflicts 17
5.6 Third-Party Consents 17
5.7 Project Assets 17
5.8 [Real Estate 18
5.9 Tax Matters 19
5.10 [Contracts.] 20
5.11 Legal Compliance 21
5.12 [Environmental Laws.] 21
5.13 [Permits 21
5.14 [Renewable Resource Data 21
5.15 Solvency 21
5.16 Brokers 22
5.17 Investment Company 22
5.18 [Intellectual Property 22

5.19 Material Misstatements or Omissions 22
5.20 [Project-Specific Representations 22

ARTICLE 6 REPRESENTATIONS AND WARRANTIES OF PGE 22

6.1 Organization and Authority 23
6.2 Binding Agreement 23
6.3 No Adverse Order or Injunctions 23
6.4 No Conflicts 23
6.5 Third-Party Consents 23
6.6 Brokers 24

ARTICLE 7 CONFIDENTIAL INFORMATION 24

7.1 PGE Confidential Information 24
7.2 Seller Confidential Information 25

ARTICLE 8 [COVENANTS OF PGE AND SELLER] 26

8.1 [Conduct Pending the Closing 26
8.2 [Exclusivity 27
8.3 [Site and Project Access 28
8.4 [Due Diligence 28
8.5 [Notice of Developments 28

ARTICLE 9 INDEMNIFICATION 28

9.1 Survival 28
9.2 Applicable Survival Period 28
9.3 Indemnification by Seller 29
9.4 Indemnification by PGE 30
9.5 Claims for Indemnification 30
9.6 Defense 31
9.7 Limitations on Liability 32

ARTICLE 10 TAX MATTERS 32

10.1 Allocation of Purchase Price 32
10.2 Sales, Transfer and Documentary Taxes 33
10.3 Treatment of Indemnity Payments 33

ARTICLE 11 MISCELLANEOUS 33

11.1 Successors and Assigns 33
11.2 Entire Agreement; Amendments; Attachments 33
11.3 Severability 33
11.4 Dispute Resolution Process; Consent to Jurisdiction 34
11.5 Consequential Damages 35
11.6 Governing Law 36
11.7 Section Headings 36
11.8 Counterparts 36

11.9 No Third-Party Beneficiaries 36
11.10 Waiver 36
11.11 Costs 36
11.12 Relationship of Parties 37
ARTICLE 12 NOTICES 37

Exhibits[2]

[Exhibit A	Form of Bill of Sale]
[Exhibit B	Form of Assignment and Assumption Agreement]
[Exhibit C	Form of Assignment of Real Property Interests]
[Exhibit D	Form of Contract Estoppel Letter]

Schedules

Schedule 2.1	Assumed Liabilities
Schedule 5.6	Seller Third-Party Consents; Seller Required Regulatory Approvals
Schedule 5.7	Project Assets
Schedule 5.8	Real Property Interests
Schedule 5.10	Contracts
Schedule 5.13	Permits
Schedule 5.14	Renewable Resource Data
Schedule 6.5	PGE Third-Party Consents; PGE Required Regulatory Approvals
Schedule 8.1.6	Project Development

[2] NTD: The type of project assets being conveyed to PGE will dictate the appropriate forms of these exhibits.

ASSET PURCHASE AGREEMENT

This **ASSET PURCHASE AGREEMENT** (together with all exhibits and schedules appended hereto, this "***Agreement***"), dated as of [DATE] (the "***Effective Date***"), is made by and between [COUNTERPARTY], [STATE] [ENTITY TYPE] ("***Seller***"), and Portland General Electric Company, an Oregon corporation ("***PGE***"). PGE and Seller each may be referred to herein as a "***Party***", and collectively as the "***Parties***".

RECITALS

WHEREAS, Seller owns [and operates] the Project and owns all right, title and interest in and to the Project Assets.

WHEREAS, in accordance with the terms and conditions set forth in this Agreement, Seller desires to sell and transfer to PGE, and PGE desires to purchase from Seller, the Project and the Project Assets.

NOW, THEREFORE, in consideration of the mutual promises and covenants contained in this Agreement, the adequacy and sufficiency of which are hereby acknowledged, the Parties agree as follows:

AGREEMENT

ARTICLE 1
DEFINITIONS AND CONSTRUCTION

1.1 Specific Definitions. As used in this Agreement, the following terms shall have the meanings ascribed to them below:

"***AAA***" shall mean the American Arbitration Association.

"***AAA Procedures***" shall have the meaning given to it in Section 11.4.2.

"***Account***" shall have the meaning given to it in Section 2.3.2.

"***Affiliate***" of a specified Person shall mean any other Person that directly, or indirectly through one or more intermediaries, controls, is controlled by or is under common control with the Person specified. For purposes of the immediately preceding sentence, "control" shall mean the ability to control or affect the day-to-day management and control of the Person or a fifty percent (50%) or greater beneficial ownership interest in the partnership interests, membership interests or voting stock of the Person. For purposes of this Agreement, any Person owning an interest in Seller shall be considered an "Affiliate" of Seller.

"***Affiliate Contracts***" shall have the meaning given to it in Section 5.10.1.

"***Agreement***" shall have the meaning given to it in the Preamble.

"***Allocation***" shall have the meaning given to it in Section 10.1.

"***Applicable Law***" shall mean all laws, treaties, ordinances, judgments, decrees, injunctions, writs, orders, rules, regulations and interpretations of any Governmental Authority having jurisdiction over (a) any Party, (b) the Project Assets or (c) the Project.

"***Applicable Survival Period***" shall have the meaning given to it in Section 9.2.

"***ARRA***" shall mean the American Recovery and Reinvestment Act of 2009, Public Law 111-5.

"***Assumed Liabilities***" shall mean those Liabilities and obligations of Seller set forth on Schedule 2.1, which shall be assumed by PGE.

"***Business Day***" shall mean a day on which national banks are not required or authorized by law or executive order to close in Portland, Oregon.

"***Claim***" shall have the meaning given to it in Section 9.5.

"***Claim Notice***" shall have the meaning given to it in Section 9.5.

"***Closing***" shall have the meaning given to it in Section 4.1.

"***Closing Date***" shall have the meaning given to it in Section 4.1.

"***Code***" shall mean the Internal Revenue Code of 1986, as amended.

"***Contracts***" shall have the meaning given to it in Section 5.10.1.

"***Debt***" of any Person at any date means, without duplication, (a) all obligations of such Person for borrowed money, (b) all obligations of such Person evidenced by bonds, debentures, notes or other similar instruments, (c) all obligations of such Person to pay the deferred purchase price of property or services, (d) all monetary liabilities of such Person under contracts, (e) all obligations of such Person to purchase securities (or other property) which arise out of or in connection with the sale of the same or substantially similar securities (or property), (f) all obligations of such Person to reimburse any bank or other Person in respect of amounts paid or advanced under a letter of credit or other instrument, (g) all obligations of others secured by a Lien on any asset of such Person, whether or not such obligation is assumed by such Person, and (h) all obligations of others guaranteed directly or indirectly by such Person or as to which such Person has an obligation substantially the economic equivalent of a guaranty.

"***Dispute***" shall have the meaning given to it in Section 11.4.1.

"***Effective Date***" shall have the meaning given to it in the Preamble.

"***Environmental Attributes***" means any and all credits, benefits, emissions reductions, offsets and allowances of any kind, howsoever entitled, attributable to an electric generating facility or the electric energy, capacity or other generator-based products produced therefrom, including (a) any avoided emissions of pollutants to the air, soil or water, such as sulfur oxides, nitrogen oxides and carbon monoxide, and any rights related thereto, (b) any avoided emissions of methane, carbon dioxide and other "greenhouse gases" that have been determined by the United Nations Intergovernmental Panel on Climate Change or any other governmental, quasi-governmental or non-governmental agency or body to contribute to the actual or potential threat of altering the Earth's climate by trapping heat in the atmosphere, and (c) any reporting rights relating to the reduction of "greenhouse gases" under Section 1605(b) of the National Energy Policy Act of 1992 or under any other federal, state, local or foreign law, rule or regulation related to the reduction of air pollutants or "greenhouse gases" or the trading of emissions or emissions credits, including so-called "green tags" or "green certificates."

"***Environmental Laws***" shall mean all laws that regulate or relate to (a) the protection or clean-up of the environment, (b) the handling of Hazardous Substances, (c) the preservation or protection of waterways, groundwater, drinking water, air, wildlife, plants or other natural resources, and (d) the health and safety of persons or property as it pertains to the environment, including, without limitation, protection of the health and safety of employees. Environmental Laws shall include, without limitation, the Resource Conservation & Recovery Act, Clean Water Act, Safe Drinking Water Act, Occupational Safety and Health Act, Toxic Substances Control Act, Clean Air Act, Comprehensive Environmental Response, Compensation and Liability Act, Emergency Planning and Community Right-to-Know Act, Hazardous Materials Transportation Act and Centers for Disease Control guidelines, policies and procedures, and all analogous or related laws.

"***Federal Funds Effective Rate***" shall mean, for any day, the weighted average (rounded upwards, if necessary, to the next 1/100 of 1%) of the rates on overnight federal funds transactions with members of the Federal Reserve System arranged by federal fund brokers, as published on the next succeeding Business Day by the Federal Reserve Bank of New York, or, if such rate is not published for any day that is a Business Day, the weighted average (rounded upwards if necessary, to the next 1/100 of 1%) of the rates on overnight federal funds transactions with the members of the Federal Reserve System arranged by federal fund brokers, as published on the next succeeding Business Day by the Federal Reserve of New York.

"***Final Order***" shall mean, with respect to a Seller Required Regulatory Approval or PGE Required Regulatory Approval, as the case may be, that such Seller Required Regulatory Approval or PGE Required Regulatory Approval has not been reversed, stayed, set aside, annulled or suspended, with respect to which any waiting period prescribed by Applicable Laws

before the transactions contemplated hereby may be consummated has expired (but without the requirement for expiration of any applicable rehearing period), and as to which all conditions to the consummation of such transactions prescribed by Applicable Laws have been satisfied.

"***Governmental Authority***" shall mean any federal, state, local or other governmental, judicial, public or statutory instrumentality, tribunal, agency, authority, body or entity, or any political subdivision thereof, having legal jurisdiction over the matter or person in question.

"***Hazardous Material***" shall mean (a) any petroleum or petroleum products, flammable explosives, radioactive materials, asbestos in any form that is or could become friable, lead containing paints or coatings, urea formaldehyde foam insulation and transformers or other equipment that contain dielectric fluid containing levels of polychlorinated biphenyls, (b) any chemicals or other materials or substances which are defined as or included in the definition of "hazardous substances," "hazardous wastes," "hazardous materials," "extremely hazardous wastes," "restricted hazardous wastes," "toxic substances," "toxic pollutants" or words of similar import under any Environmental Law, and (c) any other chemical or other material or substance, exposure to which is prohibited, limited or regulated by any Governmental Authority under any Environmental Law.

"***Indemnified Party***" shall have the meaning given to it in Section 9.5.

"***Indemnifying Party***" shall have the meaning given to it in Section 9.5.

"***Instruments of Conveyance***" shall have the meaning given to it in Section 2.2.

"***Liabilities***" shall mean, with respect to any Person, any and all Debts, liabilities, payables, obligations, commitments, losses, damages, expenses, claims, deficiencies, guarantees or endorsements, of any kind whatsoever, in each case requiring a payment (including a potential payment of damages for non-performance), including those of a contingent or deferred nature.

"***Lien***" shall mean mortgages, deeds of trust, liens, pledges, charges, security interests, assessments, reservations, hypothecations, restrictive covenants, easements or encumbrances.

"***Losses***" shall have the meaning given to it in Section 9.3.1.

"***Material Adverse Effect***" shall mean any event, occurrence, change or effect that, individually or in the aggregate, (a) with respect to Seller, could reasonably be expected to have a material adverse effect on the ability of Seller to consummate the transactions contemplated by this Agreement and to satisfy its obligations contemplated by this Agreement, and (b) with respect to the Project or the Project Assets, could reasonably be expected to have a material adverse effect on the interconnection, ownership, operation or maintenance of the Project, or on the fair market value of the Project Assets; *provided*, *however*, that a "Material Adverse Effect" shall not include any adverse change, effect or circumstance directly or indirectly resulting from

or arising out of (i) actions taken or omissions made by a Party at the request or with the consent of the other Party, or the failure to take any action prohibited by this Agreement, (ii) changes in the renewable power development industry or in renewable energy markets generally or (iii) changes in economic conditions or financial markets in any country or region or globally, including changes in interest or exchange rates and changes in currency and credit markets.

"***OPUC***" shall mean the Public Utility Commission of Oregon.

"***Ordinary Course of Business***" means the ordinary course of business consistent in material respects with past practices and Prudent Utility Standards.

"***Party***" or "***Parties***" shall have the meaning given to it in the Preamble.

"***Permits***" shall mean permits, licenses, approvals, consents, orders, registrations, privileges, franchises, memberships, certificates, entitlements variances, waivers, certificates of occupancy and other authorizations issued by any Governmental Authorities, and any siting, zoning and land use approvals required under Applicable Laws in connection with the development, construction, operation, use and/or maintenance of the Project, and all amendments, modifications, supplements, general conditions and addenda thereto.

"***Permitted Liens***" shall mean all of the following: (a) liens for property Taxes and installments of assessments and charges of Governmental Authorities not yet due and payable as of the Closing Date; (b) liens created by the act or omission of PGE; (c) any other encumbrances created or permitted with the prior written consent of PGE; and (d) any encumbrances that will not have an adverse effect on the construction, ownership, operation or performance of the Project and/or Project Assets.

"***Person***" shall mean any natural person, corporation, limited liability company, partnership, firm, association, Governmental Authority or any other entity whether acting in an individual, fiduciary or other capacity.

"***PGE***" shall have the meaning given to it in the Preamble.

"***PGE Conditions Precedent***" shall have the meaning given to it in Section 3.2.

"***PGE Confidential Information***" shall have the meaning given to it in Section 7.1.

"***PGE Indemnified Party***" shall have the meaning given to it in Section 9.3.1.

"***PGE Indemnity Cap***" shall have the meaning given to it in Section 9.7.2.

"***PGE Required Regulatory Approvals***" shall mean those items listed on Part II of Schedule 6.5.

"***Placed in Service***" means placed in service for purposes of (a) Section 1603 of ARRA and any guidance issues by Treasury in relation thereto, (b) Sections 48(b)(2) and (3) of the Code (as in effect on the day before the date of the enactment of the Revenue Reconciliation Act of 1990) and (c) Section 168 of the Code.

"***Post-Closing Assets***" shall mean all assets and rights of any kind, whether tangible or intangible, real or personal, including land and properties (or interests therein, including rights of way, leaseholds and easements), buildings, equipment, machinery, improvements, fixtures, agreements, contracts, renewable resource data, reports and studies (including those related to interconnection, environmental, cultural, resource and market matters), Permits, intellectual property, inventory, books and records, proprietary rights, return and other rights under or pursuant to all warranties, representations and guarantees, cash, accounts receivable, deposits and prepaid expenses acquired by PGE after the Closing Date in connection with or associated with the Project.

"***Project***" shall mean that certain [[____] MW [solar] [wind] [hydroelectric] [OTHER TECHNOLOGY][3] energy generating project [under development] [located in _____]].

"***Project Assets***" shall mean the assets, other than Retained Contracts, set forth on Schedule 5.7, which shall include all assets and rights of any kind, related to the ownership, operation or maintenance of the Project and owned by Seller, whether tangible or intangible, real or personal, including land and properties (or interests therein including rights of way, leaseholds and easements), buildings, equipment, machinery and associated equipment, improvements, fixtures, agreements, contracts, renewable resource data, reports and studies (including those related to interconnection, environmental, cultural, resource and market matters), the ownership of Environmental Attributes created on or after the Closing Date, Permits, software and intellectual property, inventory, books and records, proprietary rights, return and other rights under or pursuant to all warranties, representations and guarantees, cash, accounts receivable, deposits and prepaid expenses.

"***Prudent Utility Standards***" shall mean those practices, methods, equipment, specifications and standards of care, skill, safety and diligence and acts as the same may change from time to time, but applied in light of the facts known at the time, as are generally applied or utilized under comparable circumstances by experienced and prudent professionals in respect of the interconnection, transmission, ownership, operation or maintenance of renewable resource generating facilities of comparable type and complexity to the Project and which would have been expected to accomplish the desired result in a manner consistent with Applicable Law, safety, environmental protection, economy and expedition. Prudent Utility Standards are not

[3] NTD: Bidder to include appropriate technology descriptor.

necessarily defined as the optimal standard practice method or act to the exclusion of others, but rather, refer to a range of actions reasonable under the circumstances.

"***Purchase Price***" shall have the meaning given to it in Section 2.3.

["***Real Property Agreements***" shall mean the agreements set forth on Schedule 5.8 evidencing the Real Property Interests.]

["***Real Property Interests***" shall mean, collectively, [_____].]

"***Renewable Resource Data***" means any and all renewable resource data measured by Seller at the Site and collected by the meteorological towers on the Site through the Closing Date and which are included as part of the Project Assets.

"***Representatives***" shall mean, with respect to a Person, such Person's directors, partners, officers, managers, employees, members, agents and representatives, including attorneys, accountants, consultants, potential lenders, lenders, potential investors, investors and financial advisors.

"***Retained Contracts***" shall have the meaning given to it in Section 5.10.5.

"***Retained Liabilities***" shall mean those obligations and Liabilities of Seller arising under [_____], which shall be retained by Seller.

"***RFP***" shall mean that certain request for proposals for renewable energy resources issued by PGE in May 2016 and conducted in accordance with the OPUC Competitive Bidding Guidelines set forth in OPUC Order 14-149 (Docket UM-1182), dated April 30, 2014.

"***Seller***" shall have the meaning given to it in the Preamble.

"***Seller Conditions Precedent***" shall have the meaning given to it in Section 3.3.

"***Seller Confidential Information***" shall have the meaning given to it in Section 7.2.1.

"***Seller Contracts***" shall have the meaning given to it in Section 5.10.1.

"***Seller's Exclusivity Obligations***" shall have the meaning given to it in Section 8.2.

"***Seller Indemnified Party***" shall have the meaning given to it in Section 9.4.1.

"***Seller Indemnity Cap***" shall have the meaning given to it in Section 9.7.1.

"***Seller Required Regulatory Approvals***" shall mean those items listed on Part II of Schedule 5.6.

"***Site***" shall mean [_____]4.

"***Tax***" or "***Taxes***" shall mean any federal, state, local or foreign income, gross receipts, license, payroll, employment, excise, severance, stamp, occupation, premium, windfall profits, environmental, customs duties, capital stock, franchise, profits, withholding, social security, unemployment, disability, real property, personal property, sales, use, transfer, registration, value added, alternative, minimum, estimated or similar tax, levy or assessment and any related interest or penalty.

"***Tax Return***" shall mean any return, report, statement, claim for refund, information return or other document (including any amendments thereto and any related or supporting information) filed or required to be filed with any Governmental Authority in connection with the determination, assessment, collection or administration of Taxes or the administration of any Applicable Law relating to Taxes.

"***Third-Party Claim***" shall have the meaning given to it in Section 9.6.

"***Treasury***" shall mean the United States Department of Treasury, including any successor agency.

"***Treasury Regulations***" shall mean the Treasury regulations promulgated under the Code, including any successor regulations.

1.2 Construction. Headings and the rendering of text in bold and italics are for convenience and reference purposes only and do not affect the meaning or interpretation of this Agreement.

1.2.1 A reference to an Exhibit, Schedule, Article, Section or other provision shall be, unless otherwise specified, to exhibits, schedules, articles, sections or other provisions of this Agreement, which exhibits and schedules are incorporated herein by reference.

1.2.2 Any reference in this Agreement to another agreement or document shall be construed as a reference to that other agreement or document as the same may have been, or may from time to time be, varied, amended, supplemented, substituted, novated, assigned or otherwise transferred.

1.2.3 Any reference in this Agreement to "this Agreement," "herein," "hereof" or "hereunder" shall be deemed to be a reference to this Agreement as a whole and not limited to the particular Article, Section, Exhibit, Schedule or provision in which the relevant reference

---

[4] NTD: Bidder to provide description of project site.

appears and to this Agreement as varied, amended, supplemented, substituted, novated, assigned or otherwise transferred from time to time.

1.2.4 References to any Party shall, where applicable, include any successors, transferees and permitted assigns of the Party.

1.2.5 References to the term "includes" or "including" shall mean "includes, without limitation" or "including, without limitation."

1.2.6 Words importing the singular include the plural and vice versa and the masculine, feminine and neuter genders include all genders.

1.2.7 If the time for performing an obligation under this Agreement occurs or expires on a day that is not a Business Day, the time for performance of such obligation shall be extended until the next succeeding Business Day.

1.2.8 References to any statute, code or statutory provision are to be construed as a reference to the same as it may have been, or may from time to time be, amended, modified or reenacted, and include references to all bylaws, instruments, orders and regulations for the time being made thereunder or deriving validity therefrom unless the context otherwise requires.

1.2.9 References to any amount of money shall mean a reference to the amount in United States Dollars.

ARTICLE 2
PURCHASE AND SALE OF ASSETS; PURCHASE PRICE AND PAYMENT

2.1 Purchase and Sale. Subject to and upon the terms and conditions of this Agreement, including (a) the satisfaction or written waiver by PGE of the PGE Conditions Precedent, and (b) the satisfaction or written waiver by Seller of the Seller Conditions Precedent, on the Closing Date, Seller shall sell, assign, transfer, convey and deliver to PGE, and PGE shall purchase, acquire and accept from Seller, all of the Project Assets, free and clear of any and all Liens other than Permitted Liens. Upon the consummation of the purchase by PGE of the Project Assets, PGE agrees to assume and become responsible for, and shall pay, discharge or perform when due, all of the Assumed Liabilities as of and after the Closing Date. PGE and its Affiliates shall not assume or incur any Liability in respect of, and Seller shall remain bound by and be liable for, and shall pay, discharge or perform when due, the Retained Liabilities.

2.2 Instruments of Conveyance. The sale, conveyance, assignment, transfer and delivery of the Project Assets will be effected by the execution and delivery by Seller and PGE of (a) the Bill of Sale, substantially in the form of Exhibit A, (b) the Assignment and Assumption Agreement substantially in the form set forth in Exhibit B, [(c) assignments of the Real Property Interests in recordable form, substantially in the form set forth in Exhibit C,] and (d) such other

agreements or documents requested by PGE, with the items described in clauses (a) through (d) of this Section 2.2 collectively referred to herein as the "***Instruments of Conveyance***."

2.3 Payments. As consideration for the sale, transfer, assignment, conveyance and delivery by Seller to PGE of the Project Assets, PGE will pay to Seller the "***Purchase Price***" in an amount equal to [_____] as further described and on the terms and conditions contained in this Agreement.

2.3.1 [Payment Terms.] [5] [_____].

2.3.2 Wiring Instructions. PGE shall pay the Purchase Price, to the extent due pursuant to the terms of this Agreement, to Seller by depositing the applicable amount for Seller's account into the account listed below (the "***Account***") by the date due (as provided in this Article 2) in accordance with the following transfer instructions, or such other instructions as Seller may provide to PGE in writing:

TO: [_____]

Account No.: [_____]

ABA Routing No.: [_____]

Bank Name: [_____]

Branch Address: [_____]

Contact: [_____]

2.4 Late Payments. Unless otherwise specified herein, the amount of any payment due by either PGE or Seller pursuant to the terms of this Agreement that is not paid when due hereunder shall bear interest at an annual rate equal to the lower of the Federal Funds Effective Rate plus two percent (2%) or the maximum rate allowed by Applicable Law, from the date such payment was required to have been made through and including the date such payment is actually received by the Party to whom such payment is due.

2.5 Further Assurances; Cooperation. At any time, and from time to time after the Closing Date, at either Party's reasonable request, the other Party shall promptly execute, acknowledge and deliver all such further acts, assurances and instruments of sale, transfer, conveyance, assignment and confirmation, as are reasonably required, and take all such other action as the requesting Party may reasonably request, in connection with the performance of such Party's obligations under this Agreement. From and after the Effective Date until the

[5] NTD: Bidder to propose additional payment terms, as applicable.

Closing Date, each Party shall reasonably cooperate with the other Party in connection with the performance of such Party's obligations under this Agreement.

ARTICLE 3
CONDITIONS PRECEDENT

3.1 Conditions Generally. For purposes of this Agreement, there shall be conditions which must be satisfied or waived prior to the Closing. PGE's obligation to cause the Closing to occur is subject to the satisfaction, or waiver in writing by PGE, of each of the PGE Conditions Precedent, and Seller's obligation to cause the Closing to occur is subject to the satisfaction or waiver in writing by Seller, of each of the Seller Conditions Precedent, in each case within the applicable time periods herein. Seller and PGE expressly acknowledge and agree that each of the (a) PGE Conditions Precedent are for the sole benefit of and may only be waived by PGE in writing, and (b) Seller Conditions Precedent are for the sole benefit of and may only be waived by Seller in writing.

3.2 PGE Conditions Precedent to the Closing. PGE shall not be obligated to effect the Closing hereunder if the following conditions precedent (the "***PGE Conditions Precedent***") are not satisfied (or waived in writing by PGE) on or prior to the Closing Date:

3.2.1 [Project Specific Conditions. _____][6].

3.2.2 Third-Party Consents. All authorizations, approvals and consents of all Persons, including Governmental Authorities, that are required in connection with the execution, delivery, and performance of this Agreement by each of PGE and Seller shall have been received.

3.2.3 Certificates. PGE shall have received a certificate, dated as of the Closing Date, in form and substance reasonably satisfactory to PGE, of a duly authorized officer of Seller certifying that attached thereto are the following: (a) the incumbency of Seller's officers executing this Agreement and any other agreement delivered on the Closing Date and any certificate delivered in connection with the Closing; (b) true, accurate and complete copies of the certificates issued by the Secretary of State of the State of [_____] within ten (10) days of the Closing Date certifying that Seller is duly [organized] [incorporated] [formed] and validly existing under the laws of the State of [_____] and is current in payment of Taxes in such state; (c) true, accurate and complete resolutions of Seller duly authorizing the execution, delivery and performance of this Agreement and all other related agreements and transactions contemplated hereby and thereby, and that such resolutions are in full force and effect as of the

[6] NTD: PGE reserves the right to require additional conditions precedent to be met prior to the Closing, based on the nature and state of development of Bidder's project. Such conditions may include, but are not limited to, delivery of a title insurance policy, survey, Permits and environmental reports.

Closing Date; (d) the certificate of formation of Seller, as certified by the Secretary of State of the State of [_____]; and (e) the [operating agreement] [by-laws] of Seller (as amended through the Closing Date).

3.2.4 Representations and Warranties. Each of the representations and warranties of Seller in this Agreement shall be true and correct on and as of the Closing Date as though such representations and warranties were made on and as of the Closing Date (except to the extent such representations and warranties are made as of a particular date, in which case such representations and warranties shall be true and correct as of such date).

3.2.5 UCC Search Report. PGE shall have received Uniform Commercial Code search reports from the relevant jurisdictions covering the Seller with respect to the Project Assets, the results of which shall be satisfactory to PGE in its sole discretion.

3.2.6 Performance. Seller shall have performed, in all material respects, each and all of the covenants and obligations required to be performed by it prior to the Closing Date, on or prior to the Closing Date.

3.2.7 Litigation. No action or proceeding by or before any court or other Governmental Authority shall have been instituted or threatened by any Governmental Authority or Person whatsoever that (a) could reasonably be expected to impair, restrain, prohibit or invalidate the Closing, (b) could reasonably be expected to have a Material Adverse Effect on Seller, the Project or the Project Assets, (c) challenges any Permit in a way that could reasonably be expected to invalidate, impair or restrain, in a material way, such Permit, in PGE's reasonable discretion, or (d) could reasonably be expected to have a material adverse effect on PGE's ability to consummate the Closing.

3.2.8 No Material Adverse Effect. As of the Closing Date, no Material Adverse Effect shall have occurred with respect to Seller, the Project or the Project Assets.

3.2.9 Regulatory Approvals. The Seller Required Regulatory Approvals in Schedule 5.6 and the PGE Required Regulatory Approvals in Schedule 6.5 shall have been made or obtained and shall have become Final Orders.

3.2.10 FIRPTA Certificate. Seller shall have executed and delivered an affidavit, dated as of the Closing Date, stating, under penalty of perjury, Seller's United States taxpayer identification number and that Seller is not a foreign person, pursuant to Section 1445(b)(2) of the Code and Treasury Regulation 1.1445-2(b)(2)(iii)(B) (or any similar provision under other applicable Tax law).

3.2.11 Assignment of Project Contracts and Real Property Interests.[7] PGE shall have received an assignment of each Contract (as set forth on Schedule 5.10) and each Real Property Interest (as set forth on Schedule 5.8), executed by all parties thereto, all in form and substance reasonably acceptable to PGE, and an estoppel letter from each counterparty to each Contract executed and delivered no earlier than ten (10) days prior to the Closing Date substantially similar to the form set forth in Exhibit D.

3.2.12 Completion of Due Diligence. PGE shall have completed its due diligence review of the Project and the Project Assets to its satisfaction.

3.3 Seller Conditions Precedent to the Closing. Seller shall not be obligated to effect the Closing hereunder if the following conditions precedent (the "***Seller Conditions Precedent***") are not satisfied (or waived in writing by Seller) on or prior to the Closing Date:

3.3.1 Certificates. Seller shall have received a certificate, dated as of the Closing Date, in form and substance reasonably satisfactory to Seller, of a duly authorized officer of PGE certifying that attached thereto are the following: (a) the incumbency of PGE's officers executing this Agreement and any other agreement delivered on the Closing Date and any certificate delivered in connection with the Closing; (b) true, accurate and complete copies of the certificates issued by the Secretary of State of the State of Oregon within ten (10) days of the Closing Date certifying that PGE is duly organized and validly existing under the laws of the State of Oregon and is current in payment of Taxes in such state; (c) true, accurate and complete resolutions of PGE duly authorizing the execution, delivery and performance of this Agreement and all other related agreements and transactions contemplated hereby and thereby, and that such resolutions are in full force and effect as of the Closing Date; and (d) the certificate of formation of PGE, as certified by the Secretary of State of the State of Oregon.

3.3.2 Representations and Warranties. Each of the representations and warranties of PGE in this Agreement shall be true and correct on and as of the Closing Date as though such representations and warranties were made on and as of the Closing Date (except to the extent such representations and warranties are made as of a particular date, in which case such representations and warranties shall be true and correct as of such date).

3.3.3 Performance. PGE shall have performed, in all material respects, each and all of the covenants and obligations required to be performed by it prior to the Closing Date, on or prior to the Closing Date.

3.3.4 Litigation. No action or proceeding by or before any court or other Governmental Authority shall have been instituted that seeks to impair, restrain, prohibit or

[7] NTD: Any assignment of a Real Property Interest must be in recordable form and shall be recorded at Closing.

invalidate the Closing (other than an action or proceeding commenced by Seller or an Affiliate of Seller).

3.3.5 Regulatory Approvals. The Seller Required Regulatory Approvals and the PGE Required Regulatory Approvals shall have been made or obtained and shall have become Final Orders. The PGE Required Regulatory Approvals shall have been made or obtained at PGE's cost.

3.4 Term; Termination.

3.4.1 Term. This Agreement shall become effective on the Effective Date and, unless terminated earlier as provided in this Agreement, shall remain in full force and effect until the obligations of each of the Parties under the Agreement shall have been satisfied in full or waived in writing by the other Party, as applicable.

3.4.2 [Termination. This Agreement may be terminated prior to the Closing as follows:

(a) By the mutual written consent of the Parties;

(b) by PGE upon written notice to Seller of such termination, in the event the Closing has not occurred on or before [_____]; provided, that the failure to consummate the transactions contemplated by this Agreement did not result from the failure by PGE to fulfill in any material respect any undertaking or commitment provided for herein that is required to be fulfilled by it prior to the Closing; or

(c) by either Party, upon written notice to the other Party of such termination due to a breach of or default under this Agreement which breach or default continues for thirty (30) days after the non-breaching Party has delivered written notice of the default or breach to the breaching Party.][8]

3.5 Effect of Termination; Remedies.

3.5.1 In the event that this Agreement is validly terminated in accordance with Section 3.4, this Agreement shall forthwith have no further force and effect and, except as set forth in this Agreement to the contrary, there shall be no further liability or obligation on the part of PGE or Seller under this Agreement. No such termination shall serve (a) to release any Party from any liability with respect to any breach of its duties and obligations hereunder prior to such termination, or (b) to void or terminate the limitations on liability expressly set forth in this Agreement.

[8] NTD: This Section can be omitted for any transaction that contemplates a simultaneous signing and closing.

3.5.2 Notwithstanding the foregoing, Article 7 (Confidential Information) shall survive the termination of this Agreement for a period of two (2) years from the date on which such termination occurs.

ARTICLE 4
CLOSING

4.1 Place of Closing. Upon the terms and conditions set forth in this Agreement, the sale of the Project Assets (the "***Closing***") shall take place no later than the second Business Day after satisfaction or waiver of the conditions set forth in Article 3, unless this Agreement has been terminated prior to such date in accordance with the provisions of Section 3.4 (the actual time and date of the Closing being referred to herein as the "***Closing Date***"). The Closing shall take place at PGE's offices or at such other location as the Parties may agree, on the Closing Date.

4.2 Closing Deliveries. On the Closing Date, the following shall occur:

4.2.1 Payment of Purchase Price. PGE shall deliver to Seller the Purchase Price in accordance with Section 2.3.1.

4.2.2 Delivery of Certificates by Seller. On the Closing Date, Seller shall deliver to PGE a certificate, dated as of the Closing Date, in form and substance satisfactory to PGE, stating that (a) the conditions set forth in Section 3.3 have been satisfied or waived in writing by Seller, and (b) that all representations and warranties of Seller set forth in Article 5 are true and correct as of the Closing Date (except to the extent such representations and warranties are made as of a particular date in which case such representations and warranties shall be true and correct as of such date).

4.2.3 Delivery of Certificates by PGE. On the Closing Date, PGE shall deliver to Seller one or more certificates of PGE, in form and substance satisfactory to Seller, stating that (a) the conditions set forth in Section 3.2 have been satisfied or waived in writing by PGE, and (b) that all representations and warranties of PGE set forth in Article 6 are true and correct as of the Closing Date (except to the extent such representations and warranties are made as of a particular date in which case such representations and warranties shall be true and correct as of such date).

4.2.4 Other Items. All other items required to be delivered or received as a Seller Condition Precedent or as a PGE Condition Precedent shall have been delivered to, or received by, Seller or PGE, as applicable, unless waived. Without limiting the generality of the foregoing, unless already delivered or unless waived by the relevant Party, the following documents, instruments and certificates shall be delivered at Closing: (a) by each Party to the other Party, executed counterparts of the Instruments of Conveyance; (b) by PGE to Seller, all

documents, instruments and certificates required to be delivered by PGE to Seller pursuant to this Agreement; (c) by Seller to PGE, all documents, instruments and certificates required to be delivered by Seller to PGE pursuant to this Agreement; and (d) by Seller to PGE, all books, records[and operating logs] relating to the Project and the Project Assets, in the possession of, or subject to the control of, Seller.

ARTICLE 5
REPRESENTATIONS AND WARRANTIES OF SELLER

Seller represents and warrants to PGE that, as of the Effective Date [and as of the Closing Date][9], the following are true and correct:

5.1 Organization and Authority. Seller is a [_____] duly [organized] [formed], validly existing and is qualified to do business under the laws of the State of [_____], and has all requisite power and authority to own the Project Assets, to execute and deliver this Agreement, to consummate the transactions contemplated hereby and to carry on its business as now being conducted. Seller is duly qualified to do business and is in good standing in all other jurisdictions in which its ownership of property or the character of its business requires such qualification.

5.2 Binding Agreement. All necessary action on the part of Seller has been taken to authorize the execution and delivery of this Agreement, the performance of its obligations under this Agreement and the consummation of the transactions contemplated hereby. This Agreement has been, and the other documents and instruments required to be delivered by Seller in accordance with the provisions hereof at the Closing have been, or will be, duly and validly executed and delivered by Seller, and upon execution and delivery thereof by Seller, will constitute the valid and binding agreement and obligations of Seller, enforceable in accordance with their respective terms, except as the enforceability thereof may be limited by bankruptcy, insolvency, reorganization, moratorium and similar laws of general application relating to or affecting creditors' rights generally and to general principles of equity (regardless of whether such enforceability is considered in any proceeding in equity or at law), including the availability of injunctive relief.

5.3 No Adverse Order or Injunctions. Seller is not a party to, nor is Seller subject to or bound by, nor does there exist any agreement, or any judgment, order, writ, prohibition, injunction or decree of any Governmental Authority with respect to Seller, which would prevent the execution, delivery or performance of this Agreement by Seller, or the transfer, conveyance and sale of all of the Project Assets to PGE pursuant to the terms hereof.

[9] NTD: This item can be omitted for any transaction that contemplates a simultaneous signing and closing.

5.4 Litigation. There is no action, suit, investigation or proceeding pending in which Seller has been named or served as a party or threatened against Seller before any Governmental Authority.

5.5 No Conflicts. None of the execution, delivery nor performance by Seller of this Agreement nor the consummation of the transactions contemplated by this Agreement, nor the compliance by Seller with any of the provisions of this Agreement, will result in: (a) a violation of or a conflict with any provision of the formation documents of Seller or any law, judgment, order, writ, decree, determination, award or injunction applicable to Seller; (b) a breach or violation of, a conflict with or a default under, or the creation of a right of any Person to accelerate, terminate or cancel any Contract; (c) a violation by Seller of any Applicable Laws; or (d) a violation, or conflict with, or result in a breach of any provision of, or constitute a default (or any event which, with or without due notice or lapse of time, or both, would constitute a default) under, or result in the termination, cancellation, suspension, modification or acceleration of, or result in or give to any Person any additional rights or entitlement to increased, additional, accelerated or guaranteed payments under, or result in the impairment, loss or forfeiture of any material benefit, rights or privilege under, or the creation of any Lien or other encumbrance upon any of the assets of Seller under any contract, note, bond, mortgage, indenture, deed of trust, license, lease, agreement or other instrument or obligation to which Seller is a party.

5.6 Third-Party Consents. Part I of Schedule 5.6 sets forth a true, correct and complete list of all consents and approvals of all Persons, including Governmental Authorities, (other than any Permits) that are required in connection with the execution, delivery and performance of this Agreement by Seller or the consummation by Seller of the transactions contemplated by this Agreement. Part II of Schedule 5.6 sets forth a true, correct and complete list of all Seller Required Regulatory Approvals that are required in connection with the execution, delivery and performance of this Agreement by Seller or the consummation by Seller of the transactions contemplated by this Agreement.

5.7 Project Assets.

5.7.1 Seller holds of record and owns beneficially one hundred percent (100%) of the ownership interests of the Project Assets. Seller does not currently own any asset necessary for PGE to be able after the Closing to develop, construct, own, operate or maintain the Project in accordance with Prudent Utility Standards, except such assets that are (or by the Closing, will be) included in the Project Assets. Schedule 5.7 sets forth a true, accurate and complete list of the Project Assets owned by Seller, which constitute all of the assets and rights of any kind necessary for PGE to develop, construct, own, operate and maintain the Project.

5.7.2 [All of the Project Assets constituting physical assets, if any, including equipment, machinery, vehicles, structures, fixtures and other tangible property, have been

maintained in accordance with Prudent Utility Standards and are in good operating condition and repair, ordinary wear and tear excepted.]

5.7.3 Seller has good, valid and marketable title to all the Project Assets, which are free and clear of any and all Liens, other than Permitted Liens.

5.7.4 [There are no existing or continuing claims against Seller, the Project or the Project Assets by any prior developers of the Project (or partners of or investors in Seller (with respect to the Project Assets)).]

5.8 [Real Estate.

5.8.1 Schedule 5.8 sets forth a true, accurate and complete list of the Real Property Interests Seller holds with respect to the Project and that will be assigned to PGE at Closing.]

5.8.2 [Seller represents and warrants to PGE that the Real Property Agreements: (a) comprise all of the property interests and other rights necessary in connection with the ownership, operation and maintenance of the Project in accordance with Applicable Law and Permits; (b) with respect to the Real Property Agreements, Seller has delivered to PGE correct and complete copies of each of them; (c) provide legal and practical ingress and egress rights for any reasonable purpose in connection with the development, construction, ownership, operation and maintenance of the Project; (d) each of the Real Property Agreements constitute the legal, valid and binding obligations of Seller, and the counterparties thereto, and are in full force and effect except, in each case, as enforceability may be limited by applicable bankruptcy, insolvency, moratorium, reorganization or other similar laws affecting the enforcement of creditors' rights and subject to general equitable principles; (e) each of the Real Property Agreements will continue to be legal, valid, binding and in full force and effect on identical terms immediately following the consummation of the transactions contemplated hereby (including any assignments and assumptions referred to herein) except, in each case, as enforceability may be limited by applicable bankruptcy, insolvency, moratorium, reorganization or other similar laws affecting the enforcement of creditors' rights and subject to general equitable principles; (f) no party to any Real Property Agreements is in breach or default and, no event has occurred which, with notice or lapse of time or without a cure being completed, would constitute a breach or default or permit termination or modification thereof or acceleration thereunder; (g) no party to any Real Property Agreement has repudiated any provision thereof; (h) there are no disputes, oral agreements or representations or forbearance programs in effect as to any Real Property Agreements; (i) no Real Property Agreement has been assigned, transferred, conveyed, mortgaged, deeded in trust or encumbered by Seller; and (j) except as set forth in the Real Property Agreements, there are no rents, royalties, fees or other amounts payable or receivable by Seller or any Person in connection with any Real Property Interests.]

5.9 Tax Matters.[10] Seller represents and warrants with respect to itself:

5.9.1 All Tax Returns required to have been filed with respect to the Project and the Project Assets have been duly and timely filed and each such Tax Return was true, correct and complete in all material respects. All Taxes required to be paid (whether or not shown on any Tax Return) with respect to the Project and the Project Assets have been duly and timely paid. Seller has adequately provided for, in its books of account and related records, liability for all unpaid Taxes with respect to the Project and the Project Assets.

5.9.2 Solely with respect to the Project or any of the Project Assets: (a) there is no action, audit, dispute or claim now pending against, or any proposed or threatened action, audit, dispute or claim against, or with respect to, Seller in respect of any Taxes; (b) no Tax Return of Seller has been subject to examination or audit; (c) Seller has not received from any Governmental Authority any written (i) notice indicating an intent to open an audit or other review, (ii) request for information related to Tax matters, or (iii) notice of deficiency or proposed adjustment for any amount of Tax proposed, asserted or assessed by any taxing authority; and (d) no written claim has been made by a Governmental Authority in any jurisdiction where Seller does not file Tax Returns that Seller is or may be subject to taxation by such jurisdiction.

5.9.3 Neither the Project nor any of the Project Assets constitutes tax-exempt bond financed property or tax-exempt use property within the meaning of Section 168 of the Code. None of Seller or any of its Affiliates has applied for, claimed or received a Cash Grant, production tax credit pursuant to Code Section 45, or an investment tax credit pursuant to Code Section 48 with respect to any of the Project Assets. At least 80% of the Project Assets constitutes "new Section 38 property," as defined in Treasury Regulation Section 1.48-2. Neither the Project nor any Project Assets have been Placed in Service. Either: (a) the Project is a "qualified facility" that produces electricity using "qualified energy resources" within the meaning of Sections 45(d)(1) and 45(a)(2)(A)(i) or the Code, respectively; (b) the Project Assets are "energy property" within the meaning of Section 48(a)(3) of the Code; (c) the Project Assets are "qualified property" or a "qualified investment credit facility" within the meaning of Section 48(a)(5) of the Code; or (d) the Project Assets are "specified energy property," as that term is defined in Section 1603(d) of ARRA. In respect of any financial projections setting forth the amount of depreciation deductions available under Section 168 of the Code, any tax credits available pursuant to either Section 45 or Section 48 of the Code, or any grant available pursuant to Section 1603 of ARRA, in each case in respect of the Project or any Project Assets, (i) the facts and information used to create such financial projections are true, complete and correct and (ii) such financial projections are based on reasonable assumptions and, to the knowledge of Seller, fairly represent the expected performance of the Project and the Project Assets.

[10] NTD: Subject to additional review by KLG tax group.

5.9.4 Seller is not a "foreign person" as defined in Section 1445(f)(3) of the Code, and Seller will provide to PGE the certification described in Section 1445(b)(2) of the Code and Treasury Regulations Section 1.1445-2(b).

5.9.5 There are no Liens (other than Permitted Liens) for unpaid or delinquent Taxes, assessments or other charges or deposits upon the Project or the Project Assets.

5.10 [Contracts.]

5.10.1 [Part I of Schedule 5.10 sets forth a true, accurate and complete list of all written agreements and contracts entered into by Seller on or prior to the Effective Date for the benefit of the Project or otherwise related to the Project (the "***Seller Contracts***"). Part II of Schedule 5.10 sets forth a true, accurate and complete list of all written agreements and contracts entered into by Seller on or prior to the Effective Date for the benefit of the Project or otherwise related to the Project, which will be retained by Seller. Part III of Schedule 5.10 sets forth a true, accurate and complete list of all written agreements and contracts entered into by an Affiliate of Seller on or prior to the Effective Date for the benefit of the Project or otherwise related to the Project, which will be assigned to PGE on the Closing Date (the "***Affiliate Contracts***" and together with the Seller Contracts, the "***Contracts***"). Part IV of Schedule 5.10 sets forth a true, accurate and complete list of all written agreements and contracts entered into by an Affiliate of Seller on or prior to the Effective Date for the benefit of the Project or otherwise related to the Project, which will be retained by Seller.]

5.10.2 [Each Contract has been duly authorized, executed and delivered by Seller, is in full force and effect, and constitutes the legal, valid, binding and enforceable agreement as to Seller, the respective counterparties thereto, and will not be rendered invalid or unenforceable as a result of the transactions contemplated by this Agreement, except, in each case, as such enforceability may be limited by applicable bankruptcy, insolvency, moratorium, reorganization or other similar laws affecting the enforcement of creditors' rights and subject to general equitable principles.]

5.10.3 [Neither Seller (or its Affiliate with respect to the Affiliate Contracts), nor the counterparty thereto, is in material breach of or in default under any Contract, no event has occurred which with the passage of time or giving of notice or both would constitute such a default, result in a loss of material rights or permit termination or acceleration under, or result in the creation of any Lien (other than a Permitted Lien) under any Contract.]

5.10.4 [Neither Seller nor any of Seller's Affiliates, as the case may be, has sold or transferred, or agreed to sell or transfer, or granted any options or rights to purchase energy or Environmental Attributes related to the electric power to be generated by the Project for any period after the Closing.]

5.10.5 [Each of the Contracts listed on Parts II and IV of Schedule 5.10 (the "***Retained Contracts***") will not be assigned to PGE as part of the Project Assets. None of the Retained Contracts will provide any material ongoing benefit to the Project on or after the Closing Date.]

5.11 Legal Compliance. Seller is in compliance with all Applicable Laws (other than Environmental Laws, which are the subject of Section 5.12) with respect to the Project and the Project Assets.

5.12 [Environmental Laws.]

5.12.1 [Seller has conducted its activities with respect to the development of the Project and the Project Assets in compliance with all Environmental Laws, and no action, suit, proceeding, hearing, investigation or written charge, complaint, claim, demand or notice has been filed or commenced or threatened against Seller (with respect to the Project Assets), the Project or the Site alleging any failure to comply with or any violation of any applicable Environmental Law.]

5.12.2 [All environmental investigations, studies, audits, tests, reviews or other analyses conducted on behalf of, or that are in the possession of, Seller in relation to the Site, the Project Assets and the Real Property Interests have been delivered to PGE prior to the Effective Date of this Agreement and there are no other such items.]

5.13 [Permits. Schedule 5.13 sets forth a true, correct and complete list of all Permits that Seller is required to obtain, and has obtained, in order to develop, construct, operate, and maintain the Project.]

5.14 [Renewable Resource Data. Schedule 5.14 of this Agreement sets forth a true, correct and complete list of the Renewable Resource Data, which data does not contain any material errors. Seller has the right to use and to validly transfer to PGE the Renewable Resource Data.]

5.15 Solvency. Seller is solvent and has sufficient assets and capital to carry on its business as it is now conducted and to perform its obligations hereunder. No petition or notice has been presented, no order has been presented, no order has been made and no resolution has been passed for the bankruptcy, liquidation, winding-up or dissolution of Seller. No receiver, trustee, custodian or similar fiduciary has been appointed over the whole or any part of the Project Assets or the income of Seller, nor does Seller have any plan or intention of, or has received any notice that any other Person has any plan or intention of, filing, making or obtaining any such petition, notice, order or resolution or of seeking the appointment of a receiver, trustee, custodian or similar fiduciary. Seller is solvent and has sufficient assets and capital to carry on its businesses as they are now conducted and to perform its obligations hereunder.

5.16 Brokers. Seller does not have any contract, arrangement or understanding with any broker or other intermediary with respect to the transactions contemplated by this Agreement.

5.17 Investment Company. Seller is not an "investment company" or a company controlled by an "investment company" within the meaning of the Investment Company Act of 1940, as amended.

5.18 [Intellectual Property. Seller has the right to use and to transfer to PGE all patents, trademarks, copyrights or other intellectual property rights used in connection with the Project Assets, and which constitute all intellectual property necessary for the operation, maintenance or use of the Project. Seller has not infringed nor has been claimed to have infringed the patent, trademark, copyright or other intellectual property rights of any Person. No Person is infringing the patent, trademark or other intellectual property rights of Seller.]

5.19 Material Misstatements or Omissions. None of the representations or warranties (a) given by Seller in this Agreement (including the Schedules hereto) or any certificate delivered by Seller at Closing, (b) included in any document, exhibit, written communication, certificate or schedule heretofore prepared by Seller, an Affiliate of Seller or a Representative (commissioned by Seller or an Affiliate of Seller) and furnished by or on behalf of Seller in connection with the transactions contemplated by this Agreement (including any and all materials delivered to and written communication made to any Governmental Authority), or (c) included in any document, exhibit, written communication, certificate or schedule heretofore furnished by or on behalf of Seller in connection with the transactions contemplated by this Agreement, that was not prepared by Seller, an Affiliate of Seller or a Representative (commissioned by Seller or an Affiliate of Seller) (including any and all materials delivered to and written communication made to any Governmental Authority), when taken as a whole, contains any untrue statement of a material fact, or omits to state any material fact necessary to make the statements or facts contained in such representations or warranties, in light of the circumstances in which they were made, not materially misleading.

5.20 [Project-Specific Representations.][11]

ARTICLE 6
REPRESENTATIONS AND WARRANTIES OF PGE

PGE represents and warrants to Seller that, as of the Effective Date [and as of the Closing Date], the following are true and correct:

---

[11] NTD: PGE reserves the right to require the inclusion of additional representations and warranties based on the nature and state of development of Bidder's project. Such representations may include, but are not limited to, representations regarding permitting, regulatory status, insurance, affiliate transactions and studies and reports.

6.1 Organization and Authority. PGE is a corporation duly organized, validly existing and is qualified to do business under the laws of the State of Oregon, and has all requisite corporate power and authority to execute and deliver this Agreement and to perform its obligations hereunder. PGE is duly qualified to do business and is in good standing in all other jurisdictions in which its ownership of property or the character of its business requires such qualification, except where the failure to be so qualified would not reasonably be expected to have a material adverse effect with respect to PGE.

6.2 Binding Agreement. All necessary company action on the part of PGE has been taken to authorize the execution and delivery of this Agreement, the performance of its obligations under this Agreement and the consummation of the transactions contemplated hereby. This Agreement has been, and the other documents and instruments required to be delivered by PGE in accordance with the provisions hereof have been, or will be, duly and validly executed and delivered by PGE, and upon execution and delivery thereof by PGE, will constitute the valid and binding agreement and obligations of PGE, enforceable in accordance with their respective terms, except as the enforceability thereof may be limited by bankruptcy, insolvency, reorganization, moratorium and similar laws of general application relating to or affecting creditors' rights generally and to general principles of equity (regardless of whether such enforceability is considered in any proceeding in equity or at law), including the availability of injunctive relief.

6.3 No Adverse Order or Injunctions. PGE is not a party to, and to PGE's knowledge, is not subject to or bound by, any agreement, or any judgment, order or injunction of any Governmental Authority, which would prevent or have a material adverse effect on the execution, delivery or performance of this Agreement by PGE, or the purchase of the Project Assets by PGE pursuant to the terms hereof.

6.4 No Conflicts. Neither the execution, delivery nor performance by PGE of this Agreement will result in (a) a violation of or a conflict with any provision of the articles of incorporation, bylaws or other corporate documents of PGE, or (b) a violation by PGE of any Applicable Laws, except any such conflict, breach or violation, acceleration, termination or cancellation that would not have or be expected to have a material adverse effect on PGE.

6.5 Third-Party Consents. Part I of Schedule 6.5 sets forth a true, accurate and complete list of all consents and approvals of all Persons, including Governmental Authorities, that are required in connection with the execution, delivery and performance of this Agreement or the consummation by PGE of the transactions contemplated by this Agreement. Part II of Schedule 6.55.6 sets forth a true, correct and complete list of all PGE Required Regulatory Approvals that are required in connection with the execution, delivery and performance of this Agreement by Seller or the consummation by Seller of the transactions contemplated by this Agreement.

6.6 Brokers. Neither PGE nor its Affiliates has any contract, arrangement or understanding with any broker or other intermediary with respect to the transactions contemplated by this Agreement.

ARTICLE 7
CONFIDENTIAL INFORMATION

7.1 PGE Confidential Information.

7.1.1 Seller acknowledges that PGE Confidential Information (as defined below) is valuable and proprietary and Seller agrees not to, directly or indirectly, use, publish, disseminate, describe or otherwise disclose any PGE Confidential Information without the prior written consent of PGE. For purposes of this Agreement, "***PGE Confidential Information***" shall mean (i) any and all information provided by PGE to Seller and identified by PGE as confidential and (ii) any and all information provided by PGE to Seller with respect to the Project or the transactions contemplated hereby. Information shall not be deemed to be PGE Confidential Information if: (a) it has become generally known or available within the industry or the public through no act or omission of Seller; (b) Seller can demonstrate that, prior to disclosure in connection with the transactions contemplated hereby, such information was already in the possession of Seller; (c) it was rightfully received by Seller from a third party who became aware of it through no act or omission of Seller and who is not under an obligation of confidentiality to PGE; or (d) Seller can demonstrate it was independently developed by employees or consultants of Seller. Notwithstanding the foregoing, from and after the Closing, PGE Confidential Information shall include any information that is a Project Asset, whether or not of the type referred to in clauses (b), (c) or (d) above.

7.1.2 Seller shall maintain any PGE Confidential Information which has been or will be disclosed directly or indirectly to Seller by or on behalf of PGE or its Affiliates in confidence and shall not disclose or cause to be disclosed by them or any third person without PGE's prior express written consent; provided, however, that Seller may disclose the PGE Confidential Information to Persons who provide legal, accounting or other services to Seller in connection with Seller's evaluation or implementation of the transactions contemplated by this Agreement, provided that such persons have first been informed of the duties required hereby.

7.1.3 Notwithstanding the preceding Section 7.1.1 and Section 7.1.2, PGE Confidential Information may be disclosed if required by any Governmental Authority or court or otherwise by Applicable Law; provided, however, that: (a) such PGE Confidential Information is submitted under any and all applicable provisions for confidential treatment and (b) PGE is given written notice of the requirement for disclosure promptly after such disclosure is requested, so that it may take whatever action it deems appropriate, including intervention in any proceeding and seeking a protective order or an injunction, to prohibit such disclosure.

7.1.4 Seller agrees that it will not make any use of any PGE Confidential Information received pursuant to this Agreement except in connection with the transactions contemplated by this Agreement, unless specifically authorized to do so in writing by PGE, and this Agreement shall not be construed as a license or authorization to Seller to utilize the PGE Confidential Information except for such purpose.

7.1.5 Seller acknowledges that a breach of the covenants contained in this Section 7.1 will cause irreparable damage to PGE, the exact amount of which will be difficult to ascertain, and that the remedies at law for any such breach will be inadequate. Accordingly, Seller agrees that if Seller breaches any of the covenants contained in this Section 7.1, in addition to any other remedy that may be available at law or in equity, PGE shall be entitled to injunctive relief, without posting bond or other security and Seller shall have no right or power to raise the defense of adequate remedy at law.

7.2 Seller Confidential Information.

7.2.1 PGE acknowledges that Seller Confidential Information (as defined below) is valuable and proprietary to Seller and PGE agrees not to, directly or indirectly, use, publish, disseminate, describe or otherwise disclose any Seller Confidential Information in respect of the Project without the prior written consent of either Seller. For purposes of this Agreement, "***Seller Confidential Information***" shall mean (i) any and all information provided by Seller to PGE and identified by Seller as confidential and (ii) any and all information provided by Seller to PGE with respect to the Project or the transactions contemplated hereby. Information shall not be deemed to be Seller Confidential Information if: (a) the Closing has occurred and such information is also an a Project Asset and/or Post-Closing Asset under this Agreement; (b) it has become generally known or available within the industry or the public though no act or omission of PGE; (c) PGE can demonstrate that, prior to disclosure in connection with the transactions contemplated hereby, such information was already in the possession of PGE; (d) it was rightfully received by PGE from a third party who became aware of it through no act or omission of PGE and who is not under an obligation of confidentiality to Seller; or (e) PGE can demonstrate it was independently developed by employees or consultants of PGE.

7.2.2 PGE shall maintain any Seller Confidential Information which has been or will be disclosed directly or indirectly to PGE by or on behalf of Seller in confidence by it and shall not disclose or cause to be disclosed by PGE or any third person without Seller's prior express written consent; provided, however, that PGE may disclose Seller Confidential Information to its Representatives and to Persons who provide financial analysis, banking, legal, accounting or other services to PGE provided that such Persons have first been informed of the duties required hereby.

7.2.3 Notwithstanding the preceding Section 7.2.1 and Section 7.2.2, Seller Confidential Information may be disclosed (a) if required by any Governmental Authority or court or otherwise by Applicable Law and (b) to the OPUC and/or the independent evaluator retained by PGE and approved by the OPUC in connection with the RFP; provided, however, that (i) such Seller Confidential Information is submitted under any and all applicable provisions for confidential treatment and (ii) if PGE is permitted to do so, Seller is given written notice of the requirement for disclosure promptly after such disclosure is requested, so that it may take whatever action it deems appropriate, including intervention in any proceeding and seeking a protective order or an injunction, to prohibit such disclosure.

7.2.4 PGE agrees that it will not make any use of any Seller Confidential Information received pursuant to this Agreement except in connection with the transactions contemplated by this Agreement, unless specifically authorized to do so in writing by Seller, and this Agreement shall not be construed as a license or authorization to PGE to utilize Seller Confidential Information except for such purpose.

7.2.5 PGE acknowledges that a breach of the covenants contained in this Section 7.2 will cause irreparable damage to Seller and Seller's Affiliates, the exact amount of which will be difficult to ascertain, and that the remedies at law for any such breach will be inadequate. Accordingly, PGE agrees that if PGE breaches any of the covenants contained in this Section 7.2, in addition to any other remedy that may be available at law or in equity, Seller and its Affiliates shall be entitled to injunctive relief, without posting bond or other security, and PGE shall have no right or power to raise the defense of adequate remedy at law.

ARTICLE 8
[COVENANTS OF PGE AND SELLER][12]

8.1 [Conduct Pending the Closing.] Between the Effective Date and the earlier to occur of the termination of this Agreement and the Closing Date, Seller shall:

8.1.1 [continue to operate the Project and conduct its business in the Ordinary Course of Business;]

8.1.2 [maintain and keep the Project and the Project Assets in a state of repair and condition as good as at the Effective Date, ordinary wear and tear excepted, and in accordance with the Ordinary Course of Business;]

8.1.3 [maintain relationships with landowners and suppliers in accordance with the Ordinary Course of Business;]

[12] NTD: This Article 8 can be omitted for any transaction that contemplates a simultaneous signing and closing.

8.1.4 [maintain the Permits and comply with Applicable Law affecting the Project or the Project Assets;]

8.1.5 [perform and comply in all material respects with [the Contracts, the Real Property Agreements and the Permits] and Seller shall not, without PGE's consent, (a) amend or modify, or consent to the amendment or modification of, any of the [Contracts, the Real Property Agreements and the Permits] which amendments, modifications or consents would remain in effect for any period after Closing, or (b) enter into any new or additional contracts, real property agreements or permits relating to the Project that would remain in effect for any period after the Closing;]

8.1.6 [continue development of the Project as provided on Schedule 8.1.6;]

8.1.7 [not, without PGE's prior written consent, (a) sell, transfer or otherwise dispose of, or agree to sell, transfer or otherwise dispose of, any of the Project Assets, or (b) lease, mortgage or pledge any of the Project Assets and which such lease, mortgage or pledge would remain in effect for any period after the Closing;]

8.1.8 [not place or cause to be Placed in Service the Project or any of the Project Assets, in each case for purposes of Section 45 or Section 48 of the Code or Section 1603 of ARRA;

8.1.9 [not claim or permit any Person to claim any tax credit pursuant to Section 45 or Section 48 of the Code or any grant pursuant to Section 1603 of ARRA with respect to the Project or any Project Asset;]

8.1.10 [not cause or permit the Project or any Project Assets to become tax-exempt bond financed property or tax-exempt use property within the meaning of Section 168 of the Code;]

8.1.11 [not make any election or take any action that would limit, prevent or preclude the Project or any of the Project Assets from being classified in the hands of PGE as: (a) "qualified energy resources" and "qualified facilities" within the meaning of Sections 45(a)(2)(A)(i) and 45(d)(1) of the Code; (b) "energy property" in the hands of PGE within the meaning of Section 48(a)(3) of the Code; (c) "qualified property" or a "qualified investment credit facility" within the meaning of Section 48(a)(5) of the Code; or (d) "specified energy property" within the meaning of Section 1603(d) of ARRA;]

8.1.12 [maintain all books and records of Seller relating to the Project Assets in the Ordinary Course of Business.]

8.2 [Exclusivity. From and after the Effective Date, Seller agrees that it shall not (and shall not permit or cause any of its Affiliates to) solicit, initiate, encourage, entertain, make

or accept offers with respect to the sale of the Project or the Project Assets (the "***Seller's Exclusivity Obligations***").]

8.3 [Site and Project Access. From and after the Effective Date, Seller shall allow, permit or obtain the right of PGE to reasonable access to the Site and the Project (all in accordance with the limitations imposed by the Real Property Agreements and other Project safety rules and regulations and security limitations imposed by Seller or the relevant landowners), upon reasonable prior notice, in order to perform its due diligence review, including physical inspection and analysis of the Project Assets.]

8.4 [Due Diligence. From and after the Effective Date, Seller shall allow, permit or obtain the right of PGE (a) to access to the management, development and operational personnel of Seller and (b) to review and make copies of the books and records of Seller. Any and all such access to Seller's management, development and operational personnel shall take place during normal business hours.]

8.5 [Notice of Developments. Seller shall, from time to time prior to the Closing, promptly (a) supplement or amend the Schedules referred to in Article 5, with respect to any matter that arises after the Effective Date, which if existing as of the Effective Date, would have been required to be set forth or described in such Schedules in order to make any representation or warranty set forth in Article 5 true and correct, and (b) notify PGE of any conditions, circumstances or events that could reasonably be expected to have a Material Adverse Effect.]

ARTICLE 9
INDEMNIFICATION

9.1 Survival. Except as set forth in Sections 9.1.1, all representations, warranties and related indemnification obligations contained in this Agreement and any Schedule, certificate or other document delivered pursuant to this Agreement at Closing, shall survive the Closing for a period of twenty-four (24) months.

9.1.1 The representations, warranties and related indemnification obligations of (a) Seller contained in Section 5.1 (Organization and Authority) and Section 5.7 (Project Assets), and (b) PGE contained in Section 6.1 (Organization and Authority) shall survive termination of this Agreement. The representations, warranties and related indemnification obligations of Seller contained in Section 5.9 (Tax Matters) and Section 5.12 (Environmental Laws) shall survive the Closing until the expiration of the applicable statute of limitations. The obligations of (i) Seller pursuant to Sections 9.3.1(d) and (e) or (ii) PGE pursuant to Sections 9.4.1(c) and (d) shall survive the Closing indefinitely.

9.2 Applicable Survival Period. The period for which a representation, warranty or indemnification obligation survives the Closing is referred to herein as the "***Applicable Survival***

Period." In the event notice of claim for indemnification under Sections 9.3 or 9.4 is given within the Applicable Survival Period, the representation, warranty or indemnification obligation that is the subject of such indemnification claim (whether or not formal legal action shall have been commenced based upon such claim) shall survive with respect to such claim until such claim is finally resolved. All claims for indemnification shall be made no later than ninety (90) days after the Applicable Survival Period. In the event notice of claim for indemnification under Sections 9.3 or 9.4 is not given within ninety (90) days after the Applicable Survival Period, such claim shall be null and void and no remedy, relief or recourse will be available to the indemnified party with respect to such claim.

9.3 Indemnification by Seller.

9.3.1 Seller shall indemnify and defend PGE and its Affiliates and their respective stockholders, members, managers, officers, directors, employees, agents, successors and assigns (each, a "***PGE Indemnified Party***") against, and shall hold them harmless from, any and all losses, damages, claims (including third-party claims), charges, interest, penalties, Taxes, costs and expenses (including legal, consultant, accounting and other professional fees, costs of sampling, testing, investigation, removal, treatment and remediation of contamination and fees and costs incurred in enforcing rights under this Section 9.3) (collectively, "***Losses***") resulting from, arising out of, or incurred by any PGE Indemnified Party in connection with, or otherwise with respect to:

(a) the failure of any representation and warranty or other statement by Seller contained in this Agreement or any certificate or other document furnished to PGE at Closing, to be true and correct in all respects as of the Effective Date [or the Closing Date, as applicable];

(b) any material breach of any covenant or agreement of Seller contained in this Agreement or any certificate or other document furnished to PGE at the Closing;

(c) any Retained Liabilities;

(d) any fraud, intentional misrepresentation, willful misconduct by or gross negligence of Seller in connection with this Agreement or the transactions contemplated by this Agreement;

(e) any claims, actions or suits made by third parties (before, on or after the Closing Date) against any PGE Indemnified Party arising from or as a result of the acts or omissions of Seller or any of its Affiliates in connection with the development, ownership or operation of the Project or the Project Assets; and

(f) any liability for Taxes (including Tax Liens) imposed on or incurred by PGE relating to any taxable period ending on or before the time of the Closing or the portion of any other taxable period beginning before and occurring on or before the time of the Closing relating to the Project or the Project Assets.

9.4 Indemnification by PGE.

9.4.1 PGE shall indemnify and defend Seller and its Affiliates and their respective stockholders, members, managers, officers, directors, employees, agents, successors and assigns (each, a "***Seller Indemnified Party***") against, and shall hold them harmless from, any and all Losses resulting from, arising out of, or incurred by any Seller Indemnified Party in connection with, or otherwise with respect to:

(a) the failure of any representation and warranty or other statement by PGE contained in this Agreement or any certificate or other document furnished to Seller at Closing, to be true and correct in all respects as of the Effective Date [and as of the Closing Date, as applicable;]

(b) any material breach of any covenant or agreement of PGE contained in this Agreement, or any certificate or other document furnished to Seller at the Closing;

(c) any claims, actions or suits made by third parties (before, on or after the Closing Date) against any Seller Indemnified Party arising from or as a result of the acts or omissions of PGE or any of its Affiliates in connection with its ownership or operation of the Project, the Project Assets or the Post-Closing Assets;

(d) any fraud, intentional misrepresentation, willful misconduct by or gross negligence of PGE in connection with this Agreement or the transactions contemplated by this Agreement;

(e) any liability for Taxes (including Tax Liens) imposed on or incurred by Seller relating to any taxable period ending on or after the time of the Closing or the portion of any other taxable period beginning before and occurring on or after the time of the Closing relating to the Project and the Project Assets; and

(f) Assumed Liabilities.

9.5 Claims for Indemnification. A Party seeking indemnification (the "***Indemnified Party***") under this Article 9 shall give written notice (a "***Claim Notice***") to the other Party (the "***Indemnifying Party***") as soon as practicable after the Indemnified Party becomes aware of any fact, condition or event which may give rise to Losses for which indemnification may be sought under this Article 9 (a "***Claim***"). Except as set forth in Section 9.2, the failure of the Indemnified

Party to timely give a Claim Notice to the Indemnifying Party hereunder shall not affect the Indemnified Party's rights to indemnification hereunder, except and only to the extent that the Indemnifying Party is materially prejudiced by such delay.

9.6 Defense. In the case of a Claim involving the assertion of a claim by a third party (whether pursuant to a lawsuit or other legal action or otherwise, a "***Third-Party Claim***"), the Indemnifying Party may, upon written notice to the Indemnified Party, take control of the defense and investigation of such Third-Party Claim if the Indemnifying Party acknowledges to the Indemnified Party in writing the obligation of the Indemnifying Party to indemnify the Indemnified Party with respect to all elements of such Third-Party Claim. If the Indemnifying Party assumes the defense of any such Third-Party Claim, the Indemnifying Party shall select counsel reasonably acceptable to the Indemnified Party (and separate from counsel to the Indemnifying Party if there is any conflict or divergence of interest between the Indemnifying Party and the Indemnified Party) to conduct the defense of such claims or legal proceedings and, at the sole cost and expense of the Indemnifying Party, shall take all steps necessary in the defense or settlement thereof. The Indemnifying Party shall not consent to a settlement of or the entry of any judgment arising from any such Third-Party Claim without the prior written consent of the Indemnified Party (which consent shall not be unreasonably withheld or delayed). The Indemnified Party shall be entitled to participate in (but not control) the defense of any such Third-Party Claim, with its own counsel and at its own expense; *provided*, *however*, that the Indemnified Party shall be entitled to settle any Third-Party Claim involving criminal penalties, civil fines or harm without the consent, but at the expense, of the Indemnifying Party if the Indemnifying Party shall unreasonably fail to do so after being requested to do so by the Indemnified Party. If the Indemnifying Party does not notify the Indemnified Party that it will assume the defense of such Third-Party Claim within thirty (30) days after the Indemnifying Party receives notice of such claim from the Indemnified Party: (a) the Indemnified Party may defend against such Third-Party Claim in such manner as it may deem reasonably appropriate, *provided* that the Indemnified Party shall not consent to a settlement of or the entry of any judgment arising from such Third-Party Claim without the prior written consent of the Indemnifying Party (which consent shall not be unreasonably withheld or delayed); and (b) the Indemnifying Party shall be entitled to participate in (but not control) the defense of such action, with its counsel and at its own expense. Regardless of which Party shall assume the defense of the Third-Party Claim, the Parties agree to cooperate fully with one another in connection therewith. Such cooperation shall include the providing of records and information which are relevant to such Third-Party Claim and making employees and officers available on a mutually convenient basis to provide additional information and explanation of any material provided hereunder and to act as a witness or respond to legal process, in each case to the extent that the Party being requested to provide records and information or to make employees and officers available can do so without waiving any evidentiary privileges to which it is entitled.

9.7 Limitations on Liability.

9.7.1 Notwithstanding any provision in this Agreement to the contrary, the aggregate maximum liability of Seller for indemnity under this Agreement shall not exceed the sum of one hundred percent (100%) of the Purchase Price (the "***Seller Indemnity Cap***"); provided, however, that the Seller Indemnity Cap shall not apply to any breach by Seller of Sections 5.1 (Organization and Authority), 5.7 (Project Assets), 5.15 (Solvency) or 5.17 (Investment Company), any Third-Party Claim or any claims based upon fraud or willful misconduct of Seller.

9.7.2 Notwithstanding any provision in this Agreement to the contrary, the aggregate maximum liability of PGE for indemnity under this Agreement shall not exceed the sum of one hundred percent (100%) of the Purchase Price (the "***PGE Indemnity Cap***"); provided, however, that the PGE Indemnity Cap shall not apply to any breach by PGE of Section 6.1 (Organization and Authority) or any Third-Party Claim or any claims based upon fraud or willful misconduct of PGE.

9.7.3 No Indemnified Party shall be entitled to indemnification under Sections 9.3 or 9.4 for Losses to the extent directly or indirectly caused by the willful misconduct, fraud or a negligent act of such Indemnified Party, or any of its Affiliates, or a breach by such Indemnified Party, or any of its Affiliates, of any representation, warranty, covenant or other agreement set forth in this Agreement. Any Indemnified Party making a claim under Sections 9.3 or 9.4 shall take such commercially reasonable steps to mitigate its Losses upon becoming aware of any event which could reasonably be expected to give rise thereto.

9.7.4 Any Claim made or Losses claimed under this Article 9 shall be reduced to the extent the Seller Indemnified Party or PGE Indemnified Party, as applicable, recovers any insurance proceeds in respect of such Claim or Loss.

ARTICLE 10
TAX MATTERS

10.1 Allocation of Purchase Price. The allocation of the Purchase Price (the "***Allocation***") shall be agreed between the Parties each acting reasonably as soon as practicable, but in no event later than sixty (60) days after the Closing Date. The Allocation agreed to by the parties shall be consistent with Section 1060 of the Code and the Treasury Regulations promulgated thereunder, and any analogous provisions of state, local or foreign law. If any adjustment is subsequently made to the Purchase Price or other relevant items, the Parties shall reasonably cooperate with each other to promptly amend the Allocation to reflect such adjustment. The Allocation (as so adjusted) shall be binding on the Parties and each of their respective Affiliates for all purposes. The Parties and each of their respective Affiliates shall report, act and file Tax Returns (including Internal Revenue Service Form 8594) in all respects

and for all purposes consistent with the Allocation, to the extent permitted by Applicable Law. Neither the Parties nor their respective Affiliates shall take any position on any Tax Return, before any Governmental Authority or in any judicial proceeding, that is inconsistent with the Allocation, unless taking such a position is required by Applicable Law.

10.2 Sales, Transfer and Documentary Taxes. Seller shall be responsible for all federal, state and local sales, documentary and other transfer taxes, if any, due as a result of the purchase, sale or transfer of the Project Assets in accordance herewith, whether imposed by law on Seller or PGE.

10.3 Treatment of Indemnity Payments. The Parties shall treat all payments made by Seller to or for the benefit of PGE and all payments by PGE to or for the benefit of Seller under any indemnity provision of this Agreement, as adjustments to the Purchase Price, unless otherwise required by Applicable Law (taking into account all relevant facts and circumstances underlying such payment), in which case any such payment will be increased by any Tax cost actually incurred by the recipient or reduced by any Tax benefit actually realized by the recipient, as applicable.

ARTICLE 11
MISCELLANEOUS

11.1 Successors and Assigns. This Agreement shall be binding upon and inure to the benefit of the Parties and their respective successors and assigns, except that PGE, on the one hand, and Seller, on the other hand, may not assign their respective obligations hereunder without the prior written consent of the other Party.

11.2 Entire Agreement; Amendments; Attachments. This Agreement, and all exhibits and schedules hereto, represents the entire understanding and agreement between the Parties with respect to the subject matter hereof and supersedes all prior oral and written and all contemporaneous oral negotiations, commitments and understandings between the Parties. PGE and Seller may amend or modify this Agreement, in such manner as may be agreed upon, by a written instrument executed by PGE and Seller. If the provisions of any exhibit or schedule are inconsistent with the provisions of this Agreement, the provisions of this Agreement shall prevail. The exhibits and schedules attached hereto are hereby incorporated as integral parts of this Agreement.

11.3 Severability. Any provision of this Agreement which is invalid, illegal or unenforceable shall be ineffective to the extent of such invalidity, illegality or unenforceability, without affecting in any way the remaining provisions hereof or rendering that or any other provision of this Agreement invalid, illegal or unenforceable. Upon such determination that any term or other provision is invalid, illegal or incapable of being enforced, the Parties shall negotiate in good faith to modify this Agreement so as to effect the original intent of the Parties

as closely as possible in an acceptable manner to the end that the transactions contemplated hereby are fulfilled to the fullest extent possible.

11.4 Dispute Resolution Process; Consent to Jurisdiction.

11.4.1 Avoidance and Mediation. The Parties agree to cooperate with each other and agree to communicate regularly with each other at all times so as to avoid or minimize disputes. In the event of any controversy, claim or dispute between the Parties arising out of or related to this Agreement ("***Dispute***"), within three (3) Business Days following the date of delivery of a written request by either Party, (a) each Party shall appoint as its representative a senior officer, and (b) such senior officers shall meet, negotiate and attempt in good faith to resolve the Dispute quickly, informally and inexpensively.

11.4.2 Mandatory Mediation. Any Dispute that is not resolved pursuant to Section 11.4.1 may be submitted for mediation before a single mediator in accordance with the provisions contained herein and in accordance with the Commercial Mediation Procedures of the AAA in effect at the time of the mediation ("***AAA Procedures***"); provided, however, that in the event of any conflict between the procedures herein and the AAA Procedures, the procedures herein shall control. The mediator will be named by mutual agreement of the Parties or by obtaining a list of five (5) qualified Persons from the Parties and alternately striking names. All mediation shall be administered by the AAA. All mediation shall take place in the City of Portland, Oregon, unless otherwise agreed to by the Parties. Each Party shall be required to exchange documents to be used in the mediation not less than five (5) Business Days prior to the mediation. The Parties shall use all commercially reasonable efforts to conclude the mediation as soon as practicable. All aspects of the mediation shall be treated as Confidential Information. Neither the Parties nor any mediator may disclose the content or results of the mediation, except as necessary to comply with legal, audit or regulatory requirements. Before making any such disclosure, a Party shall give written notice to the other Party and shall afford such Party a reasonable opportunity to protect its interests. Each Party shall be responsible for its own expenses and one-half of any mediation expenses incurred to resolve the dispute. The mediator will provide the Parties with a fee and expense schedule in advance of mediation. Mediation will terminate by (a) written agreement signed by both Parties, (b) determination by the mediator that the Parties are at an unresolvable impasse, or (c) two unexcused absences by either Party from the mediation sessions. The mediator will never participate in any claim or controversy covered by this Article as a witness, collateral contract or attorney and may not be called as a witness to testify in any proceeding involving the subject matter of mediation. O.R.S. §§ 36.100 to 36.238 will apply to the entire process of mediation.

11.4.3 If the Parties are still unable to resolve their differences after good faith consideration of a resolution through mediation pursuant to Section 11.4.2, then each of the Parties hereby irrevocably consents and agrees that any legal action or proceedings with respect

to this Agreement may be brought in any of the courts of the State of Oregon located in the City of Portland or the courts of the United States of America for the District of Oregon having subject matter jurisdiction. By execution and delivery of this Agreement and such other documents executed in connection herewith, each Party hereby (a) accepts the exclusive jurisdiction of the aforesaid courts, (b) irrevocably agrees to be bound by any final judgment (after any and all appeals) of any such court with respect to such documents, (c) irrevocably waives, to the fullest extent permitted by law, any objection it may now or hereafter have to the laying of venue of any action or proceeding with respect to such documents brought in any such court, and further irrevocably waives, to the fullest extent permitted by law, any claim that any such action or proceeding brought in any such court has been brought in any inconvenient forum, and (d) agrees that services of process in any such action or proceeding may be effected by mailing a copy thereof by registered or certified mail (or any substantially similar form of mail), postage prepaid, to such Party at its address set forth in Article 12, or at such other address of which the Parties have been notified.

11.4.4 EACH PARTY IRREVOCABLY WAIVES, TO THE FULLEST EXTENT PERMITTED BY APPLICABLE LAW, ANY AND ALL RIGHTS TO TRIAL BY JURY IN ANY LEGAL PROCEEDING ARISING OUT OF OR RELATING TO THIS AGREEMENT OR THE TRANSACTIONS CONTEMPLATED HEREBY.

11.4.5 If either Party institutes any legal suit, action or proceeding against the other Party arising out of or relating to this Agreement, including, but not limited to, contract, equity, tort, fraud and statutory claims, the prevailing Party in the suit, action or proceeding will be entitled to receive, in addition to all other remedies to which the prevailing Party may be entitled, the costs and expenses incurred by the prevailing Party in conducting the suit, action or proceeding, including reasonable attorneys' fees and expenses, court costs and other legal expenses such as expert witness fees, and all fees, taxes, costs and expenses incident to appellate, bankruptcy and post-judgment proceedings.

11.4.6 The provisions set forth in this Section 11.4 shall survive the termination or expiration of this Agreement.

11.5 Consequential Damages. EXCEPT WITH RESPECT TO LOSSES DIRECTLY OR INDIRECTLY CAUSED BY A PARTY'S WILLFUL MISCONDUCT OR FRAUD, IN NO EVENT SHALL SELLER OR PGE OR ANY OF THEIR RESPECTIVE OFFICERS, DIRECTORS, MEMBERS, PARTNERS, SHAREHOLDERS, EMPLOYEES, AGENTS OR AFFILIATES BE LIABLE FOR ANY SPECIAL, INDIRECT, NON-COMPENSATORY, CONSEQUENTIAL, INCIDENTAL, PUNITIVE OR EXEMPLARY DAMAGES, LOST OR PROSPECTIVE PROFITS, LOSS OF BUSINESS OPPORTUNITY OR BUSINESS INTERRUPTIONS UNDER OR IN RESPECT TO THIS AGREEMENT OR FOR ANY FAILURE OF PERFORMANCE RELATED HERETO, IRRESPECTIVE OF WHETHER

SUCH DAMAGES ARE REASONABLY FORESEEABLE OR WHETHER SUCH CLAIMS ARISE IN CONTRACT, TORT (INCLUDING NEGLIGENCE, WHETHER SOLE, JOINT OR CONCURRENT OR STRICT LIABILITY) OR OTHERWISE.

11.6 Governing Law. This Agreement shall be governed by and construed in accordance with the laws of the State of Oregon applicable to contracts made and to be performed in the State of Oregon and without reference to the conflicts of laws rules thereof.

11.7 Section Headings. The Section headings are for the convenience of the Parties and in no way alter, modify, amend, limit or restrict the contractual obligations of the Parties.

11.8 Counterparts. This Agreement may be executed in one or more counterparts, each of which shall be deemed to be an original, but all of which shall be one and the same document.

11.9 No Third-Party Beneficiaries. This Agreement is entered into for the sole benefit of the Parties, and except as specifically provided herein, no other Person shall be a direct or indirect beneficiary of, or shall have any direct or indirect cause of action or claim in connection with, this Agreement.

11.10 Waiver. At any time prior to the Closing Date, any Party may (a) extend the time for the performance of any of the obligations or other acts of the other Parties hereto, (b) waive any inaccuracies in the representations and warranties of the other Parties contained herein or in any document delivered pursuant hereto and (c) waive compliance by any other Party with any of the agreements or conditions contained herein. Any such extension or waiver shall be valid only if set forth in an instrument in writing signed by the Party or Parties to be bound thereby. The failure of any Party to this Agreement to assert any of its rights under this Agreement or otherwise shall not constitute a waiver of such rights.

11.11 Costs. Each Party shall pay all of its own costs and expenses, including the fees and costs of its attorneys, consultants, contractors and representatives and internal overhead costs, incurred in connection with the negotiation, authorization, execution and delivery of this Agreement and the agreements, Permits and other documents prepared or to be entered into in connection with the transactions contemplated herein. In the event of legal action to enforce or interpret any provision of this Agreement or the agreements, instruments or certificates delivered pursuant hereto, the prevailing Party shall be entitled to recover from the other Party its reasonable attorneys' fees and other costs of suit so incurred from the losing Party, at trial, on any appeal, and on any petition for review or other proceeding, in addition to all other sums provided by law.

11.12 Relationship of Parties.

11.12.1 The duties, obligations and Liabilities of the Parties are intended to be several and not joint or collective. This Agreement shall not be interpreted or construed to create an association, joint venture, fiduciary relationship or partnership between Seller and PGE or to impose any partnership obligation or liability or any trust or agency obligation or relationship upon either Party. Seller and PGE shall not have any right, power or authority to enter into any agreement or undertaking for, or act on behalf of, or to act as or be an agent or representative of, or to otherwise bind, the other Party.

11.12.2 The relationship between PGE and Seller shall be that of contracting party to independent contractor. Accordingly, subject to the specific terms of this Agreement, PGE shall have no general right to prescribe the means by which Seller shall meet its obligations under this Agreement.

ARTICLE 12
NOTICES

Any communications between the Parties hereto or regular notices provided herein to be given shall be given to the following addresses:

To PGE:

Portland General Electric Company
121 SW Salmon St.
1 WTC 1700
Portland, Oregon 97204
Attention: [_____]
Facsimile: [_____]

To Seller:

[_____]
[_____]
[_____]
[_____]
Attention: [_____]
Facsimile: [_____]

Any notice which is personally served shall be effective upon the date of service; any notice given by U.S. Mail shall be deemed effectively given, if deposited in the U.S. Mail, registered or certified with return receipt requested, postage prepaid and addressed as provided above, on the date of receipt, refusal or non-delivery indicated on the return receipt. In addition,

either Party may send notices by electronic mail, facsimile or by a nationally recognized overnight courier service which provides written proof of delivery (such as U.P.S. or Federal Express). Any notice sent by electronic mail or facsimile shall be effective upon confirmation of receipt in legible form, and any notice sent by a nationally recognized overnight courier shall be effective on the date of delivery to the Party at its address specified above as set forth in the courier's delivery receipt. Either Party may, by notice to the other from time to time in the manner herein provided, specify a different address for notice purposes.

[SIGNATURE PAGE FOLLOWS]

IN WITNESS WHEREOF, this Agreement has been duly executed by the Parties hereto as of and on the date first above written.

SELLER:	PORTLAND GENERAL ELECTRIC COMPANY
[_____]	
By:_____	By:_____
Name:	Name:
Title:	Title:
By:_____	
Name:	
Title:	

16 Appendix E – Engineering, Procurement and Construction Agreement

Template provided in a separate document available for download on PortlandGeneralRFP.accionpower.com.

ENGINEERING, PROCUREMENT AND CONSTRUCTION AGREEMENT

by and between

PORTLAND GENERAL ELECTRIC COMPANY

as Owner

and

as Contractor

dated as of

_____, 2016

for the

PROJECT

Legal Notice: The drawings and specifications of this Agreement will contain the following requisite statutory notices: (i) "Notice of Alternative Billing Cycle" (O.R.S. 701.625(2)) (as applicable to the extent that any payments to Contractor as described in this Agreement are not considered monthly progress payments), (ii) "Notice of Extended Certification Period Provision" (O.R.S. 701.625(6)) (as with respect to Owner's making of progress payments and final payment as described in this Agreement), and (iii) "Notice of Extended Payment Provision" (O.R.S. 701.625(3)(b)) (as regards the timing of Owner's payments to Contractor as described in this Agreement).

TABLE OF CONTENTS

ARTICLE I DEFINITIONS 1

1.1 Definitions 1

1.2 Rules of Interpretation 10

1.3 Order of Precedence 11

ARTICLE II RETENTION OF CONTRACTOR; CONTRACTOR RESPONSIBILITIES 11

2.1 Work to be Performed 11

2.2 Project 12

2.3 Further Work Responsibilities and Commitments 12

2.4 Prudent Industry Practices for the Work/Compliance 20

2.5 Commencement of Work; Project Schedule; Acceleration 21

2.6 Hazardous Materials 22

2.7 Owner's Right to Inspect; Correction of Defects 24

2.8 Inspection Not Approval. 25

2.9 Liens 25

2.10 Cooperation 26

2.11 Intellectual Property Rights 27

2.12 Credit Support 27

ARTICLE III SUBCONTRACTORS 27

3.1 Subcontractors 27

3.2 Owner as Third Party Beneficiary 28

3.3 Subcontractor Warranties 28

ARTICLE IV CONTRACT PRICE 29

4.1 Contract Price 29

4.2 Taxes 29

4.3 Disputed Invoices 31

4.4 Retainage 31

4.5 Conditions of Payment 31

4.6 Deductions from Payments 32

4.7 Effect of Payment 32

4.8 Set off 32
4.9 No Payment if Default 32
4.10 Interest 32
ARTICLE V OWNER RESPONSIBILITIES 32
5.1 Project Site Access 33
5.2 Permits 33
ARTICLE VI STAGES OF COMPLETION OF THE WORK 33
6.1 Work Completion 33
6.2 Project Mechanical Completion 34
6.3 Project Substantial Completion 34
6.4 Punch List for Project 35
6.5 Final Completion 36
6.6 Reasonable Amount; Exclusive Remedy 37
ARTICLE VII WARRANTIES 37
7.1 Warranty Provisions 37
7.2 Delay 39
7.3 Subcontractor Warranties 39
7.4 Proprietary Rights 40
7.5 NO IMPLIED WARRANTIES 40
7.6 Survival of Warranties 40
ARTICLE VIII FORCE MAJEURE; OWNER-CAUSED DELAYS 40
8.1 Force Majeure 40
8.2 Owner-Caused Delay 41
8.3 No Effect on Obligation to Pay Delay Liquidated Damages 42
ARTICLE IX CHANGES 42
9.1 Changes 42
9.2 Changes at Owner's Request 42
9.3 No Unapproved Changes 43
9.4 Changes Initiated by Contractor 43
9.5 Required Change Orders 43

ARTICLE X INDEMNIFICATION 46

10.1 Indemnities 46
10.2 Indemnification Procedure 48

ARTICLE XI INSURANCE 49

ARTICLE XII DEFAULT, TERMINATION AND SUSPENSION 49

12.1 Contractor Default 49
12.2 Owner Default 52
12.3 Termination Without Cause 52
12.4 Termination Payment 52
12.5 Actions Required Following Termination 53
12.6 Suspension by Owner for Convenience 54

ARTICLE XIII TITLE AND RISK OF LOSS 55

13.1 Title to Project and the Work 55
13.2 Title to Contractor Deliverables 55
13.3 Risk of Loss 55

ARTICLE XIV DISPUTE RESOLUTION 56

14.1 Referral to Senior Management 56
14.2 Mediation. 56
14.3 Legal Action 56
14.4 Waiver of Jury Trial. 57
14.5 Attorneys' Fees 57
14.6 Survival 57

ARTICLE XV REPRESENTATIONS AND WARRANTIES 57

15.1 Contractor Representations 57
15.2 Owner Representations 58
15.3 Survival of Representations and Warranties 59

ARTICLE XVI MISCELLANEOUS PROVISIONS 59

16.1 Confidentiality and Publicity 59
16.2 Consequential Damages 61
16.3 Limitation on Liability 61

16.4 Notice 62
16.5 Time of the Essence 62
16.6 No Rights in Third Parties 62
16.7 Entire Agreement 62
16.8 Amendments 63
16.9 GOVERNING LAW 63
16.10 Right of Waiver 63
16.11 Severability 63
16.12 Successors and Assigns; Assignment 63
16.13 Survival 64
16.14 Expenses and Further Assurances 64
16.15 Counterparts 64
16.16 Status of Contractor; No Partnership; No Agency 64
16.17 Compliance with Applicable Laws 64

EXHIBITS

Exhibit A	Scope of Work
Exhibit B-1	Schedule of Values
Exhibit B-2	Form of Request for Payment
Exhibit B-3	Unit Rates for Additional Work
Exhibit B-4	Deliverables List
Exhibit C-1	Project Schedule Key Milestones
Exhibit C-2	Payment Schedule
Exhibit C-3	Guaranteed Milestone Dates
Exhibit C-4	Performance Testing
Exhibit C-5	Performance Guarantee and Performance Liquidated Damages
Exhibit D	Major Equipment Provider Technical Specifications, Manuals and Standards
Exhibits D-1 to D-5	Major Equipment Warranties
Exhibit E	Design Drawing and Specification Index
Exhibit F	Geotechnical Reports
Exhibit G-1	Site Map
Exhibit G-2	Summary of Land Owner Requirements
Exhibit H	Owner & Contractor Permits
Exhibit I	List of Approved Subcontractors or Suppliers
Exhibit J-1	Contractor-Provided Training
Exhibit J-2	Spare Parts List
Exhibit K	Site Control Agreement
Exhibit L	Contractor Site Safety Plan, Drug, and Alcohol Abuse Policy
Exhibit M	Form of Change Order
Exhibit N	Form of Quality Assurance and Quality Control Manual
Exhibit O-1	Form of Contractor's Partial Lien Waiver and Release
Exhibit O-2	Form of Subcontractor's Partial Lien Waiver and Release
Exhibit O-3	Form of Contractor's Final Lien Waiver and Release

Exhibit O-4	Form of Subcontractor's Final Lien Waiver and Release
Exhibit P-1	Insurance Requirements
Exhibit P-2	Contractor's Insurance Certificates
Exhibit P-3	Form of Contractor Parent Guaranty
Exhibit Q	Form of Work Completion Certificates
Exhibit R-1	Environmental Assessment
Exhibit R-2	Environmental Permit Matrix
Exhibit S-1	Form of Limited Notice to Proceed
Exhibit S-2	Form of Notice to Proceed

ENGINEERING, PROCUREMENT AND CONSTRUCTION AGREEMENT

THIS ENGINEERING, PROCUREMENT AND CONSTRUCTION AGREEMENT (this "Agreement"), is made, entered into and is effective as of _____, 2016 (the "Effective Date"), by and between _____("Owner"), and _____ ("Contractor").

RECITALS

Owner is developing a renewable energy generation facility (defined as the Project below) and all services and utilities related thereto, all to be located near the town of _____in ____ County, _____.

In connection with such Project, Owner desires to obtain and Contractor desires to provide certain work, including, among other things, procurement, installation, construction and related services for the Project, all for the Contract Price (as hereinafter defined).

NOW, THEREFORE, the Parties agree as follows:

ARTICLE I

DEFINITIONS

1.1 Definitions. As used in this Agreement, the following terms have the meanings indicated:

"AAA" means the American Arbitration Association.

"AAA Procedures" has the meaning set forth in Section 14.2.

"Affiliate" means, in relation to any Person, any other Person, who: (a) directly or indirectly controls, or is controlled by, or is under common control with, such Person; or (b) directly or indirectly beneficially owns or holds fifty percent (50%) or more of any class of voting stock or other equity interests of such Person; or (c) has fifty percent (50%) or more of any class of voting stock or other equity interests that is directly or indirectly beneficially owned or held by such Person, or (d) either holds a general partnership interest in such Person or such Person holds a general partnership interest in the other Person. For purposes of this definition, the word "controls" means possession, directly or indirectly of the power to direct or cause the direction of the management or policies of a Person, whether through the ownership of voting securities or otherwise.

"Agreement" has the meaning set forth in the preamble hereto, as the same may be amended, supplemented or modified from time to time in accordance with the terms hereof.

"Applicable Laws" means any act, statute, law, regulation, Permit (including Applicable Permits), ordinance, rule, judgment, order, decree, directive, guideline or policy (to the extent mandatory) or any similar form of decision or determination by, or any interpretation or

administration of, any of the foregoing by any Government Authority with jurisdiction over Contractor, Owner, the Project, the Project Site, the performance of the Work or other services to be performed under the Agreement, and includes any of the same as they may be amended or imposed from time to time.

"Applicable Permits" means any and all Permits from or required by any Government Authority that are necessary for the performance of the Work or the completion or operation of the Project.

"As-Built Drawings" means final Drawings for the Work, as revised to reflect the changes in the Work during construction, and shall include as-built drawings that show the physical placement and location of all improvements, including the equipment, roads, overhead electric transmission line, underground collection lines, communication lines (both above and below ground), the Transformer Substation, electric one-line drawings, electric schematics and connection diagrams.

"Builder's Risk Policy" has the meaning set forth in Exhibit P-1.

"Business Day" means every day other than a Saturday, Sunday or a day which is a legal holiday in the state in which the Project is located.

"Change" has the meaning set forth in Section 9.1.

"Change Order" has the meaning set forth in Section 9.1.

"Change Order Request" has the meaning set forth in Section 9.4.

"Confidential Information" has the meaning set forth in Section 16.1.1.

"Consequential Damages" has the meaning set forth in Section 16.2.

"Consumable Parts" has the meaning set forth in Section 2.3.6.

"Contractor" has the meaning set forth in the preamble hereto and includes its legal successors and permitted assignees as may be approved by Owner, in writing, pursuant to the terms of the Agreement.

"Contractor Deliverables" means all Drawings, Job Books, Operating Manuals, all written comments, field changes, and redlined drawings for incorporation into the final As-Built Drawings, and other documents and similar information prepared or modified by Contractor or any of its Subcontractors and delivered or required to be delivered hereunder.

"Contractor Event of Default" has the meaning set forth in Section 12.1.1.

"Contractor Permits" means those Permits required to be obtained by Contractor, as set forth in Exhibit H.

"Contractor Termination for Cause" has the meaning set forth in Section 12.2.

"Contractor's Equipment" means all of the equipment, materials, apparatus, structures, tools, supplies and other goods provided and used by Contractor and its Subcontractors for performance of the Work, but which are not intended to be incorporated into the Project.

"Contractor's Parent" has the meaning set forth in Section 2.12.

"Contractor's Project Manager" means the Person designated by Contractor as having the responsibility, authority and supervisory power of Contractor for design, construction, procurement, testing and start-up of the Work, as well as all matters relating to the administration of the provisions of the Agreement, and who will be primarily located at the Project Site on a daily basis.

"Contractor's Taxes" has the meaning set forth in Section 4.2.1.

"Contract Price" has the meaning set forth in Section 4.1.

"Day" or "day" means a period of twenty-four (24) consecutive hours from 12:00 midnight, and shall include Saturdays, Sundays and all holidays.

"Defect" or "Defective" means, any condition, characteristic or item of the Work that (a) does not conform to the terms or requirements of the Agreement (including Prudent Industry Practices), (b) is not of uniform good quality, free from defects or deficiencies in design, manufacture or workmanship, or (c) would adversely affect (i) the performance of the Project under anticipated operating conditions, (ii) the continuous safe operation of the Project during the Project's design life, or (iii) the structural integrity of the Project.

"Delay Liquidated Damages" has the meaning set forth in Section 6.6.

"Delivery Point" means the Equipment laydown area at the Site, or any other location mutually agreed to in writing by the Parties after the Effective Date.

"Direct Costs" has the meaning set forth in Section 9.5.3(c).

"Dispute" has the meaning set forth in Section 14.1.

"Dollar" or "$" means a dollar of the currency of the United States of America.

"Drawings" means (a) all specifications, calculations, designs, plans, drawings, engineering and analyses, and other documents which determine, establish, define or otherwise describe the scope, quantity, and relationship of the components of the Project, including the structure and foundation thereof, and (b) all technical drawings, specifications, shop drawings, diagrams, illustrations, schedules and performance charts, calculations, samples, patterns, models, operation and maintenance manuals, piping and instrumentation diagrams, underground structure drawings, conduit and grounding drawings, lighting drawings, conduit and cable drawings, electric one-line's, electric schematics, connection diagrams and technical information of a like nature, prepared or modified by Contractor or any of its Subcontractors all of which are and required to be submitted by Contractor or any Subcontractor, from time to time under the

Agreement or at Owner's request which illustrates any of the Equipment or any other portion of the Work, either in components or as completed.

"Effective Date" has the meaning set forth in the preamble to this Agreement.

"Equipment" means all of the equipment, materials, apparatus, structures, tools, supplies, goods and other items required to complete the Project excluding the Contractor's Equipment and Major Equipment. The Parties acknowledge that Contractor will provide, install and incorporate the Equipment into the Project as described in this Agreement.

"Final Completion" has the meaning set forth in Section 6.5.1.

"Final Completion Certificate" means the certificate by this name as described in, and in the form set forth in, Exhibit Q.

"Final Completion Date" means the date on which Final Completion occurs as per Section 6.5.1.

"Final Punch List" has the meaning set forth in Section 6.4.1.

"Force Majeure Event" means any event or circumstance, or combination of events or circumstances, that meets all of the following criteria:

(a) arises after the Effective Date,

(b) was not caused by and is unforeseeable and beyond the reasonable control of the Party claiming the Force Majeure Event,

(c) is unavoidable or could not be prevented or overcome by the reasonable efforts and due diligence of the Party claiming the Force Majeure Event, and

(d) either (i) as with respect to Owner as the impacted Party, has an impact which will actually, demonstrably and adversely affect Owner's ability to perform its obligations (other than payment obligations) in accordance with the terms of the Agreement or (ii) as with respect to Contractor as the impacted Party, has an impact which will actually, demonstrably and adversely affect Contactor's ability to perform Work on the Project Site so as to achieve a Key Milestone by the scheduled completion date for such Key Milestone as set forth in the Project Schedule.

Provided they meet all of the criteria described above, Force Majeure Events may include the following: acts of God, natural disasters, wildfires, earthquakes, tornadoes, lightning, floods, civil disturbances, riots, war and military invasion, physical damage to the Project caused by third parties who are not Subcontractors or representatives, employees or agents of the impacted Party, national, regional and area-wide strikes and other national, regional and area-wide labor disputes (including collective bargaining disputes and lockouts) involving Contractor or Subcontractors and not directed exclusively at Contractor and/or such Subcontractor; a severe inclement weather condition not mentioned above, which prevents or substantially hinders the safe performance of the Work at the Project Site; acts of the public enemy; blockade; acts of

terrorism; insurrection, riot or revolution; sabotage or vandalism; embargoes, and actions of a Governmental Authority (other than in respect of or in relation to or resulting from Contractor's non-compliance with Applicable Laws). Notwithstanding anything in the foregoing to the contrary, in no event shall any of the following constitute a Force Majeure Event: (i) strikes, and other labor disputes (including collective bargaining disputes and lockouts) of the labor force under the control of the Party claiming the Force Majeure Event or its Affiliates or with respect to the Work by a Subcontractor on the Project Site unless the strike is part of a more widespread or general strike extending beyond the Party, Affiliate or Subcontractor; (ii) cost or shortages of labor or manpower; (iii) unavailability, late delivery, failure, breakage or malfunction of equipment or materials unless there is an independent, identifiable Force Majeure Event causing such condition; (iv) events that affect the cost of equipment or materials; (v) economic hardship (including lack of money) of any entity or its affiliates or their respective Subcontractors or suppliers; (vi) delays in transportation (including delays in clearing customs) other than delays in transportation resulting from accidents or closure of roads or other transportation route by Government Authorities; (vii) any weather conditions which are not defined above as Force Majeure Events; (viii) actions of a Government Authority in respect of or in relation to or resulting from Contractor's compliance or non-compliance with Applicable Laws; (ix) any failure by Contractor to obtain and/or maintain any Applicable Permit it is required to obtain and/or maintain hereunder; (x) any other act, omission, delay, default or failure (financial or otherwise) of a Subcontractor or other Personnel of Contractor.

"Force Majeure Notice" has the meaning set forth in Section 8.1.1.

"Geotechnical Survey" means that certain geotechnical reports referenced in Exhibit F.

"Government Authority" means any and all foreign, national, federal, state, county, city, municipal, local or regional authorities, departments, bodies, commissions, corporations, branches, directorates, agencies, ministries, courts, tribunals, judicial authorities, legislative bodies, administrative bodies, regulatory bodies, autonomous or quasi-autonomous entities or taxing authorities or any department, municipality or other political subdivision thereof.

"Grid" means the interconnected high voltage transmission facilities that are a part of the transmission system to which the Project connects.

"Guaranteed Substantial Completion Date" shall be as provided in Exhibit C-3.

"Hazardous Material" means any and all chemicals, constituents, contaminants, pollutants, materials, and wastes and any other carcinogenic, corrosive, ignitable, radioactive, reactive, toxic or otherwise hazardous substances or mixtures (whether solids, liquids, gases), or any similar substances now or at any time subject to regulation, control, remediation or otherwise addressed under Applicable Laws, including those laws, regulations and policies relating to the discharge, emission, spill, release, or threatened release into the environment or relating to the disposal (or arranging for the disposal), distribution, manufacture, processing, storage, treatment, transport, or other use of such substances.

"Indemnified Person" has the meaning set forth in Section 10.2.1.

"Indemnifying Party" has the meaning set forth in Section 10.2.1.

"Intellectual Property Rights" has the meaning set forth in Section 2.11.

"Interconnect Switchyard" means the Utility-owned electric transmission switchyard to be located at the end of the Transmission Corridor, immediately adjacent to the connection to the Grid, including all necessary breakers, protection equipment, metering and associated control buildings and other infrastructure associated therewith.

"Job Book" means all documentation specified in the Scope of Work, which shall include all engineering, design, purchasing and other information relating to the Project, including: (a) a drawing index; (b) a reference index; (c) copies of Contractor's and Subcontractors' Permits; (d) copies of all contracts and purchase orders for Major Subcontractor's equipment (non-priced); (e) Subcontractor information for equipment purchased (as received from Subcontractors) including instruction and maintenance manuals from Subcontractors; (f) one copy of the As-Built Drawings and documentation; (g) training manuals; (h) the Operating Manuals; (i) electrical one-line diagrams for the Project; (j) a cable and raceway schedule for the Project; (k) connection report/loop diagrams for the Project; and (l) a final list and summary of the work performed by all Subcontractors.

"Key Milestones" means the milestones identified as such in the Project Schedule (Exhibit C-1).

"Labor" means the workforce of the relevant Person, including its staff and employee and non-employee and skilled and unskilled workers (and including those provided by Subcontractors).

"Lien" means any lien, security interest, mortgage, hypothecation, encumbrance or other restriction on title or property interest.

"Lien Waiver and Release" means waivers to lien rights and may be conditional or unconditional. Lien Waiver and Releases will follow the form as set forth in Exhibit O-1, Exhibit O-2, Exhibit O-3, and Exhibit O-4, as required.

"Limited Notice to Proceed" or "LNTP" means a written notice, substantially in form as shown in Exhibit S-1, issued by Owner on or after the Effective Date to Contractor in accordance with this Agreement that is signed by both Parties and directing Contractor to commence the Work set forth in the LNTP in accordance with the terms of this Agreement in advance of the Notice to Proceed.

"Major Equipment" shall be as defined in the Scope of Work.

"Major Equipment Warranties" shall be as defined in Section 7.4.

"Major Subcontract" means any agreement or purchase order with a Subcontractor for performance of any part of the Work that has an aggregate value in excess of _____ Dollars ($_____).

"Major Subcontractor" means, any Owner-approved Subcontractor with whom Contractor will enter (or has entered) into a Major Subcontract.

"Mechanical Completion" has the meaning set forth in Section 6.2.

"Mechanical Completion Certificate" means the certificate by this name as described in, and in the form set forth in, Exhibit Q.

"Mechanical Completion Checklist" means the means the checklist by this name as described in Exhibit Q.

"Monthly Progress Report" means a monthly written report that includes a description of the progress and status of the Work compared to the Project Schedule, the Subcontractors' activities, engineering and design progress, a summary of any Change Orders executed by the Parties as of the date of such report and a summary of any events that may affect the Project Schedule (including, without limitation, any Force Majeure Events, Owner-Caused Delays, Liens on the Project Site, or the Project, and any asserted violations of Applicable Laws.

"Notice to Proceed" means a written notice issued by Owner to Contractor pursuant to Section 2.1, and substantially in form as shown in Exhibit S-2, that is signed by both Parties directing Contractor to commence the Work in accordance with the terms of this Agreement.

"Operating Manual" means the complete system instructions and procedures for the operation and maintenance of the Work, which shall comply with the requirements of the Scope of Work, including Contractor's manufacturers', vendors', suppliers' and Subcontractors' recommended list of Spare Parts, all safety information, equipment and maintenance manuals and any precautionary measures therefor.

"Operational Policy" has the meaning set forth in Exhibit P-1.

"Other Owner Contractors" means those Persons, other than Contractor, with whom Owner contracts or subcontracts to perform work in connection with the Project, including the Equipment Provider and the Owner Engineer. Owner Contractors may also include Owner in the event Owner elects to perform any work in connection with the Project.

"Owner" has the meaning set forth in the preamble hereto.

"Owner-Caused Delay" means a delay in Contractor's or a Subcontractor's performance of the Work and/or an increase in Contractor's or a Subcontractor's costs that has been demonstrably caused by the failure of Owner, Other Owner Contractors (other than Equipment Provider) to perform any material obligation of Owner under this Agreement (other than by exercise of rights under this Agreement, including the exercise by Owner of the right to have Defective or nonconforming Work corrected or re-executed) or by the acts or omissions of Owner, Other Owner Contractors (other than Equipment Provider). Any delay that is due in part to Contractor's or any of its Subcontractors' actions or inactions shall not be an Owner-Caused Delay.

"Owner Engineer" means _____.

"Owner Event of Default" has the meaning set forth in Section 12.2.

"Owner Indemnified Party" has the meaning set forth in Section 10.1.1.

"Owner Permits" means those Permits required to be obtained by Owner, as set forth on Exhibit H.

"Owner's Project Manager" means the individual appointed by Owner to act on its behalf in connection with this Agreement.

"Owner's Taxes" has the meaning set forth in Section 4.2.2(b).

"Parent Guaranty" has the meaning set forth in Section 2.12.

"Party" or "Parties" means, respectively, a party or both parties to this Agreement.

"Payment and Performance Bond" has the meaning set forth in Section 2.12.

"Permit" means any waiver, exemption, variance, certificate, franchise, permit, approval, exemption, authorization, clearance, license, consent, or similar order of or from, or filing or registration with, or notice to, any Government Authority.

"Person" means any individual, corporation, partnership, limited liability company, association, joint stock company, trust, unincorporated organization, joint venture, or Government Authority or other entity of whatever nature.

"Personnel" means, with respect to a Party or entity, such Party's or entity's employees, agents, personnel, representatives, invitees, subcontractors, vendors and any other third party independent contractors with whom such Party or entity has contracted, and its agents', personnel's, representatives', invitees', subcontractors', vendors' or third party independent contractors' respective employees, agents, personnel, representatives, invitees, subcontractors, vendors or third party independent contractors.

"Pre-Existing Hazardous Material" means any Hazardous Material (a) that existed on or in the Project Site prior to the date when Contractor or any of its Subcontractors or other representatives is present thereon following the Effective Date and/or (b) brought to the Project Site by Owner, any Other Owner Contractor or any third party other than Contractor or its Personnel after the Effective Date.

"Project" means the electric generation project that is the subject of this Agreement, as described in the Scope of Work.

"Project Schedule" means the schedule of dates and milestones (including Key Milestones) for timely completion of the Work as set forth in Exhibit C-1 with specific start and end dates for each activity comprising (or relating to) the Work.

"Project Site" means all those parcels of land subject to the Real Property Rights in favor of Owner including the Transmission Corridor on which the Work will be located as shown in Exhibit G-1.

"Project Substantial Completion" has the meaning set forth in Section 6.3.1.

"Project Substantial Completion Date" means the date on which the Project achieves Project Substantial Completion, per Section 6.3.2.

"Prudent Industry Practices" means, in connection with the design and construction of renewable energy power generation systems of a type and size and having geographical and climatic attributes similar to the Project, those practices, methods, specifications and standards of safety, performance, dependability, efficiency and economy generally recognized by industry members in the United States as good and proper, and such other practices, methods or acts which, in the exercise of reasonable judgment by those reasonably experienced in the industry in light of the facts known at the time a decision is made, would be expected to accomplish the result intended at a reasonable cost and consistent with Applicable Laws, reliability, safety and expedition. Prudent Industry Practices are not intended to be limited to the optimum practices, methods or acts to the exclusion of all others, but rather to be a spectrum of good and proper practices, methods and acts.

"Punch List" means any punch list as described in Section 6.4.1, as applicable.

"Quality Assurance Procedures" means the quality assurance and quality control procedures as set forth in Exhibit N.

"Real Property Requirements" means the applicable covenants, agreements, restrictions, limitations, or requirements of the Real Property Rights imposed upon Owner or its assignees, contractors, licensees, or invitees regarding the use and possession of the Project Site, the construction, operation, and maintenance of the Project on the Project Site, and any other activities on or over the Project Site, a summary of which is attached hereto as Exhibit G-2.

"Real Property Rights" means all rights in or to real property (such as leasehold or other rights to use or access the Project Site), leases, agreements, Permits, easements, including licenses, private rights-of-way, and utility and railroad crossing rights required to be obtained or maintained by Owner in connection with construction of the Project on the Project Site, transmission of electricity to the Grid, performance of the Work, or operation of the Project.

"Request for Payment" means the written requests from Contractor to Owner for payment, as described in Exhibit B-2.

"Retainage" has the meaning set forth in Section 4.4.1.

"Safety Plan" has the meaning set forth in Section 2.3.14(a).

"Schedule of Values" means that payment schedule set forth in Exhibit B-1 which shall contain a breakdown of milestones for completion of the Work that corresponds to the Project Schedule and is in reasonable detail as approved by the Owner, and an allocation of the Contract Price to the milestones.

"Scope of Work" means the services and work to be provided, or caused to be provided, by or through Contractor under the Agreement, as more particularly described in Exhibit A, and

the other obligations of Contractor under the Agreement, as the same may be amended from time to time in accordance with the terms hereof.

"Spare Parts" has the meaning set forth in Section 2.3.10.

"Subcontract" means an agreement between Contractor and any Subcontractor.

"Subcontractor" means any Person other than Contractor performing any portion of the Work, including every tier of subcontractor, vendor or supplier of equipment, materials or services to Contractor or any subcontractor of any Person engaged or employed by Contractor or any subcontractor in connection with the performance of the Work, whether or not incorporated into the Project.

"Termination for Cause" has the meaning set forth in Section 12.1.2.

"Termination Payment" has the meaning set forth in Section 12.4.1.

"Termination Without Cause" has the meaning set forth in Section 12.3.

"Third Party Controversy" has the meaning set forth in Section 14.4.

"Transmission Corridor" means, as part of the Project Site, those connected parcels of land subject to the Real Property Rights in favor of Owner on which certain Project, including transmissions lines, electrical works and the Interconnect Switchyard, will be located.

"Equipment Provider" means _____.

"Unforeseen Subsurface Condition" has the meaning set forth in Section 2.4.1(b).

"Warranty" has the meaning set forth in Section 7.1.1.

"Warranty Period" has the meaning set forth in Section 7.1.2.

"Warranty Service" has the meaning set forth in Section 7.1.3.

"Work" has the meaning set forth in Section 2.1 and includes Contractor Deliverables, the Project, the Equipment, and any other product or result of the Work, and further described in Exhibit A.

"Working Day" means the hours from 7:00 am to 7:00 pm, Monday through Saturday, excluding holidays, at the Project Site.

1.2 Rules of Interpretation. Unless otherwise required by the context in which any term appears: (a) unless otherwise specified, references to "Articles," "Sections," or "Exhibits" (if any) shall be to Articles, Sections, or Exhibits (if any) of this Agreement, as the same may be amended, supplemented or replaced from time to time hereunder; (b) all references to a Person shall include a reference to such Person's successors and permitted assigns; (c) references to any agreement, document or instrument shall mean a reference to such agreement, document or instrument as the same may be amended, modified, supplemented or

replaced from time to time; (d) the use of the word "including" or "include" in this Agreement to refer to specific examples shall be construed to mean "including, without limitation" and shall not be construed to mean that the examples given are an exclusive list of the topics covered; and (e) the headings contained herein are used solely for convenience and should not be used to aid in any manner to construe or interpret this Agreement. The Parties collectively have prepared this Agreement, with advice of legal counsel; none of the provisions hereof shall be construed against one Party on the ground that such Party is the author of this Agreement or any part hereof.

1.3 Order of Precedence. In the event of any inconsistencies in this Agreement, the following order of precedence in the interpretation hereof or resolution of such conflict hereunder shall prevail:

(a) Amendments, addenda or other modifications to the Agreement (including Change Orders) duly signed and issued after the signing of this Agreement, with those of a later date having precedence over those of an earlier date;

(b) This Agreement (excepting Exhibits hereto);

(c) Exhibit A through Exhibit S;

(d) Drawings produced and delivered pursuant hereto (in respect of which, precedence shall be given to drawings of a larger scale over those of smaller, figured dimensions on the drawings shall control over scaled dimensions, and noted materials shall control over undimensioned graphic indications).

Notwithstanding the foregoing provisions of this Section, if a conflict exists within a part of the Agreement as listed in a lettered subclause above, or between or among the Agreement and Applicable Laws, the Real Property Requirements, then the more stringent or higher quality requirements shall control. Where a conflict exists among codes and standards applicable to the Project or Contractor's performance of the Work, the most stringent provision of such codes and standards shall govern.

ARTICLE II

RETENTION OF CONTRACTOR; CONTRACTOR RESPONSIBILITIES

2.1 Work to be Performed. Commencing on the date specified in the Notice to Proceed, or earlier with respect to Work authorized pursuant to the Limited Notice to Proceed ("LNTP"), and except as otherwise expressly set forth in Article V or elsewhere in this Agreement as being the responsibility of Owner or Equipment Provider, Contractor shall perform or cause to be performed all necessary work and services (the "Work") required in connection with (a) the design, procurement, engineering, specified permitting, construction, assembly, installation and, where applicable, the start-up and testing, of the Project to Final Completion, (b) the provision, management and supervision of all Labor, transportation, administration and other services as required in connection with any of the foregoing, (c) the inspection and furnishing of all materials, equipment, machinery, tools, temporary structures, temporary utilities as required in connection with the foregoing including the performance

obligations described in this Article II and the Scope of Work, and (d) the performance of Contractor's warranty obligations hereunder. Owner hereby retains Contractor, and Contractor hereby agrees to be retained by Owner, to perform or cause to be performed the Work in accordance with the terms and conditions of this Agreement. Contractor hereby represents that it has ascertained the nature and location of the Work, the general character and accessibility of the Project Site, the existence of known obstacles to construction, the location and character of existing or adjacent work or structures, and other general and local conditions including Applicable Laws, and the availability of Labor which might affect its performance of the Work or the cost thereof and that, based upon the same, but subject to Section 9.5.1, commits that it can complete the Work for the Contract Price in accordance with the Project Schedule.

2.2 Project.

2.2.1 General. Contractor shall construct the Project and all other components of the Work that are set forth in Exhibit A as part of Contractor's Scope of Work.

2.2.2 Interconnection to Grid. As further described in the Scope of Work and Contractor shall be responsible for all interconnection up to and including provision of and connection to the Interconnect Switchyard. Contractor shall coordinate with and permit the Utility to install the interconnection works between such point and the Grid.

2.2.3 Start-up and Testing of Project. Contractor shall perform the start-up and testing of the Project, including the calibration and functional testing of all controls and equipment in accordance with Exhibit A. If the Scope of Work requires that any item comprising the Project be tested by Contractor, Contractor shall notify Owner in writing at least ten (10) Business Days prior to the commencement of any such test. Contractor shall coordinate with Owner the scheduling of any test and Owner shall coordinate such test with Equipment Provider, so as not to interfere, in either case, with either Party's obligations with respect thereto. Owner shall witness such tests and will, within three (3) Business Days after receipt of written results of such tests, deliver to Contractor a written notice either (a) accepting such tests as having been passed, or (b) rejecting such tests as having demonstrated that the tested item failed to comply with the performance requirements therefor under this Agreement. Any rejection shall include a detailed description of the basis for rejection.

2.3 Further Work Responsibilities and Commitments.

2.3.1 Site Clearance and Preparation.

(a) Topography. Contractor has surveyed the general surface conditions of the Project Site topography and represents that, subject to Unforeseen Subsurface Conditions, the same are sufficient for Contractor to construct the Project and perform the Work. Contractor will be responsible for clearance of the Project Site, including the removal of obstructions. Contractor will be responsible for access road construction as described in the Scope of Work. Contractor shall provide for the procurement of or disposal of, as necessary, all soil, gravel and similar materials required for the performance of or otherwise in connection with the Work. Contractor will provide adequate treatment of and protection against water runoff resulting from Contractor's and its Subcontractor's work. Contractor will provide for the

collection, treatment and disposal of groundwater resulting from Contractor's and its Subcontractors' work.

(b) Geotechnical Survey; Subsurface Risk. "Unforeseen Subsurface Conditions" shall mean: (i) subsurface or latent physical conditions at the Project Site, differing materially from those indicated in the Geotechnical Survey, or (ii) previously unknown physical conditions at the Project Site of an unusual nature (including unknown and unexpected archaeological or religious sites, places, monuments or areas) or conditions that differ materially from those ordinarily encountered and generally recognized as inherent in work similar to the Work or which should have been known or discoverable Contractor based upon the information in the Geotechnical Survey If Contractor encounters any condition that Contractor believes is or may be an Unforeseen Subsurface Condition, Contractor shall notify Owner of the same promptly, but in any event no later than three (3) days after becoming aware of the condition. If the condition at issue is indeed an Unforeseen Subsurface Condition as defined herein and Contractor has delivered such notice within such time period, then Contractor will be entitled to a Change Order to the extent so provided in Section 9.5.1(d). If Contractor fails to notify Owner of such a condition within such three (3) day period, then Contractor shall not be entitled to and will thereby be deemed to have waived its rights to receive any Change Order as with respect to such condition.

2.3.2 Storage. At all times prior to the date of Project Substantial Completion, Contractor shall provide appropriate storage for the Consumable Parts, Equipment, and all other materials, supplies and other equipment utilized in connection with the Work and all other personal property owned or leased by Contractor or any Subcontractor located at the Project Site. At a minimum, Contractor shall comply with all Equipment manufacturer recommendations and requirements and shall comply with requirements in the Scope of Work

2.3.3 Transportation and Delivery Specification ***[To Be Discussed as appropriate to equipment.]***

2.3.4 Drawings and Documents.

(a) Ownership of Drawings. All drawings, specifications and other documents prepared by or for Contractor in respect of the Project and all drawings, specifications, calculations, memoranda, data, notes and other materials containing information supplied by Owner which shall come into Contractor's possession during its performance hereunder, shall be the property of Owner, and such Owner documents and other materials shall be returned to Owner upon the earlier of the Project Substantial Completion Date or termination of this Agreement. Owner shall have the right to retain a reproducible set of all Contractor's proprietary drawings, specifications and other documents for use in respect of the Project. Review (or lack thereof) by Owner or its designees of any Project documents provided by Contractor, and the fact that Owner has not discovered any errors reflected in such Project documents, shall not relieve or release Contractor of any of its duties, obligations or liabilities under the terms of this Agreement.

(b) As-Built Drawings. During construction, Contractor shall keep on file one set of current as-built drawings reflecting all field deviations from the design drawings.

As a condition to Final Acceptance, Contractor shall provide to Owner, for Owner's approval, a set of as-built drawings which have been fully conformed to the construction records as of the completion of the Work. Drawings shall be provided in AutoCAD DWG/DWF and Adobe PDF format.

2.3.5 Religious and Archaeological Resources. If any archaeological or religious sites, places, monuments or areas are discovered or identified by Contractor during the performance of Work under the Agreement, Contractor shall leave such sites untouched and protected by fencing and shall immediately stop any Work affecting the area and shall comply with any applicable Real Property Requirements. Contractor shall notify Owner of any such discovery as soon as practicable, and Contractor shall carry out Owner's reasonable instructions for dealing with the same. All fossils, coins, articles of value or antiquity and structures and other remains or things of geological, archaeological, historical, religious, cultural or similar interest discovered on the Project Site shall, as between Owner and Contractor, be deemed to be the property of Owner. Contractor shall prevent its and its Subcontractors' Labor from removing or damaging any such article or thing.

2.3.6 Equipment, Consumables, Construction Utilities and Related Services. Except to the extent provided by Owner or Equipment Provider as described in Article V or as part of the Work, Contractor shall procure and supply, at its own expense, all Equipment required to complete the Work, including without limitation all Equipment as necessary for performance and completion of its obligations under this Agreement (whether on or off the Project Site). Contractor shall inspect or cause to be inspected all such Equipment and shall reject those items determined not to be in compliance with the requirements of this Agreement. Contractor shall be responsible, at its sole expense, for furnishing and installation of all temporary utilities, telephone, data lines, cabling and wiring necessary for all activities associated with the completion of the Work. All Equipment provided by Contractor shall be new and of suitable grade for its intended purpose. With the exception of those consumable items expressly stated to be provided by Equipment Provider as described in Exhibit D, Contractor shall supply all consumable parts and supplies required for the Work including, but not limited to, cable ties, cable wraps, splices, wire nuts, lubricants, greases and other consumable materials (collectively, the "Consumable Parts").

2.3.7 Obtaining, Maintaining and Identifying Permits. Contractor shall timely obtain and maintain all Contractor Permits. In addition, Contractor shall provide all assistance reasonably requested by Owner in connection with Owner's efforts to obtain and maintain the Owner Permits. If any Applicable Permit is required for the Project or to perform the Work that is not identified in Exhibit H, Contractor or Owner, as applicable, shall promptly, after it becomes aware of the need for such Applicable Permit, notify the other Party that such Applicable Permit is required. If such Applicable Permit is of a nature typically obtained by contractors in similar projects, Contractor shall, at its sole cost and expense, be obligated to obtain and maintain such Applicable Permit. Otherwise, Owner shall obtain and maintain such Applicable Permit. All Applicable Permits (other than any building permits) designated as either "To be issued in the name of Owner" or "To be issued in the name of the Owner and Contractor" on Exhibit H shall be issued in the name of Owner or Owner and Contractor, as required, to the best of Contractor's ability unless otherwise required by Applicable Law or such Applicable Permit. If any Contractor Permit (or application therefor) is in the name of Owner or otherwise

requires action by Owner, Owner shall, upon the request of Contractor, sign such application or take such action as reasonably appropriate. Owner reserves the right to review any such application of Contractor; provided, however, that Owner's exercise of such right shall not under any circumstances, be considered an approval of the necessity, effect or contents of such application or related Permit nor shall it be allowed to unreasonably delay the submittal of such application. Contractor shall deliver to Owner true and complete copies of all Permits obtained by Contractor upon its receipt thereof.

2.3.8 Real Property Requirements and Real Property Rights. Contractor shall comply with those Real Property Requirements as summarized in Exhibit G-2. In addition, Contractor shall provide such assistance as may be reasonably requested by Owner in connection with Owner's efforts to observe and maintain the Real Property Requirements, including efforts to obtain any necessary revisions or adjustments thereof. As of the date hereof, subject to Section 2.4.1(b) as regards Unforeseen Subsurface Conditions, Contractor represents and warrants that it has inspected and is fully familiar with the Project Site, including the boundaries thereof, and that (a) they are sufficient for Contractor to undertake and complete that portion of the Work to be located thereon in accordance with the Agreement, the Real Property Requirements and Applicable Laws, and (b) Contractor has not discovered any conditions that in Contractor's reasonable judgment would be a basis for claiming a Change. In the performance of the Work, Contractor and its Subcontractors shall abide by any restrictions in regard to the location of facilities that are part of the Real Property Requirements. Owner shall enforce the Real Property Requirements for the benefit of Contractor and shall indemnify Contractor with respect to any claims by the Real Property Owners other than those claims caused by Contractor or its Personnel. Contractor shall indemnify Owner from any claims or expenses arising out of the failure of Contractor or its Subcontractors to comply with the Real Property Requirements. Contractor shall provide all necessary information and documents and use all reasonable efforts to assist Owner in obtaining any Real Property Rights that Owner at any time is seeking within the Project Site. Contractor shall notify Owner upon the occurrence, or likely occurrence, of a dispute, conflict, confrontation, or other similar problem, or potential problem, involving one or more owners or occupiers of land so situated as to potentially result in a situation that may have a material adverse effect upon the performance of the Work. Contractor shall, at Owner's expense, cooperate with Owner in resolving all such problems.

2.3.9 Environmental Compliance. Contractor shall comply with all Environmental Assessment requirements applicable to Contractor and/or the Work as set forth in Exhibit R-1 and the Environmental Permit Matrix as set forth in Exhibit R-2.

2.3.10 Spare Parts. Set forth in Exhibit J-2 is a list of spare parts that are necessary to operate and maintain the Project (the "Spare Parts"). Owner may at any time prior to Project Substantial Completion notify Contractor in writing that Owner wishes to purchase certain Spare Parts, and therein request pricing for the Spare Parts in question and the quantities desired. Contractor will supply the pricing for such identified Spare Parts to Owner as soon as practicable after such request. Owner may thereafter order those of such Spare Parts as Owner desires. Contractor shall thereafter deliver such Spare Parts Duty Paid (DDP) (Incoterms 2000) Project Site), using commercially reasonable efforts to complete such delivery within two (2) weeks after Owner's placement of such order. Title and risk of loss to such Spare Parts will transfer to Owner upon such delivery. After such delivery is completed, Contractor will invoice

Owner for the Spare Parts (based upon the quoted pricing), and the undisputed portions of such invoice shall be payable by Owner within thirty (30) days after Owner's receipt of such invoice. Should a component of the Equipment fail during commissioning, start-up or testing, Contractor may utilize a Spare Part of that component from Owner's inventory in order to return the Equipment to operating condition. Contractor shall at its cost promptly replace any such Spare Parts so utilized.

2.3.11 Operating Manuals and Job Books.

(a) Operating Manuals. Within 30 days after finalizing the equipment selection the Contractor shall prepare and deliver to the Customer the following documents: (i) O&M Manuals in an electronic draft version, (ii) recommended spare parts list, and (iii) lubrication schedule. Prior to commencing commissioning activities, Contractor shall prepare and deliver to Owner the documentation as required in the Scope of Work. In the event of total or partial rejection or revisions of the draft Operating Manuals by Owner, within fifteen (15) days after receipt of notice of such revisions or rejection Contractor shall make appropriate changes to the drafts to respond to Owner's revisions or reasons for rejection and shall resubmit such draft to Owner or shall explain why such revisions are not necessary. Such procedure shall be repeated until receipt of Owner's written approval therefore. Upon the earlier of Final Completion and thirty (30) days after Project Substantial Completion, Contractor shall prepare in individually numbered bound volumes and deliver to Owner two (2) sets of such approved Operating Manuals (which may be combined with the other Operating Manuals) and shall also provide three (3) copies of the Operating Manuals to Owner in electronic format.

(b) Job Books. As a condition to Project Substantial Completion, Contractor shall deliver to Owner two (2) copies of the semi-final draft of the Job Books, either in job book format or in form and format then available as a result of the design and construction process, as appropriate. A semi-final draft shall mean a draft that does not contain final As-Built Drawings and documentation, but is as reasonably complete as available information will allow, containing at a minimum sufficient information to permit the conduct of operator training and operation, repair and modification of the Project by Persons generally familiar with machinery and equipment similar to that comprising the same. Upon the earlier of Final Completion and thirty (30) days after Project Substantial Completion, Contractor shall provide one (2) original hard copy and three (3) electronic copies (on CD Roms) of the final and complete Job Books to Owner. Where any of the information in the Job Books was produced by computer-aided design and is available to Contractor or any Subcontractor, Contractor shall provide or cause to be provided to Owner an electronic copy of such information.

2.3.12 Contractor-Provided Training. Commencing at least thirty (30) days prior to the then-scheduled date for achievement of Mechanical Completion, Contractor shall provide, at its own expense, a training program in the operation and maintenance of the Project for Owner's Project Personnel and the operation and maintenance contractor's Project Personnel (collectively, "O&M Personnel"). The training program provided by Contractor shall be as described on Exhibit J-1 and shall (a) include classroom and field training, (b) include all educational materials necessary for such training, and (c) establish quality controls so that O&M Personnel are suitably trained and capable of operating and maintaining the Project after Project Substantial Completion. Contractor shall make every reasonable effort to use the O&M

Personnel during start-up and initial operation of the Project; provided, however, Owner shall not be obligated to supply (i) O&M Personnel for the construction of the Project or (ii) provide during Project start-up and initial operation more O&M Personnel than the number of O&M Personnel Owner an O&M contractor would use during normal Project operation as determined by Owner. Contractor shall remain solely responsible for performing the Work in accordance with this Agreement, including Contractor's obligation to achieve Project Substantial Completion, and achieve Final Completion, subject to Contractor's right to a Change Order in the event of an Owner-Caused Delay. The cost of the O&M Personnel's salary, travel, lodging, food and other living expenses shall be borne by Owner.

2.3.13 Labor and Personnel.

(a) Engagement of Labor. Contractor shall provide and manage and transport all Labor and Personnel required in connection with the performance of the Work and of its obligations hereunder. Contractor shall retain only such Labor and Personnel that have experience with the equipment and who are competent to perform their assigned duties in a safe and secure manner, including: (i) Contractor's Project Manager; (ii) lead project engineer and field engineers, cost and schedule engineers. Contractor shall require its Subcontractors to adhere to the same standard with respect to their Labor. Where required by Applicable Law, Contractor shall employ only licensed Personnel in good standing with their respective trades and licensing authorities to perform engineering, design, architectural and other professional services in the performance of the Work. All such professional services shall be performed with the degree of care, safety, skill and responsibility customary among such licensed Personnel provided such performance is in accordance with Applicable Law and Prudent Industry Practices. To the extent required by Applicable Law and Prudent Industry Practices, all Labor shall have received formal documented training in their area of expertise and certification.

(b) Owner Review of Labor. Upon Owner's request, Contractor shall provide Owner with the resumes of all management and supervisory Personnel employed in connection with the Work and Owner may require the replacement of any Personnel, at Contractor's sole expense if, in Owner's reasonable opinion, such Person is (i) endangering life or limb on or near the Project Site or violates or breaches the Real Property Requirements, thereby adversely affecting Owner's relationship with the land owners, (ii) incompetent, or (iii) violating or has violated this Agreement, particularly the Safety Plan and Sections 2.4.12(c) through (e). Rejection of Contractor's Personnel by Owner shall not relieve Contractor of any of its obligations hereunder or be construed as a waiver by Owner of any of its rights under the Agreement.

(c) Alcohol and Drugs. Contractor shall comply with Owner's policies and practices regarding alcohol and drugs and shall not possess, consume, import, sell, give, barter or otherwise dispose of any alcoholic beverages or drugs (excluding drugs for proper medical purposes and then only in accordance with Applicable Law) at the Project Site, or permit or suffer any such possession, consumption, importation, sale, gift, barter or disposal by its Subcontractors, agents or Labor. Subject to requirements of Applicable Law, Contractor shall perform random drug and alcohol testing on Persons employed by its Subcontractors and shall perform a drug and alcohol test on any Person employed by a Subcontractor who Owner or Contractor reasonably suspects is in possession of or under the influence of any dangerous or

controlled drug, alcohol or other such substance at any time during such Person's performance of any portion of the Work at the Project Site. Subject to requirements of Applicable Law, Contractor shall perform drug and alcohol testing on its Subcontractors, agents and Labor for purposes of such Person's hiring, treatment and/or annual physical. Additionally, Contractor shall perform, or cause its Subcontractors and agents to perform, a drug and alcohol test on each of their respective employees prior to any such employee first entering the Project Site to perform any Work. Contractor shall immediately identify and remove from its or its Subcontractors' employment at the Project Site any Person (whether in the charge of Contractor or any of its Subcontractors) who is in possession of or under the influence of any dangerous or controlled drug, alcohol or other such substance at any time during such Person's performance of any portion of the Work, excluding any Person using a prescription drug under supervision and approval from a medical doctor, or any other Person who does or whose actions may create any unsafe condition or other situation that may cause damage or harm to any Person or property, including any Person using a prescription drug under supervision and approval from a medical doctor. Contractor's Drug and Alcohol Abuse Policy is attached as Exhibit L. This policy does not apply to Owner and its Personnel. Owner shall enforce its own drug and alcohol policy with respect to its Personnel.

(d) Arms and Ammunition. Contractor and its Personnel, shall not possess, give, barter or otherwise dispose of, to any Person or Persons, any arms or ammunition of any kind at the Project Site, or permit or suffer the same as aforesaid and shall at all times assure that the Project Site is kept free from arms and ammunition. No hunting of any kind by Contractor or its Personnel, or other invitees, shall be permitted on the Project Site. Contractor shall immediately identify and remove from its or its Subcontractors' employment at the Project Site any Person that violates this provision.

(e) Disorderly Conduct. Contractor shall be responsible for the conduct and deeds of its Labor and its Subcontractors' Labor relating to the Agreement and the consequences thereof. Contractor shall at all times take all reasonable precautions to prevent any unlawful, riotous or disorderly conduct by or among such Labor and for the preservation of peace, protection and safety of Persons and property in the area of the Project Site against the same. Contractor shall not interfere with any members of any authorized police, military or security force in the execution of their duties.

(f) Labor Disputes. Contractor shall use reasonable efforts to minimize the risk of labor-related delays or disruption of the progress of the Work. Contractor shall promptly take any and all reasonable steps that may be available in connection with the resolution of violations of collective bargaining agreements or labor jurisdictional disputes, including the filing of appropriate processes with any court or administrative agency having jurisdiction to settle, enjoin or award damages resulting from violations of collective bargaining agreements or labor jurisdictional disputes. Contractor shall advise Owner promptly, in writing, of any actual or threatened (in writing) labor dispute, of which Contractor has knowledge, that might materially affect the performance of the Work by Contractor or by any of its Subcontractors. Notwithstanding the foregoing, the settlement of strikes, walkouts, lockouts or other labor disputes shall be at the discretion of the Party having the difficulty.

2.3.14 Safety and Emergencies.

(a) Safety. Contractor shall initiate and maintain safety precautions and programs to conform with Applicable Laws, Applicable Permits, Exhibit A, or other requirements designed to prevent injury to all Persons (including members of the public and the employees, agents, contractors, consultants and representatives of Owner, Contractor and its Subcontractors, and other contractors and subcontractors) and all public and private property (including structures, sewers and service facilities above and below ground, along, beneath, above, across or near the Project Site) that are at or near the Project Site that are in any manner affected by the performance of the Work. Such precautions and programs shall include prevention of damage or injury to local flora and fauna. Contractor shall erect and maintain reasonable safeguards for the protection of Labor and the public. Contractor shall exercise reasonable efforts to eliminate or abate all reasonably foreseeable safety hazards created by or otherwise resulting from performance of the Work. Contractor shall, and shall cause all of its Labor, agents, invitees, and Subcontractors to follow the safety plan set forth in Exhibit L (the "Safety Plan") and to follow all other reasonable safety measures and procedures implemented by the Owner at the Project Site.

(b) Compliance with Safety Plan. Contractor shall be responsible for and shall notify Owner as soon as Contractor becomes aware of any injury resulting from a failure of its agents, invitees, Labor, or Subcontractors to abide by the requirements of the Safety Plan set forth in Exhibit L, in each case in connection with performance of the Work.

(c) Emergencies. In the event of any emergency endangering Persons or property during performance of the Work, Contractor shall take such action as may be reasonable and necessary to prevent, avoid or mitigate injury, damage or loss and shall, as soon as practicable, report any such incidents, including Contractor's response thereto, to Owner. Whenever Contractor has not taken reasonable precautions for the safety of the public or the protection of the Work or of structures or property on or adjacent to the Project Site, Owner may, but shall be under no obligation to, upon reasonable advance notice to Contractor and a reasonable opportunity to cure, take such action as is reasonably necessary under the circumstances. The taking of such action by Owner or Owner's failure to do so shall not limit Contractor's obligations or liability hereunder. Provided Contractor fails to timely act, Contractor shall reimburse Owner for any reasonable costs incurred by Owner in taking such actions in the event of an emergency.

2.3.15 Security. Contractor shall take reasonable precautions, consistent with Prudent Industry Practices, to provide for the security and protection: (a) of the equipment, machinery and components comprising the Equipment and the Project through the date of Project Substantial Completion, and (b) for the other property owned or leased by Contractor or any Subcontractor located at the Project Site at areas thereon provided by Owner or stored or warehoused off the Project Site through the date of Final Completion. Contractor shall use the same care to protect any of Owner's and Equipment Provider's property at any time in its possession or under its control while performing the Work as it does with its own property and shall be responsible for damage to such property resulting from Contractor's failure to take such precautions or use such care.

2.3.16 Clean-up. Contractor shall at all times keep the Project Site reasonably free from waste materials, rubbish and Hazardous Materials produced by the Work. As part of

the Work, Contractor will arrange and pay for disposal of sewage and wastes generated by Contractor or its Personnel as necessary to enable Contractor to perform the Work. Contractor shall maintain the Project Site in a neat and orderly condition throughout the performance of the Work. Prior to the Final Completion Date or as soon as practicable after the termination of this Agreement by Owner in accordance with the provisions of Article XII, Contractor shall (i) remove all Contractor equipment from the Project Site, (b) tear down and remove all temporary structures on the Project Site built by it or its Subcontractors and restore such areas to a condition consistent with that of a newly constructed plant (including the re-grading and/or re-seeding of disturbed areas, which re-seeding may occur after Final Completion if Owner reasonably approves), (c) reclaim, in accordance with the applicable Real Property Requirements, laydown areas, and other construction areas as required by the applicable Real Property Requirements, and (d) remove and dispose of all waste and rubbish generated by Contractor and its Subcontractors from and around the Project Site. Contractor shall provide to Owner all legally required waste disposal manifests, if any, upon request.

2.3.17 Damage to Roads. Contractor shall abide by the maintenance provisions set forth in the Road Maintenance Agreement (Exhibit K) and shall be responsible for (i) all damage it and its Subcontractors cause to state roads and highways (other than Township roads) in violation of Applicable Law, (ii) all damage Contractor or its Subcontractors cause to County roads, (iii) all damage caused by it and its Subcontractors to private roads or property of third parties, in each case in connection with performance of the Work.

2.3.18 Fire Prevention. Contractor shall be responsible for providing adequate fire prevention and protection at the Project Site and shall take all reasonable precautions to minimize the risk of fire at the Project Site. Contractor shall provide instruction to the Labor in fire prevention control. Contractor shall provide appropriate fire-fighting and fire protection equipment and systems at the Project Site in a manner consistent with those as would be provided by a prudent contractor constructing a comparable project in comparable terrain and climate to that of the Project. Notwithstanding the foregoing sentence, this Agreement shall not, and does not obligate Contractor's or any of its Subcontractors' employees to fight any fires. In the event of a fire, Contractor's or any of its Subcontractors' employees shall immediately take steps to ensure the safety of themselves and others and shall contact the local fire department to report such fire and to determine the appropriate actions. Contractor shall promptly collect and remove combustible debris and waste material from the Project Site and shall not permit such debris and material to accumulate.

2.3.19 Other Work. As part of the Work (and except as otherwise stated in the Scope of Work, Article V or elsewhere in this Agreement as being the responsibility of Owner or Equipment Provider), Contractor shall provide any other services or items not specifically described in this Agreement if providing such additional work or item is necessary to make the Project operable, free from Defects and capable of performing as specified in this Agreement.

2.4 Prudent Industry Practices for the Work/Compliance. Contractor shall perform the Work in a manner that is (a) in conformance with Prudent Industry Practices and the Quality Assurance Procedures; (b) in compliance with the terms of the Agreement, and all interconnection requirements attached hereto; (c) compliant with all Applicable Laws, Applicable Permits; and (d) in compliance with and not in violation of the terms of the Real

Property Requirements, including such that Owner would be in violation of the Real Property Requirements. In no event will references in any provision of this Agreement to one or more of the standards, guidelines, practices, regulations, laws, or Permits contained in this Section 2.5 be interpreted to limit the applicability of all such standards, guidelines, practices, regulations, laws, and Permits to such provision.

2.5 Commencement of Work; Project Schedule; Acceleration.

2.5.1 Access to Project Site. Contractor will commence performance of all off-site Work promptly after the Effective Date and upon receipt of an LNTP, including ordering "long lead time" Equipment. Contractor will not perform any clearing Work on the Project Site until Owner issues to Contractor a Notice to Proceed.

2.5.2 Project Schedule; Monthly Progress Reports.

(a) Contractor shall perform the Work in accordance with the Project Schedule.

(b) Contractor shall provide Owner with Monthly Progress Reports as further defined in Exhibit A which shall include progress reports, as compared to the Project Schedule, including the incorporation of delay and acceleration analyses where appropriate. Such Monthly Progress Reports shall be presented electronically and shall address all material elements of the Work. Contractor shall provide Owner with appropriate work and meeting facilities at the Site and shall conduct weekly and monthly project meetings at mutually agreeable locations or by telephone between representatives of Owner, Equipment Provider and Contractor to review the status of the Work. Contractor shall promptly notify Owner in writing at any time that Contractor has reason to believe that there will be a material deviation in the Project Schedule and shall set forth in such notice the corrective action planned by Contractor. Delivery of such notice shall not relieve Contractor of its obligations under Article VI.

2.5.3 Acceleration of Work. If, at any time or from time to time, Contractor fails to achieve or is reasonably likely to fail to achieve a Key Milestone by the date required therefor in the Project Schedule for any reason not otherwise excused under the terms of this Agreement, then, upon written request of Owner, Contractor shall promptly, but in any event within five (5) Business Days of such date, submit a written recovery plan with specific steps, tasks and subcontractor actions necessary to complete all necessary Work to the extent reasonably practicable by the dates for the remaining Key Milestones. Owner shall promptly submit reasonable suggestions to such written recovery plan. To the extent reasonable and feasible, Contractor shall incorporate such suggestions to such recovery plan or shall provide explanation for why such suggestions were not incorporated, which may include alternative Work acceleration proposals. Contractor shall diligently prosecute the Work in accordance with such recovery plan. Neither approval by Owner of such recovery plan nor Contractor's prosecution of the Work in compliance with such recovery plan shall (i) be deemed in any way to have relieved Contractor of its obligations under the Agreement relating to the failure to timely achieve any Key Milestone by the date required therefor, or (ii) be a basis for a Change Order or any other compensation or an increase in the Contract Price. Contractor shall not be entitled to a Change

Order or any other compensation or increase in the Contract Price in connection with the implementation of a recovery plan or any acceleration thereunder.

2.6 Hazardous Materials.

2.6.1 Contractor Duties. Contractor shall, and shall cause its Subcontractors to, comply with all Applicable Laws relating to Hazardous Material. Without limiting the generality of the foregoing: (a) Contractor shall, and shall cause its Subcontractors to, have a release prevention and response plan to contain and clean up any spills or emissions of Hazardous Materials by Contractor or its Personnel (such plan to be made available to Owner upon Owner's request); (b) Contractor shall, and shall cause its Subcontractors to apply for, obtain, comply with, maintain and renew all Applicable Permits required of Contractor by Applicable Laws regarding Hazardous Material that are necessary, customary or advisable for the performance of the Work; (c) Contractor shall, and shall cause its Subcontractors to have an independent Environmental Protection Agency identification number for disposal of Hazardous Material generated by Contractor if and as required under Applicable Laws; (d) Contractor shall conduct its activities under the Agreement, and shall cause each of its Subcontractors to conduct its activities, in a manner designed to prevent pollution of the environment or any other release of any Hazardous Material by Contractor and its Subcontractors in a manner or at a level requiring remediation pursuant to any Applicable Law; (e) neither Contractor nor its Subcontractors shall cause the release or disposal of Hazardous Material at the Project Site, bring Hazardous Material to the Project Site, or transport Hazardous Material from the Project Site, except as required for performance under the Agreement and in accordance with Applicable Law; (f) Contractor shall be responsible for the management of and proper disposal of all Hazardous Material released, brought onto or generated at the Project Site by it or its Subcontractors, if any; (g) if any spillage, discharge, emission, or release should occur through Contractor's actions, Contractor shall immediately notify Owner and take all reasonable steps necessary to: (1) stop and contain the spillage, discharge, emission, or release, (2) make any report(s) of the spillage, discharge, emission, or release as required under Applicable Law, and (3) clean-up the spillage, discharge, emission, or release as required by the applicable Government Authority; (h) Contractor shall cause all such Hazardous Material released, brought onto or generated at the Project Site by it or its Subcontractors, if any, (1) to be transported only by carriers maintaining valid Hazardous Materials transportation permits (as required) and operating in compliance with such permits and laws regarding the transportation of Hazardous Material and only pursuant to manifest and shipping documents identifying only Contractor as the generator of waste or Person who arranged for waste disposal, and (2) to be treated and disposed of only at treatment, storage and disposal facilities maintaining valid permits (as required) regarding Hazardous Material; (i) Contractor shall submit to Owner a list of all Hazardous Material to be brought onto or generated at the Project Site prior to bringing or generating such Hazardous Material onto or at the Project Site; and (j) Contractor shall keep Owner informed as to the status of all Hazardous Material on the Project Site and disposal of all Hazardous Material from the Project Site.

2.6.2 Environmental Releases.

(a) If Contractor or any of its Subcontractors releases any Hazardous Material on, at, or from the Project Site, or becomes aware of any Person who has stored, released or disposed of Hazardous Material on, at, or from the Project Site during the Work,

Contractor shall notify Owner in writing within one hour of becoming aware of such circumstance. If Contractor's Work is involved in the area where such release occurred, Contractor shall immediately stop any Work affecting the area.

(b) Contractor shall, at its sole cost and expense, diligently proceed to take all necessary and desirable remedial action to clean up and remediate fully and dispose of, in accordance with Applicable Laws and to Owner's reasonable satisfaction, any contamination caused by (i) any negligent release by Contractor or any of its Subcontractors of any Pre-Existing Hazardous Material (the Parties agree that simply discovering any Pre-Existing Hazardous Material or accidentally disturbing previously unknown Pre-Existing Hazardous Material is not a negligent release of such Pre-Existing Hazardous Material, but that Contractor will act reasonably and prudently with respect to same upon discovery), and (ii) any Hazardous Material that was brought onto or generated at the Project Site by Contractor or any of its Subcontractors, whether on or off the Project Site.

(c) If Contractor discovers any Pre-Existing Hazardous Material that has been stored, released or disposed of at the Project Site, Contractor shall immediately notify Owner in writing. If Contractor's Work involves the area where such a discovery was made, Contractor shall immediately stop any Work affecting the area and Owner shall determine a reasonable course of action. Contractor will not thereafter resume performance of the Work in the affected area except with the prior written permission of Owner. If and when Contractor is instructed to resume performance of the Work (after disposal or other decision by Owner regarding treatment of such Hazardous Substance), Contractor will be entitled to a Change Order as set forth in Section 9.5.1(g). Contractor shall not, and shall cause its Subcontractors to not, take any action that may exacerbate any such contamination.

(d) In addition to Contractor's obligations as set forth above, if Owner desires Contractor to perform all or part of any clean up and/or remediation that may become necessary as a result of the discovery of any such Pre-Existing Hazardous Material as described in Section 2.7.2(c) above, the clean up and remediation of which is not the responsibility of Contractor as set forth in Section 2.7.2(b)(i) above, it shall request a Change Order pursuant to Section 9.2. Further, if so requested by Owner, Contractor shall cooperate with and assist Owner in making the Project Site available for taking necessary remedial steps to clean-up/remediate any such contamination at Owner's expense as determined in accordance with Article IX; provided, however, that under no circumstances shall Contractor be required to participate in such clean-up/remediation of a Pre-Existing Hazardous Material if such release is not the responsibility of Contractor as set forth in Section 2.7.2(b)(i) above.

2.6.3 Recordkeeping. Contractor shall minimize the use of Hazardous Materials in performance of the Work and shall not utilize, or permit or cause any Subcontractor to utilize, such Hazardous Materials as are prohibited under Applicable Laws from being imported into or used in the United States. Contractor shall maintain an updated file of all safety data sheets for all Hazardous Materials used in connection with performance of the Work or at or near the Project Site or at any construction area related to the Project and shall update such file at least monthly and make it available on site in accordance with Applicable Law. Contractor shall maintain an accurate record and current inventory of all Hazardous Materials used in performance of the Work on at or near the Project Site or at any construction area related to the

Project and the record shall identify quantities, location of storage, use and final disposition of such Hazardous Materials.

2.6.4 Owner's Self-Help Rights. If Contractor fails or refuses to remove from the Project Site (or any areas adjacent thereto or any other areas where Contractor performs the Work) or properly dispose of such Hazardous Materials as required pursuant to Section 2.7, Owner may, after providing Contractor with reasonable notice and opportunity to cure, at its discretion perform such removal and/or disposal as it may deem to be reasonably necessary or appropriate and charge Contractor with the full cost of performing such work either directly or by offset of such cost from any payment then or thereafter due to Contractor. The taking of any action by Owner in connection with the removal or disposal of such Hazardous Materials shall not relieve Contractor of its obligations under this Agreement and any Applicable Laws or Applicable Permits.

2.7 Owner's Right to Inspect; Correction of Defects.

2.7.1 Right to Inspect. Owner and its authorized representatives shall have the right to inspect the Work and Contractor's records of inspections and quality control/quality assurance and shall have the right to maintain Personnel at the Project Site for such purpose, subject in all cases to Contractor's Safety Plan. Contractor shall use commercially reasonable efforts to include rights in all Subcontracts to permit Owner and any of their authorized representatives to audit, inspect, test and observe the Equipment at the facilities of any Subcontractor and the manufacturer of Equipment, and, if permitted, Contractor shall ensure reasonable, adequate and safe access to such facilities for such purposes, subject to any reasonable safety rules or restrictions imposed by such Subcontractor. If any portion of the Work should be covered contrary to the timely request of Owner or contrary to requirements specifically expressed in the Agreement, such portion of the Work shall, if requested by Owner, be uncovered for observation and shall be replaced at Contractor's expense. If any other portion of the Work has been covered which Owner has not specifically requested to observe prior to being covered, Owner may request to see such Work and Contractor shall uncover it. If such other portion of the Work is found not to be in accordance with the requirements of this Agreement, the cost of uncovering, replacement and re-covering shall be charged to Contractor. If such other portion of the Work is found to be in accordance with the requirements of this Agreement, Owner shall pay such costs pursuant to an appropriate Change Order in accordance with Article IX. Such inspection of any part of the Work shall in no way relieve Contractor of its obligation to perform the Work in accordance with this Agreement. If Contractor covers any portion of the Work after offering Owner the opportunity to inspect, then if Owner later requests Contractor to uncover such Work then Owner shall pay the costs to uncover unless such Work is found to contain a Defect.

2.7.2 Correction of Defects. Contractor shall, at its own cost and expense, correct or replace any Work that contains a Defect, or is not otherwise in compliance with the terms and requirements of the Agreement. Defective Equipment that has been replaced, if situated on the Project Site, shall be removed by Contractor at Contractor's sole cost and expense. If Contractor fails within a reasonable period of time, not to exceed ten (10) Business Days after it knows of such Defect or noncompliance or neglects to commence and continue correction of such Defect or noncompliance with diligence and promptness, Owner may upon

notice to Contractor, without prejudice to other remedies Owner may have under the Agreement, correct such Defect or noncompliance. In such event, an appropriate Change Order shall be issued deducting from payments then or thereafter due to Contractor the cost of correcting such Defect or noncompliance, including compensation for the costs to enforce this provision (including attorneys' fees) and any consultant's additional services and expenses made necessary by such neglect or failure. If payments then or thereafter due to Contractor are not sufficient to cover such amounts, Contractor shall pay the difference to Owner within ten (10) Business Days from Owner's request.

2.8 Inspection Not Approval. Owner will not be responsible for and will not have control over or charge of construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, and Owner will not be responsible for Contractor's failure to carry out the Work in accordance with this Agreement. Owner will not be responsible for or have control or charge over the acts or omissions of Contractor, any Subcontractor, or any of their agents or employees. No inspection made, failure to inspect, acceptance of Work, payment of money or approval given by Owner shall relieve Contractor of its obligations for the proper performance of the Work in accordance with the terms hereof. Owner may reject any Work with Defects or which is not in accordance with the requirements of the Agreement, regardless of the stage of completion, the time or place of discovery of error, and whether Owner previously accepted any or all of such Work through oversight or otherwise, except to the extent such discovery occurs after expiration of the Warranty Period. No approval given by Owner, in and of itself, shall be considered as an assumption of risk or liability by any such Person. Any such approval shall mean that the Person giving the approval has no objection to the adoption or use by Contractor of the matter approved at Contractor's own risk and responsibility. Contractor shall have no claim relating to any such matter approved, including any claims relating to the failure or inefficiency of any method approved.

2.9 Liens. Provided that Owner has paid Contractor in accordance with the requirements of this Agreement, Contractor shall, at Contractor's sole expense, discharge and cause to be released, whether by payment or posting of an appropriate surety bond in accordance with Applicable Law, within ten (10) days after receipt of a written demand from Owner, any Lien in respect to the Work, the Equipment, the Project Site, or any fixtures or personal property included in the Work (whether or not any such Lien is valid or enforceable) created by, through or under, or as a result of any act or omission (or alleged act or omission) of, Contractor or any Subcontractor, or other Person providing services or materials within the scope of Contractor's Work. Upon the failure of Contractor to promptly discharge or cause to be released any Lien as required by this Section 2.9, within ten (10) days after notice to Contractor, Owner may, but shall not be obligated to, pay, discharge or obtain a surety bond for such Lien and, upon such payment, discharge or posting of surety bond therefore, shall be entitled to immediately recover from Contractor the amount thereof together with all expenses incurred by Owner in connection with such payment, discharge or posting, or set off all such amounts against any sums owed by Owner to Contractor. Contractor shall notify Owner of the filing of any Lien against the Project, the Equipment, the Project Site, or any fixtures or personal property included in the Work promptly upon learning of the existence or filing of such Lien. Acceptance by Contractor of the final payment shall constitute a release by Contractor of Owner, Affiliates and every officer and agent thereof from all Liens (whether statutory or otherwise and including mechanics' or

suppliers' Liens), claims and liability hereunder with respect to any Work performed or furnished in connection with this Agreement, or for any act or omission of Owner or of any Person relating to or affecting this Agreement, except claims for which Contractor has delivered a Dispute Notice to Owner. No payment by Owner shall be deemed a waiver by Owner of any obligation of Contractor under this Agreement.

2.10 Cooperation.

(a) Contractor shall be responsible for coordinating work on the Project Site. Owner shall use commercially reasonable efforts to cause all Other Owner Contractors and Equipment Provider to comply with the reasonable coordination requirements imposed by Contractor, which coordination shall be intended to optimize completion of construction of the Project in a timely manner.

(b) Contractor shall cooperate with Owner in connection with Owner's efforts to obtain the approvals, certificates, financing and Permits for the Project.

(c) Contractor acknowledges that work may be performed by others at the Project Site during the execution of Work. Contractor further acknowledges that Owner, through itself or through its employees, Subcontractors or agents, will continue to work and perform activities in connection therewith at and around the Project Site during the execution of the Work. Contractor shall cooperate and cause its Subcontractors, and Owner shall use commercially reasonable efforts to cause the Other Owner Contractors to cooperate with Contractor, to assure that no Party unreasonably hinders or increases, or makes more difficult than necessary the work being done by the other Parties. Contractor shall perform the Work in full cooperation with such others (provided the Other Owner Contractors reasonably cooperate with Contractor) and to permit, without charge, reasonable access to, and use of, the Project Site, by others or by Owner, when such access or use is necessary for the performance and completion of the work of others.

(d) All material and labor shall be furnished, and the Work performed, will be properly coordinated and completed in accordance with the applicable schedules and the times of completion required by the Agreement with priority given in all instances to activities necessary to achieve Key Milestones in accordance with the Project Schedule, subject to Contractor's right to a Change Order in the event of a Force Majeure Event or Owner-Caused Delay.

(e) Contractor shall use reasonable efforts, and cause its Subcontractors to use their reasonable efforts, to assist Owner in creating, assessing and carrying out programs which shall, during all phases of the Work, minimize the impacts upon the Project Site caused by the Work. To the extent they do not materially adversely affect costs or the achievement of Key Milestones on or prior to the scheduled completion dates for such Key Milestones, as set forth in the Project Schedule, such programs shall include: (i) minimizing the impacts of noise and dust at and around the Project Site; and (ii) using local Labor and other resources whenever possible, to the extent such Labor is qualified and cost competitive.

2.11 Intellectual Property Rights. Contractor shall obtain and, to the extent described below, maintain all trade secrets, patents, copyrights, trademarks, proprietary rights or information, licenses or other intellectual property rights (collectively, the "Intellectual Property Rights") necessary for performance of the Work and the operation and maintenance of the Project. Contractor hereby grants to Owner an irrevocable, non-exclusive, perpetual, royalty-free license under all Intellectual Property Rights whether now existing or developed for the Work, now or hereafter owned, licensed to or controlled by Contractor or any of its Affiliates, to use the same to the extent necessary for the ownership, completion, operation, maintenance, repair, rebuilding, alteration and expansion of the Work (provided such alteration or expansion is within the Scope of Work for this Project) and all subsystems and components thereof. To the extent that the license granted to Owner above is predicated upon Intellectual Property Rights held by Contractor, Contractor will maintain those Intellectual Property Rights throughout the life of the Project.

2.12 Credit Support. Within thirty (30) Days following the Effective Date, but in any case no later than the date on which Notice to Proceed is issued, Contractor shall furnish to Owner a combination of ***[Payment and Performance Bond, Letter of Credit or Guaranty from Contractor's ultimate parent company ("Contractor's Parent")]***, with a limitation of liability of not less than the Contract Price (the "Parent Guaranty"), substantially in the form set forth in Exhibit P-3. Such Parent Guaranty shall remain in place until all the expiration of the Warranty Term. Contractor shall not be entitled to any increase in the Contract Price for the provision of such Parent Guaranty.

ARTICLE III

SUBCONTRACTORS

3.1 Subcontractors. Owner acknowledges that Contractor intends to have portions of the Work accomplished by Subcontractors qualified to perform such Work pursuant to written subcontracts between Contractor and such Subcontractors. Exhibit I sets forth a list of approved Major Subcontractors. Owner agrees to Contractor's use and engagement of Subcontractors; provided Contractor may not enter into any Major Subcontract with any Person not listed in Exhibit I or approved by Owner in writing (which approval shall not be unreasonably conditioned, withheld or delayed). Except as otherwise expressly provided in the Agreement, Contractor shall be solely responsible for engaging, managing, supervising and paying all Subcontractors and Persons directly or indirectly employed by them. Contractor shall require that all Work performed and all Equipment provided by Subcontractors be received, inspected and otherwise furnished in accordance with the Agreement. Contractor shall be solely liable for all acts, omissions, liabilities and Work (including Defects therein) of its Subcontractors and whenever this Agreement refers to the negligence, fault or omission of Contractor, it shall include the negligence, fault or omission of Contractor's employees, Subcontractors and their agents and employees, and other persons performing portions of the Work under a contract with Contractor.

3.2 Subcontracts. All contracts with Subcontractors shall be consistent with the terms and provisions of the Agreement. At a minimum, all subcontracts shall require the Subcontractors to comply with Applicable Laws, and shall provide that Owner has the right of

inspection as provided hereunder and require such Subcontractors to (a) be subject to the Labor obligations hereunder as well as the safety and security provisions of the Agreement, (b) provide guarantees and warranties with respect to its portion of the Work and the Equipment and (c) obtain, maintain and keep in force throughout the time during which they are engaged by Contractor such insurance coverages as are required of Contractor under this Agreement. All subcontracts shall preserve and protect the rights of Owner, shall not prejudice such rights and shall require each Subcontractor to use reasonable efforts to enter into similar agreements with other Subcontractors. Contractor shall require and shall cause all Subcontractors to perform their portions of the Work in accordance with the requirements of this Agreement. Contractor shall ensure that Contractor's rights and obligations under each Subcontract may be, without requiring the prior consent of the relevant Subcontractor, in whole or in part, assigned and delegated by Contractor to Owner. Each Subcontract shall provide that upon notification to the Subcontractor from Owner, that: (a) the Agreement has been terminated; (b) Contractor's right to proceed with the Work has been terminated; and (c) Owner will thereafter be assuming Contractor's obligations under such Subcontract, then such Subcontractor shall continue to perform its responsibilities under such Subcontract for the benefit of Owner and shall recognize Owner as being vested with all the rights and responsibilities of Contractor under such Subcontract. Notwithstanding the foregoing, it is specifically understood and agreed (and each Subcontract shall clarify) that no Subcontractor shall have any right to look to Owner for the performance of Contractor's obligations under any Subcontract unless and until such Subcontractor has received such notice from Owner. Each Major Subcontract shall require the Subcontractor to execute an acknowledgment of, and agreement to, the provisions of this Section 3.2. Contractor will deliver to Owner a copy of each such executed acknowledgment and agreement within forty-eight (48) hours after each Subcontractor's execution of its Subcontract.

3.3 Owner as Third Party Beneficiary. No Subcontractor is intended to be nor shall it be deemed a third party beneficiary of this Agreement. Nothing contained herein shall obligate Owner to pay any Subcontractor and Contractor shall be solely responsible for paying each Subcontractor in accordance with the applicable Subcontract or purchase order between Contractor and the Subcontractor; provided, however, each agreement between Contractor and a Subcontractor with respect to the Work shall name Owner as an intended third-party beneficiary.

3.4 Subcontractor Warranties. Without in any way derogating Contractor's representations and warranties and other testing requirements and guarantees set forth herein with respect to all of the Work, Contractor will require all Subcontractors to provide product and service warranties at a minimum equal to the Warranties in Article VII. Contractor shall use reasonable efforts to obtain from all Subcontractors any representations, warranties, guarantees, and obligations offered by such Subcontractors and to negotiate the longest reasonably practicable warranty periods at no additional cost with respect to design, materials, workmanship, Equipment, tools, supplies, and other items furnished by such Subcontractors. Contractor shall assign all representations, warranties, guarantees, and obligations of all Subcontractors at the request and direction of Owner, and without recourse to Contractor, to Owner upon default by Contractor or termination or expiration of this Agreement; provided, however, that, notwithstanding such assignment, Contractor shall be entitled to enforce each such representation, warranty, guaranty, and obligation so long as Contractor has any liability under this Agreement. To the extent assignable, Contractor hereby assigns to Owner, effective

as of the end of the Warranty Period for the Project, all representations, warranties, guaranties and obligations of all Subcontractors.

ARTICLE IV

CONTRACT PRICE

4.1 Contract Price. As full consideration to Contractor for the complete performance of the Work and Contractor's other covenants in this Agreement, Owner will, subject to the provisions of this Article IV and the Schedule of Value attached hereto as Exhibit B-1, pay Contractor [_____] Dollars ($_____) (the "Contract Price"). The Contract Price may be adjusted only pursuant to a Change Order issued in accordance with the provisions of Article IX. Subject to the terms and conditions of this Article IV, the Contract Price shall be paid by Owner to Contractor, in accordance with the procedures set forth in Exhibit C-2, by way of (a) monthly progress-based payments, and (b) milestone payments.

4.2 Taxes Contractor Taxes.

(a) Contractor shall be responsible for all Taxes, transportation fees, freight, packing costs, custom duties, personnel fees and all other costs associated with the performance of the Work and any other of its duties and responsibilities under this Agreement, unless otherwise stated in this Agreement. The Parties agree that the Contract Price, as stated in Section 4.1, includes all Taxes, excluding materials that are tax exempt under Applicable Law.

(b) To the extent Owner indicates to Contractor that it will obtain an exemption which is thereby factored into the original Contract Price and Contractor complies with Owner's reasonable instructions for implementing such exemption for purposes of avoiding payment of sales and use taxes to Subcontractors or Suppliers for goods and services subject to such exemption, then Owner shall reimburse Contractor for the amount of any sales or use taxes that Contractor is required to pay, to the extent excluded from the original Contract Price, notwithstanding the applicability of such exemption; provided, however, Contractor shall procure and provide to Owner such documents evidencing payment of such taxes as Owner may be reasonably required to enable Owner to obtain a refund of such paid taxes.

(c) At any time and from time to time upon Owner's reasonable request, Contractor will allow Owner and its designees the opportunity to review all purchases by Contractor and its Subcontractors (and will in this regard provide all relevant information regarding the same (including separate break-out pricing for goods and services, if reasonably available)) for the purpose of determining whether such exemptions or rebates apply and have been or should have been granted.

(i) If Owner directs Contractor to seek an exemption or rebate and Contractor fails to seek such exemption or rebate for an item, Owner will be relieved of its obligation under Section 4.2.2(a) to reimburse Contractor for the taxes on such item.

(ii) If Contractor seeks exemption or rebate on an item in accordance with the foregoing, but the same is not granted, Owner shall reimburse Contractor for the disallowed amount, and Contractor will assign to Owner its right to seek a refund of, or

rebate in connection with, the amount in question and will reasonably cooperate with Owner to seek such refund and/or rebate. If such assignment is not allowed under Applicable Law, then Contractor will, at Owner's direction and expense, seek such refund and, if received, pay over such refund to Owner, and all costs of seeking a refund or appealing the denial of an exemption, refund or rebate shall be borne by Owner.

(iii) Any rebates received by Contractor or its Subcontractors in connection with any Contractor Taxes reimbursed by Owner under Section 4.2.2 from the purchase of any materials, supplies or equipment in connection with the Work shall be immediately paid over to Owner.

(d) Contractor shall promptly provide Owner with notice of any audits, assessments or challenges by any Governmental Authority with respect to Contractor's Taxes, which are to be reimbursed by Owner. In the event of any such audit, assessment or challenge, Owner shall have the right to receive copies of all correspondence and documents relating thereto, to attend and participate in all meetings with the Governmental Authority and to participate in and control all mediation, and litigation related thereto, provided the cost thereof is borne by Owner and Owner indemnifies, defends and holds Contractor harmless with respect thereto.

(e) To the extent Owner is obligated under Applicable Laws to pay any of Contractor's Taxes, Contractor shall: (i) furnish to Owner all information and reports required to be furnished to the appropriate taxing authorities in connection with all such Contractor's Taxes; and (ii) reimburse Owner for the full amount of such Contractor's Taxes paid by Owner that are not otherwise required to be reimbursed by Owner to Contractor under Section 4.2.2. Contractor will have no responsibility for property taxes assessed on the Work or the Project Site.

4.2.2 Owner Taxes.

(a) If Contractor is assessed any taxes, for tangible personal property and services purchased for the purpose of and in conjunction with constructing of the Project despite having complied with the requirements of Section 4.2.1, Contractor will invoice Owner for reimbursement of such assessment as part of each applicable Request for Payment, and shall include therewith all documentation necessary to evidence Contractor's and Subcontractor's payment of such taxes. For the avoidance of doubt, Owner will not be responsible: (i) to reimburse Contractor for those Contractor's Taxes as described in Section 4.2.1(a); or (ii) for any penalties or interest related to non-payment or late payment of any required Contractor's Taxes, unless such non-payment or late payment is due to or caused by the instruction of Owner to Contractor, as provided in Section 4.2.1(c)(ii).

(b) Owner shall administer and pay all sales, use, gross receipts, income, value-added and withholding taxes and duties, and any other similar taxes and/or contributions (including penalties and interest related to such taxes), imposed by any taxing authority: (i) that are measured by Owner's sale of electricity from the Project; and (ii) upon services or labor provided by Owner or any Other Owner Contractors in connection with the

Project (collectively "Owner's Taxes"). Owner shall furnish to the appropriate taxing authorities all required information and reports in connection with all such Owner's Taxes.

(c) To the extent Contractor is legally obligated to pay any of Owner's Taxes, Owner shall: (i) furnish to Contractor all information and reports required to be furnished to the appropriate taxing authorities in connection with all such Owner's Taxes; and (ii) reimburse Contractor for the full amount of such Owner's Taxes paid by Contractor.

4.3 Disputed Invoices. If there is any dispute about any amount invoiced by Contractor, the amount not in dispute shall be promptly paid.

4.4 Retainage.

4.4.1 Retainage. Owner shall withhold, as retainage (the "Retainage") an amount equal to ten percent (10%) of all payments made to Contractor under this Agreement.

4.4.2 Use of Retainage. The Retainage shall be held by Owner as security for the performance of Contractor's obligations hereunder and any interest thereon shall accrue for the account of Owner and not Contractor. The Parties acknowledge that because the Retainage shall constitute security, Owner may utilize the same to, among other things, cure any Contractor Event of Default, offset Delay Liquidated Damages, pay unpaid Contractor suppliers, remove Liens filed by Subcontractors and cover any expenses associated therewith, and/or offset against any other amounts payable by Contractor to Owner under this Agreement.

4.4.3 Release of Retainage. Within fifteen (15) days after the Project Substantial Completion Date, subject to Section 4.5 Owner shall release to Contactor all cash Retainage, except for a cash amount equal to two hundred percent (200%) of the projected costs to complete any remaining items on the Punch Lists, as such cost is reasonably estimated by Owner. Within fifteen (15) days after the Final Completion Date, Owner shall release the remaining cash Retainage (less any amount utilized by Owner to perform any Punch List items).

4.5 Conditions of Payment. Contractor's right to receive any payment to be paid to it hereunder is conditioned upon its submitting a Request for Payment to Owner in the form set forth as Exhibit B-2, which shall be based upon completion for milestones in the Schedule of Values and an updated projection of the amount of anticipated monthly Requests for Payment for the remainder of the project duration. With each such Request for Payment, Contractor will submit evidence reasonably acceptable to Owner of performance of the Work for which payment is sought that demonstrates the claimed completion of milestones in the Schedule of Values, and written waivers and releases in the form of Exhibit O-1, Exhibit O-2, Exhibit O-3 and Exhibit O-4 (as applicable) duly executed by Contractor and all Major Subcontractors. Within forty five (45) Days after its receipt of a Request for Payment, provided Contractor has satisfied the foregoing conditions, Owner shall pay to Contractor the amount that remains after the deduction from the amount requested in the applicable Request for Payment of the following amounts: (a) any portion thereof that Owner in good faith disputes as not being due and owing, (b) any overpayment made by Owner for any previous period, (c) any Delay Liquidated Damages payable by Contractor, (d) any amounts withheld pursuant to Sections 4.6 and 4.8 and (e) any costs incurred by Owner in enforcing any provision hereof (including attorneys' and other

consultants' fees) regardless of whether such provisions expressly provide for withholding or set-off. Contractor may only submit one (1) Request for Payment per calendar month.

4.6 Deductions from Payments. Notwithstanding any other provision to the contrary contained herein, Owner may withhold and shall have no obligation to make payments to Contractor hereunder and Owner may decide not to certify payment or may nullify the whole or a part of a certification for payment made pursuant to a previous Request for Payment to such extent as may be reasonably necessary to protect Owner from loss because of (a) Defects in the Work not timely remedied; (b) third-party claims filed against Owner, (c) Liens filed (that have not been bonded off as described in Section 2.9 or are not covered by insurance maintained hereunder); (d) failure of Contractor to make undisputed payments when due to Subcontractors; (e) damage to Owner or another contractor, including damage to the property of Owner or any of its Affiliates, to the extent the costs of such damages are not covered by insurance maintained hereunder; (f) damages caused by Contractor or its Personnel; or (g) Contractor's failure to deliver a recovery plan as set forth in Section 2.6.3 or the failure of Contractor to diligently proceed with the recovery plan. Contractor shall not have any rights of termination or suspension hereunder as a result of Owner's exercise or attempted exercise of its rights under this Section 4.6 Owner shall release payments withheld pursuant to this Section 4.6 within thirty (30) days from the date when Contractor cures all such events or breaches to the reasonable satisfaction of Owner.

4.7 Effect of Payment. Payment of the Contract Price shall not constitute Owner's approval of any portion of the Project or the Work which has been determined not to be, or subsequently is determined not to have been, performed in accordance with the requirements of this Agreement.

4.8 Set off. Owner may deduct and set off against any part of the balance due or to become due to Contractor under this Agreement or against any Retainage (a) any Liquidated Damages due or accrued but not paid from Contractor to Owner hereunder that are not then the subject of dispute resolution under Section 14.2, or (b) any other amounts that are due from Contractor to Owner under or in connection with this Agreement.

4.9 No Payment if Default. Notwithstanding any other provision to the contrary contained herein, Owner shall have no obligation to make any payment to Contractor at any time when a Contractor Event of Default has occurred and is continuing.

4.10 Interest. Any sums not timely paid shall accrue interest at Prime Rate plus two percent (2%) from the date due until paid.

ARTICLE V

OWNER RESPONSIBILITIES

In addition to Owner's other duties and responsibilities under and pursuant to this Agreement, Owner shall have the following general obligations and responsibilities:

5.1 Project Site Access. As required by Project Schedule, Owner shall provide access to the Project Site to Contractor, Subcontractors and their Personnel as necessary to perform the Work.

5.2 Permits. Owner shall, with Contractor's reasonable assistance, timely obtain and maintain, at its own cost and expense, all Owner Permits, copies of which shall be delivered to Contractor upon its request. In addition, Owner shall execute such applications as Contractor may reasonably request in connection with obtaining any of Contractor Permits.

ARTICLE VI

STAGES OF COMPLETION OF THE WORK

6.1 Work Completion. Contractor shall complete the Work in strict compliance with the Project Schedule (Exhibit C-1) and shall certify completion of such portions of the work in accordance with the process required in Exhibit Q (Form of Work Completion Certificates).

6.1.1 Commencement of Construction Liquidated Damages. Owner and Contractor acknowledge and agree that any failure of Contractor to Commence Construction (as such term is defined in the US Tax Code) to occur on or before _____will directly cause substantial damage to Owner, which damage cannot be ascertained with reasonable certainty. Thus, if such failure occurs, Contractor shall pay to Owner, as liquidated and agreed damages and not as a penalty, the following amounts (collectively, "Commencement of Construction Liquidated Damages") ***[To be discussed depending on technology and Bidder's tax credit assumptions.]***

6.1.2 Substantial Completion Delay Liquidated Damages. Owner and Contractor acknowledge and agree that any failure of Contractor to cause Project Substantial Completion to occur by the applicable Guaranteed Substantial Completion Date will directly cause substantial damage to Owner, which damage cannot be ascertained with reasonable certainty. Thus, if such failure occurs, Contractor shall pay to Owner, as liquidated and agreed damages and not as a penalty, the following amounts (collectively, "Substantial Completion Liquidated Damages"):

Days that Project Substantial Completion is Delayed Beyond Guaranteed Substantial Completion Date	**Substantial Completion Liquidated Damages**
Day 1 to Day ___	$_____ per Day
Day ___ and beyond.	$_____ per Day

6.1.1Contractor shall not be relieved from the obligation to meet the Guaranteed Substantial Completion Dates except to the extent any such date is extended pursuant to a Change Order or a written notice from Owner.

6.2 Project Mechanical Completion. ***[Definition to be determined by Bidder's technology, Certificate of Mechanical Completion and Mechanical Completion Checklist in Exhibits.]***

6.3 Project Substantial Completion.

6.3.1 Conditions of Project Substantial Completion. "Project Substantial Completion" shall be achieved when each of the following conditions has been satisfied:

(a) all Equipment comprising the Project has been installed as required;

(b) the Project has been connected to and synchronized with the Grid, and is capable of operating as a fully-integrated electricity generating plant that safely and continuously generates electric power in accordance with the requirements of all Applicable Laws and this Agreement;

(c) Contractor and Owner have agreed upon the Final Punch List for all Work, as described in Section 6.7.1(d);

(d) Contractor has fully completed all Work (including all Work on or comprising all remaining Project for the Project), except those items on the agreed upon the Final Punch List;

(e) any Defects found have been corrected;

(f) Contractor (i) has demonstrated through Performance Testing in accordance with Exhibit C-4 that the Project has achieved the Performance Guarantee, or (ii) has demonstrated through Performance Testing results in accordance with Exhibit C-4 that the Project has not achieved the Performance Guarantee and that Contractor has paid all applicable Performance Liquidated Damages accordance with Exhibit C-5.

(g) Contractor has provided Owner with copies of all Contractor Permits;

(h) all Spare Parts requested by Owner under Section 2.4.9 have been delivered by Contractor to the Project Site in accordance with Section 2.4.9; provided that any Spare Parts requested by Owner within two (2) weeks prior to the date of submittal of the Project Substantial Completion Certificate which have not been delivered by such date will be added to the Final Punch List;

(i) Contractor has paid all Delay Liquidated Damages due under this Agreement, if any;

(j) Contractor has delivered to Owner copies of all test reports and electrical schematics related to the Work;

(k) Contractor has delivered draft copies of the Operating Manual and Job Books in accordance with Sections 2.4.10(b) and (e);

(l) Contractor has delivered to Owner all interim progress payment or final, as the case may be, waivers of mechanic's and materialman's Liens from all Subcontractors for Work completed through such date; and

(m) Owner has confirmed or is deemed to have confirmed in writing that the conditions set forth hereinabove have occurred, pursuant to Section 6.6.2.

6.3.2 Confirmation of Project Substantial Completion. When Contractor believes it has satisfied all of the requirements for Project Substantial Completion, Contractor shall notify Owner in writing. Within five (5) Business Days of receipt of such notice, Owner shall notify Contractor in writing whether Owner agrees that Contractor has fulfilled the requirements of Project Substantial Completion. If Owner believes Contractor has not fulfilled such requirements, Owner shall specify in such notice to Contractor in reasonable detail the reasons that such requirements have not been met. Contractor shall promptly act to correct such deficiencies so as to achieve Project Substantial Completion as soon as practicable. Following any such remedial action, Contractor shall deliver to Owner a new notice and the provisions of this Section 6.6.2 shall apply with respect to such new notice in the same manner as they applied to the original notice. If Owner fails to respond within seven (7) Business Days to the Project Substantial Completion Certificate provided by Contractor, Project Substantial Completion shall be deemed to have been achieved; provided, however, such deemed Project Substantial Completion shall not relieve Contractor from any of its obligations hereunder, including Contractor's obligations to achieve Project Substantial Completion. For all purposes of this Agreement, Project Substantial Completion Date shall be the date the Project Substantial Certificate is ultimately accepted by Owner or, if applicable, deemed accepted by Owner.

6.4 Punch List for Project.

6.4.1 Development of Punch List. Prior to submittal of the initial Project Substantial Completion Certificate, Contractor will prepare and deliver to Owner a written list setting forth all of the items that remain to be performed in order to complete the Work, provided such items of Work on such list shall only be items that are (i) minor in nature, and (ii) not related to the functionality, utility, operation or restoration Work, and (iii) not related to the compliance of any such Work with any Applicable Laws or Applicable Permits. Such list shall also state the proposed time limits within which Contractor will complete each of such remaining Work items. Upon its receipt of such list, Owner will reasonably review the same and notify Contractor of any proposed revisions thereto. Owner's Project Manager and Contractor's Project Manager will then meet and consult in good faith to agree upon the definitive, final version of such list (including the approved time limits within which Contractor will perform such remaining Work items) (such final list, as agreed to by Owner, the "Final Punch List").

6.4.2 Completion of Punch List Items. Once any Punch List hereunder is agreed upon, Contractor will promptly begin the items thereon. Contractor's Work on such Punch Lists shall be performed in a manner that does not unreasonably interfere with the commercial

operation of the Project. Owner will provide Contractor with reasonable access to the Project Site so that Contractor may perform the Work on the Punch Lists.

6.5 Final Completion.

6.5.1 Conditions of Final Completion. "Final Completion" will be achieved when each of the following conditions has been met:

(a) Project Substantial Completion has occurred;

(b) Contractor has completed performance of all of the Work, including all Punch List items, except for those items that Owner and Contractor agree are to be completed by Owner (and Contractor has paid all amounts due Owner in connection therewith);

(c) Owner has received a final list and summary of the work performed by all Subcontractors and verification of the payment thereof;

(d) Contractor has provided to Owner all Lien releases as required under Section 4.5 (provided that Contractor's Final Lien Waiver and Release, in substantially the form of Exhibit O-3 attached hereto from Contractor and Subcontractor's Final Lien Waiver and Release in the form of Exhibit O-4 attached hereto from each Major Subcontractor, shall be given concurrently with Final Completion and payment of amounts due by Owner in connection therewith);

(e) all documentation, including data points and redlines, as necessary to accurately reflect the Project as constructed in the As-Built Drawings shall have been delivered to, and accepted by, Owner;

(f) all sets of the final Operating Manuals and final Job Books have been delivered to Owner as required under Section 2.4.10; and

(g) Owner has confirmed or is deemed to have confirmed in writing that the conditions set forth hereinabove have occurred, pursuant to Section 6.8.2.

6.5.2 Confirmation of Final Completion. When Contractor believes that it has satisfied all of the requirements for Final Completion, Contractor shall notify Owner in writing. Within five (5) Business Days of receipt of such notice, Owner shall notify Contractor in writing whether Owner agrees Contractor has fulfilled the requirements of Final Completion. If Owner believes Contractor has not fulfilled such requirements, Owner shall specify in such notice to Contractor in reasonable detail the reasons that such requirements have not been met. Contractor shall promptly act to correct such deficiencies so as to achieve Final Completion as soon as practicable. Following any such remedial action, Contractor shall deliver to Owner a new notice and the provisions of this Section 6.8.2 shall apply with respect to such new notice in the same manner as they applied to the original notice. If Owner fails to respond within five (5) Business Days to the Final Completion Certificate provided by Contractor, Contractor shall provide a second Final Completion Certificate, which will include a reference to the previously provided certificate and a statement to the effect that failure to respond to such second certificate shall result in Final Completion being deemed to have been achieved. If Owner fails to respond to the

second Final Completion Certificate within seven (7) Business Days following receipt of such second certificate, Final Completion shall be deemed to have been achieved; provided, however, such deemed Final Completion shall not relieve Contractor from any of its obligations hereunder, including Contractor's obligations to achieve Final Completion. For all purposes of this Agreement, the date of achievement of Final Completion shall be the date the on which the relevant completion notice accepted by Owner or, if applicable, deemed accepted by Owner.

6.6 Reasonable Amount; Exclusive Remedy. The Parties agree that the sum of the amounts fixed as Construction Commencement Liquidated Damages and Substantial Completion Liquidated Damages ("Delay Liquidated Damages") are fair and reasonable, considering the damages that Owner would sustain in the described event, and that these amounts are agreed upon and fixed as liquidated damages because of the difficulty of ascertaining the exact amount of damages that would be sustained. Except as set forth in Article XII, collection of Delay Liquidated Damages shall constitute Owner's exclusive remedy and Contractor's exclusive liability for Contractor's failure to cause, as applicable, Project Substantial Completion to occur by the Guaranteed Substantial Completion Date, as such date may be extended by any executed Change Order. The foregoing sentence shall not relieve Contractor from its obligations (nor limit Owner's ability to seek other available remedies in connection with Contractor's failure to comply with its obligations) to perform the Work in accordance with this Agreement or from its Warranty or other obligations under this Agreement.

6.6.1 Limitation of Liability for Delay Liquidated Damages. Contractor's aggregate liability for Delay Liquidated Damages shall not exceed an amount equal to _____percent (___%) of the Contract Price.

6.6.2 Offset Rights; Security for Obligations. Owner shall have the right to offset any amounts owing to Owner under this Article VI against payments or other amounts owing to Contractor and to exercise its rights against any security provided by or for the benefit of Contractor, in such order as Owner may elect in its sole discretion.

ARTICLE VII

WARRANTIES

7.1 Warranty Provisions.

7.1.1 Warranty. As the "Warranty," Contractor warrants to Owner that: (a) all Equipment and Spare Parts shall be new, unused and undamaged when installed, (b) all such Equipment, Spare Parts and all Work shall (i) be free from Defects, (ii) conform to all applicable requirements of all Applicable Laws, Applicable Standards and the Agreement and (iii) be in strict compliance with the Scope of Work; (c) the services comprising the Work will be performed with Contractor's best skill and judgment in a good and workmanlike manner; (d) the Work will conform to, and be performed in accordance with, all Applicable Laws, Prudent Industry Practices, and the other terms and requirements of the Agreement; and (e) none of the Work and other services rendered by or through Contractor hereunder, nor the use of the Work by Owner, nor any license granted hereunder, infringes, violates or constitutes a misappropriation of any Intellectual Property Rights.

7.1.2 Warranty Period; Extensions. The Warranty shall commence on the Project Substantial Completion Date and shall continue for a period of ____ (__) years after Project Substantial Completion Date (the "Warranty Period"); *provided, however*, that if any component of the Work is repaired or replaced pursuant to the Warranty Service, then the Warranty Period with respect to such component shall be continued for a period that is the longer of (a) the remainder of the original Warranty Period, or (b) one (1) year from the date of completion of the repair or replacement or re-performance thereupon, *provided*, *further*, that if fifteen percent (15%) or more of any type of component of the Work requires repair or replacement within the Warranty Period, then the Warranty Period for that type of component shall be automatically extended for all such components of that type for an additional one (1) year from the later of (i) the date of expiration of the Warranty Period or (ii) the date of the completion of Warranty Service to correct the failure that caused the percentage of failures to reach fifteen percent (15%). At expiration of the Warranty Period, any unexpired warranties relating to the Work shall be assigned to Owner (and Contractor will promptly execute such documents as may be necessary to cause such assignment to occur).

7.1.3 Correction of Deficiencies. If the Work or Equipment or Spare Part is in breach of any Warranty set forth in this Section 7.1, Contractor shall promptly cure such breach as promptly as practicable upon being given written notice thereof ("Warranty Service"). Owner shall provide Contractor with reasonable access to the Project in order to perform its obligation under this Article VII and the Parties shall schedule such work as necessary so as to minimize disruptions to the operation of the Project. Owner shall have the right to operate and otherwise use the Equipment until such time as Owner deems prudent to suspend such operation or use in order to accommodate Contractor's Warranty Services. If Equipment has been placed in service, Contractor shall perform such Warranty Service as soon as Owner deems it prudent to remove the same from service for any Warranty Service by Contractor; provided that the Warranty Period will continue until Contractor has completed such Warranty Service. Neither payment by Owner, nor any other provision of this Agreement, nor partial or entire use or possession of the Work by Owner shall relieve Contractor of liability with respect to the Warranty contained in this Article VII. Contractor shall bear all costs and expenses directly associated with the Warranty Services, including, all costs of services and equipment and of any necessary disassembly, removal, replacement, transportation, reassembly, reinstallation, and retesting, as well as reworking, repair or replacement of such Work, and reassembly of structures, electrical work, machinery, Equipment, or any other obstruction as necessary to give access to the non-conforming item for correction, and for removal, repair and/or replacement of any damage to other work or property that arises from the breach of Warranty and any applicable insurance deductibles. Upon completion of Warranty Service, all Equipment shall be returned or restored to its proper condition (subject to normal wear and tear), including but not limited to fit alignment, adjustment, operability and finish. If Contractor is obligated to repair, replace or renew any Equipment, item or portion of the Work hereunder, Contractor will undertake a technical analysis of the problem and correct the "root cause" unless Contractor can demonstrate to Owner's reasonable satisfaction that there is no material risk of the reoccurrence of such problem. Contractor's obligations under this Section 7.1 shall not be impaired or otherwise adversely affected by any actual or possible legal obligation or duty of any vendor or Subcontractor to Contractor or Owner. No correction or cure shall be considered complete until Owner has reviewed and accepted such remedial work. So long as Contractor has been notified of a breach of Warranty prior to the end of the Warranty Period, the obligation of Contractor to

provide Warranty Service to correct such noncompliance, Defect or breach of Warranty shall survive the expiration of the Warranty Period.

7.1.4 Conformance of Warranty Service to Warranty. Contractor warrants that all materials incorporated into the Work as part of repairs to and replacements of the Work by Contractor or any Subcontractor, and repairs to and replacements of the Work pursuant to the Warranty Service shall conform to the requirements of this Agreement and the Warranty. Contractor shall perform, at its cost and expense, such tests as Owner may reasonably request to verify that any correction, repair, replacement or re-performance of the Work pursuant to the Warranty Service complies with the requirements of the Warranty.

7.2 Delay. Contractor shall perform the Warranty Service as promptly as reasonably possible after being notified of the noncompliance by Owner, and in any event shall commence performance of the Warranty Service no later than two (2) Business Days after such notice. If, after notification of a Defect or breach of Warranty, Contractor delays past such date in commencing, or shall fail to continue performing or completing, Warranty Service with respect to such Defect or breach of Warranty, Owner may correct such breach of Warranty so that the Work and Equipment comply with the Warranty after giving Contractor three (3) Business Days written notice, and Contractor shall be liable for all reasonable direct costs, charges and expenses incurred by Owner in connection with the same and shall pay the same to Owner upon receipt of invoices with supporting documentation from Owner. Such correction of a breach of Warranty condition shall be deemed to be Warranty Service performed by Contractor and the Warranty Period for such corrected Work shall be extended in accordance with Section 7.1.2. No correction of a Defect or breach of Warranty pursuant to this Section 7.2 shall void the Warranty.

7.3 Subcontractor Warranties. Contractor shall be responsible for enforcing the warranties of all Subcontractors through the Warranty Period unless Owner requests that any such warranties be assigned to it at an earlier date. At the end of the Warranty Period, Contractor will assign to Owner its rights under any and all such Subcontractor warranties that continue past the end of the Warranty Period, including the Major Equipment Warranties. Contractor will secure such assignment from each Subcontractor, and Contractor will deliver to Owner copies of all Subcontracts providing for warranties enforceable by Owner. Contractor will not, and Contractor will ensure that Contractor's Personnel do not, take any action which could release, void, impair or waive any Subcontractor warranties. Contractor shall provide reasonable assistance to Owner without cost to Contractor in connection with the enforcement by Owner of any Subcontractor warranty after such assignment provided those warranties are in are excess of those set forth in Section 7.1.

7.4 Major Equipment Warranties. The following components of the Facility have Equipment warranties from manufacturers or suppliers (the "Major Equipment Warranties"):

7.4.1 [_____], Appendix D-1;

7.4.2 [_____], Appendix D-2;

7.4.3 [_____], Appendix D-3;

7.4.4 [_____], Appendix D-4; and

7.4.5 [_____], Appendix D-5.

7.6 Proprietary Rights. Without limiting any of the provisions of the Agreement and notwithstanding any provision herein to the contrary, if Owner or Contractor is prevented from completing the Work (or any part thereof) in accordance with the Agreement or from the use, operation, repair, maintenance, alteration, expansion, rebuilding or enjoyment of the Work (or any part thereof) as a result of a claim, action or proceeding by any Person for unauthorized disclosure, infringement or use of Intellectual Property Rights arising from Contractor's performance (or that of its Subcontractors) under the Agreement or any Intellectual Property Right or Contractor Deliverable transferred or licensed to Owner hereunder, Contractor shall promptly, but in no event later than thirty (30) days from the date of any action or proceeding, take all actions necessary to remove such impediment, including (a) secure termination of the injunction and procure for Owner or its assigns, as applicable, the right to use such materials, Equipment or Contractor Deliverable in connection with the completion, repair, operation, maintenance, alteration, rebuilding or expansion of the Work without obligation or liability; or (b) replace such materials, Equipment, or Contractor Deliverable, with a non-infringing equivalent, or modify same to become non-infringing, all at Contractor's sole expense, but subject to all the requirements of the Agreement.

7.7 NO IMPLIED WARRANTIES. THE WARRANTIES SET FORTH IN THIS AGREEMENT ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED. THERE ARE NO OTHER WARRANTIES, AGREEMENTS, ORAL OR WRITTEN, OR UNDERSTANDINGS WHICH EXTEND BEYOND THOSE SET FORTH IN THIS AGREEMENT WITH RESPECT TO THE WARRANTED WORK, MATERIALS AND EQUIPMENT. The foregoing sentence is not intended to disclaim any other obligations of Contractor set forth herein.

7.8 Survival of Warranties. The provisions of this Article VII shall survive the expiration or termination of this Agreement.

ARTICLE VIII

FORCE MAJEURE; OWNER-CAUSED DELAYS

8.1 Force Majeure.

8.1.1 Notice. If a Party believes that an event constituting a Force Majeure Event has occurred that has or will prevent or delay the performance of its obligations under this Contract, then such Party shall give the other Party written or electronic notice within ten (10) Days after the Party became aware of such event (the "Force Majeure Notice"). The Force Majeure Notice need only be given to the other Party's on-site manager or supervisor (Owner's Project Manager), but shall be in writing or via email. Within thirty (30) Days after the Force Majeure Notice, the Party claiming a Force Majeure shall, to the extent practicable; (i) specify the length of the delay occasioned by, and additional costs incurred by reason of such Force

Majeure Event; (ii) describe the particulars of the cause and nature of the Force Majeure Event; and (iii) provide evidence of the occurrence of such Force Majeure Event. At all times after the Force Majeure Notice, the affected Party shall continue to furnish timely regular reports with respect thereto during the continuation of the Force Majeure Event.

8.1.2 Excuse of Non-Performance. So long as the conditions set forth in this Section 8.1.2 are satisfied, except with regard to payment obligations, neither Party shall be responsible or liable for or deemed in breach of this Agreement because of any failure or delay in complying with its obligations under or pursuant to the Agreement to the extent that such failure has been caused, or contributed to, by one or more Force Majeure Events or its effects or by any combination thereof; provided that in such event:

(a) any liability of either Party which arose before the occurrence of the Force Majeure Event causing the suspension of performance shall not be excused as a result of the occurrence;

(b) the affected Party shall continually exercise all commercially reasonable efforts to alleviate and mitigate the cause and effect of such Force Majeure Event, remedy its inability to perform, and limit damages to the other Party;

(c) the affected Party shall use all reasonable efforts to continue to perform its obligations hereunder and to correct or cure the event or condition excusing performance; and

(d) when the affected Party is able to resume performance of the affected obligations under the Agreement, that Party shall give the other Party written notice to that effect, and the affected Party promptly shall resume performance under the Agreement, provided that in the event that a Force Majeure Event causes a prolonged delay to the Project, Owner may elect to terminate this Agreement pursuant to Section 12.3.

8.1.3 Change Order Rights. If Contractor desires a Change Order for a Force Majeure Event, Contractor shall comply with the Force Majeure Notice requirements contained in Section 8.1.1. If Contractor does so, it will be entitled to a Change Order to the extent so provided in Section 9.5.1(a). If Contractor fails to comply with such notice requirements, then Contractor will be deemed to have waived its right to receive a Change Order for the subject Force Majeure Event.

8.1.4 Burden of Proof. The burden of proof as to whether a Force Majeure Event has occurred and whether the Force Majeure Event excuses a Party from performance under this Section 8.1 shall be upon the Party claiming such Force Majeure Event.

8.2 Owner-Caused Delay.

8.2.1 Nature of Owner-Caused Delays. Without limiting the definition of Owner-Caused-Delays, notwithstanding anything in this Agreement to the contrary, in any case where this Agreement states that Owner "shall cause" the Other Owner Contractors to take or not to take a certain action, the Parties agree that if the Owner fails to meet that obligation, such failure shall exclusively constitute an Owner-Caused Delay and shall not constitute an Owner

Event of Default, and Contractor's sole and exclusive remedies as a result thereof will be as set forth in this Section 8.2 and Section 9.5.1(c).

8.2.2 Notice. If Contractor believes an Owner-Caused Delay has occurred, then Contractor shall give Owner's Project Manager written or electronic notice describing the alleged Owner-Caused Delay within ten (10) Days following the date on which Contractor became aware of the occurrence of an event Contractor believes is or may be an Owner-Caused Delay and Contractor's notice shall describe the details of the Owner-Caused Delay and any effects on Contractor's performance of its obligations under this Agreement.

8.2.3 Excuse of Non-Performance. So long as the conditions set forth in this Section 8.2 are satisfied, Contractor shall not be responsible or liable for or deemed in breach of the Agreement because of any failure or delay in completing the Work in accordance with the Project Schedule or achieving any Key Milestone to the extent that such failure has been caused by one or more Owner-Caused Delays, provided that: (a) such suspension of performance and extension of time shall be of no greater scope and of no longer duration than is required by the effects of the Owner-Caused Delay; (b) Contractor provides timely notice of the Owner-Caused Delay, and (c) Contractor provides all assistance reasonably requested by Owner, at Owner's cost, for the elimination or mitigation of the Owner-Caused Delay.

8.2.4 Change Order Rights. If Contractor desires a Change Order for an Owner-Caused Delay, Contractor shall comply with the notice requirements contained in Section 8.2.2. If Contractor does so, it will be entitled to a Change Order to the extent so provided in Section 9.5.1(c). If Contractor fails to comply with such notification requirements, Contractor will be deemed to have waived its right to receive a Change Order for the subject Owner-Caused Delay.

8.3 No Effect on Obligation to Pay Delay Liquidated Damages. Adjustments to the Project Schedule (including the Guaranteed Substantial Completion Date) may occur as a result of any of the events described in this Article VIII. Unless dates for performance are adjusted by an executed Change Order, the obligation to pay Delay Liquidated Damages on the Guaranteed Substantial Completion Date shall not be affected.

ARTICLE IX

CHANGES

9.1 Changes. Except to the extent provided in this Article IX, there shall be no change to the Work, the Contract Price or the Project Schedule except to the extent provided in a written instrument signed by Owner and Contractor (a "Change Order") stating their mutual agreement upon all of the following: (a) a change in the Work, if any; (b) the amount of the adjustment in the Contract Price, if any; and (c) the extent of the adjustment in the Project Schedule, if any (any of the foregoing, a "Change").

9.2 Changes at Owner's Request. Owner may, from time to time, without invalidating this Agreement, order or approve by notification in writing to Contractor (a) Changes in all or a portion of the Work and/or (b) acceleration of the Work, including to recover from delays caused by an Owner-Caused Delay, a Force Majeure Event or suspension of the

Work by Owner in accordance with Section 12.6. Contractor shall review and consider any request from Owner for such a Change and shall make a written response thereto within seven (7) days after receiving such request. If giving effect to any Change so requested by Owner will increase or decrease its cost of performing the Work, shorten or lengthen the time needed for completion of the Work, require modification of its warranties in Article VII or require a modification of any other provisions of the Agreement, the Parties shall agree to issue Change Order adjusting the Contract Price upwards or downwards and the Project Schedule accordingly (including any amendments to the Agreement). Each Change Order shall constitute a final settlement of all items covered therein, including any compensation for impact on, or delay or acceleration in, performing the Work.

9.3 No Unapproved Changes. Contractor shall not perform any Changes to the Work until Owner has approved in writing the proposed adjustments or has expressly authorized Contractor in writing to perform the Change prior to such approval. If Owner does not approve the proposed adjustments and Contractor and Owner are unable mutually to agree upon alternative adjustments, Owner may by written notice to Contractor cancel the Change. Upon receiving from Owner a written approval or written authorization to perform, Contractor shall diligently perform the Change in accordance with and subject to all of the terms of this Agreement. Contractor shall not suspend, in whole or in part, performance of this Agreement during any Dispute over any Change Order unless directed to do so by Owner, and if directed to proceed with a Change or disputed item pending review and agreement upon adjustments, Contractor shall (without waiving any rights with respect to such Change or disputed item) do so.

9.4 Changes Initiated by Contractor. Promptly after Contractor becomes aware of any circumstances which Contractor has reason to believe may necessitate a Change, Contractor will issue to Owner a "Change Order Request". All Change Order Requests shall include documentation sufficient to enable Owner to determine: (a) the factors necessitating the possibility of a Change; (b) the impact which the Change is likely to have on the Contract Price; (c) the impact which the Change is likely to have on the timely achievement of the activities set forth in the Project Schedule (including the Guaranteed Substantial Completion Dates); and (d) such other information which Owner may request in connection with such Change. Owner may, but except as provided in Section 9.5 below, shall not be obligated to, issue a Change Order pursuant to a Change Order Request.

9.5 Required Change Orders.

9.5.1 Contractor Right to Change Orders. Provided that Contractor has notified Owner as required and has used all reasonable efforts to avoid and mitigate any potential delays to the Project Schedule and/or increased Direct Costs resulting from such events, Contractor will, to the extent described in Sections 9.5.2 and 9.5.3, be entitled to receive Change Orders as and for the events described in this Section 9.5.1.

(a) Change Order Due to Force Majeure Event. Subject to Sections 8.1, and 9.5.1, if and to the extent that a Force Majeure Event causes Contractor to suffer a delay in its performance of the Work, Owner will issue a Change Order extending the Project Schedule to the extent required under Section 9.5.2. Subject to Sections 9.5.1, 8.1, and 13.3, in the event one or more Force Majeure Events occurring at the Project Site, directly cause delays in the

Work exceeding thirty (30) days in the aggregate, Owner will, via Change Order, increase the Contract Price to the extent required under Section 9.5.3. Such Change Orders shall be Contractor's sole and exclusive remedy for any increased costs associated with delays caused by any Force Majeure events, and Contractor will not be entitled to any additional payment, damages and/or costs or other compensation in connection with any such delays.

(b) Change Order Due to Suspension of Work by Owner. Subject to Section 9.5.1, if after the Effective Date Owner suspends the Work pursuant to the provisions of Section 12.6, then: (A) Owner shall issue a Change Order extending the Project Schedule to the extent required under Section 9.5.2; and (B) to the extent that such suspension increases Contractor's Direct Costs in performing the Work, Owner will, via Change Order, increase the Contract Price to the extent required under Section 9.5.3. Such Change Order shall be Contractor's sole and exclusive remedy for any increased costs and delays resulting from such suspension of Work by Owner, and Contractor will not be entitled to any additional payment, damages or other compensation in connection with any such delays.

(c) Change Order Due to Owner-Caused Delay. Subject to Section 9.5.1 and Section 8.2, (i) if and to the extent that an Owner-Caused Delay causes Contractor to suffer a delay in the performance of the Work, Owner will issue a Change Order extending the Project Schedule to the extent required under Section 9.5.2, and (ii) if and to the extent that such Owner-Caused Delay increases Contractor's Direct Costs in performing the Work, Owner will, via Change Order, increase the Contract Price to the extent required under Section 9.5.3. Such Change Order(s) shall be Contractor's sole and exclusive remedy for any delays and increased costs resulting from an Owner-Caused Delay, and Contractor will not be entitled to any payment, damages or other compensation in connection with any such delays or increased costs.

(d) Change Order Due to Unforeseen Subsurface Condition. Subject to Section 9.5.1 and Section 2.4.1(b), (i) if and to the extent that an Unforeseen Subsurface Condition causes Contractor to suffer a delay in the performance of the Work, Owner will issue a Change Order extending the Project Schedule to the extent required under Section 9.5.2, and (ii) if and to the extent that such Unforeseen Subsurface Condition increases Contractor's Direct Costs in performing the Work, Owner shall, via Change Order, increase the Contract Price to the extent required under Section 9.5.3. Such Change Order(s) shall be Contractor's sole and exclusive remedy for any delays and increased costs resulting from an Unforeseen Subsurface Condition, and Contractor will not be entitled to any payment, damages or other compensation in connection with any such delays or increased costs.

(e) Change Order Due to Pre-Existing Hazardous Materials. Subject to Section 9.5.1, if and to the extent that Contractor discovers any Pre-Existing Hazardous Material that has been stored, released or disposed of at the Project Site, and, as required under Section 2.7, Contractor stops performance of the Work in that area, then, once such Work is re-commenced, Owner will issue a Change Order extending the Project Schedule to the extent required under Section 9.5.2. Subject to Section 9.5.1, if and to the extent that such cessation of Work increases Contractor's Direct Costs in performing the Work, Owner shall, via Change Order, increase the Contract Price to the extent required under Section 9.5.3. Such Change Order(s) shall be Contractor's sole and exclusive remedy for any delays and increased costs

resulting from any such cessation of the Work, and Contractor will not be entitled to any payment, damages or other compensation in connection with any such delays or increased costs.

9.5.2 Changes Involving Schedule Extensions. To the extent that Contractor demonstrates that an event for which it is entitled to a Change as described in Section 9.5.1 is the sole cause of critical path delay to Contractor's ability to perform the Work despite Contractor's use of reasonable efforts to mitigate and avoid any such delay, Owner shall issue a Change Order to extend the dates in the Project Schedule as necessary to accommodate such delay. Contractor's demonstration of the impact on the critical path of the Work must be made on a basis that analyzes the actual impacts of the given event on the then-current schedule for completion of the Work. In no event will Contractor be entitled to an extension of time under this Section 9.5.2 to the extent that the performance of the Work for which the extension is sought would have been suspended, delayed or interrupted by the concurrent fault, actions or omissions of Contractor.

9.5.3 Changes to the Contract Price.

(a) Except as set forth in Section 9.5.3(b), with respect to any Change Order required to be issued to increase the Contract Price as a result of an event described in Section 9.5.1, unless the Parties agree otherwise in writing, such Change Order will, on a retrospective basis, increase the Contract Price by an amount equal to the Direct Costs incurred by Contractor solely in connection with such event, plus a mark-up. The mark-up is not to exceed _____ percent (__%) in the aggregate, including all Subcontractor and Contractor mark-ups solely in connection with such Change.

(b) In no event will Contractor be entitled to payment for Direct Costs hereunder to the extent that such costs would have occurred notwithstanding such event, due to the concurrent fault, actions or omissions of Contractor or its Subcontractors.

(c) For purposes hereof, "Direct Costs" shall mean only the actual costs that are directly incurred by Contractor as a result of the event giving rise to the Change Order for the following items: (i) compensation for labor utilized and in the direct employ of Contractor at the Facility Site, at the rates as set forth in Exhibit B-6; (ii) cost of materials and permanent equipment; (iii) payments properly made by Contractor to Subcontractors; (iv) rental charges of necessary machinery and equipment (but excluding hand tools) used at the Project Site; (v) Permit fees; (vi) compensation of engineers or other design professionals employed directly by Contractor; and (vii) reasonable costs of mobilization and/or demobilization. Notwithstanding the foregoing, "Direct Costs" shall not include (t) salaries or other compensation (including costs of contributions, assessments, fringe benefits or taxes based on salaries or compensation) of Contractor's Personnel at Contractor's principal office and branch offices (except as provided in the previous sentence); (u) expenses of Contractor's principal and branch offices; (v) Contractor's profit, overhead or general expenses of any kind; (w) any replacement, repair or other costs or liabilities arising from any loss of or damage to any equipment, tools or other property owned or used by Contractor or its Subcontractors; (x) costs to correct or reperform any components of such Work as a result of the acts or omissions of Contractor or its Personnel; (y) any fines or penalties assessed against Contractor or its Personnel in connection with such Work that were assessed due to the fault of Contractor or its Personnel;

(z) any Builder's All Risk deductibles; or (aa) any costs or expenses other than those specifically set forth above as Direct Costs.

9.5.4 Taxes. The Parties acknowledge that the provisions of Section 4.2 will apply to any additional Work covered by any Change Order.

9.5.5 Offsets. If Owner so requests, Contractor will in good faith work with Owner to enable a reduction in any required schedule extension hereunder via a Change Order directing and paying for achievable acceleration.

ARTICLE X

INDEMNIFICATION

10.1 Indemnities.

10.1.1 Contractor's General Indemnity. Contractor shall defend, indemnify, reimburse and hold harmless, Owner, the financing parties and each of their subsidiaries and Affiliates, and the directors, officers, agents, employees, successors and assigns of each of them, and the owners of the real property comprising the Project Site (each of the foregoing, an "Owner Indemnified Party") from and against any and all losses, costs, damages, injuries, liabilities, claims, demands, penalties, assessments, interest and causes of action, expenses, including reasonable attorney's fees, incurred by or asserted against any Owner Indemnified Party as a result of any and all of the following:

(a) any bodily injury, death or damage to property caused by any negligent act or omission (including strict liability) or willful misconduct relating to or arising out of the performance of the Work or any curative action under any warranty related to the Work, following performance of the Work by Contractor or any Affiliate thereof, any Subcontractor, or anyone directly or indirectly employed by any of them, or anyone for whose acts such Person may be liable;

(b) any claims resulting from bodily injury, death or property damage arising out of Defects or breach of Warranty;

(c) claims by any Government Authority for any Contractor's Taxes;

(d) any pollution or contamination that may originate from sources in Contractor's or its Subcontractors' possession, use and control or caused by the negligence of Contractor, any Subcontractor or anyone directly or indirectly employed by any of them, or anyone for whose acts such Person may be liable (including as a result of the negligent release of Pre-Existing Hazardous Materials, the negligent exacerbation of Pre-Existing Hazardous Materials or negligent rendering of removal or remediation of Pre-Existing Hazardous Material more costly), including from Hazardous Material, industrial hazards, bilge and garbage;

(e) any Lien on the Work, Equipment, the Project, the Project Site, or any fixtures or personal property included in the Work (whether or not any such Lien is valid or enforceable) to the extent Owner has paid all amounts due relating to the Work that is the subject

of such Lien, created by, through or under, or as a result of any act or omission (or alleged act or omission) of, Contractor or any Subcontractor or other Person providing services, equipment or materials in connection with the Work;

(f) any claim, action or proceeding by any Person for unauthorized disclosure, infringement or use of any Intellectual Property Right arising from or related to (i) Contractor's performance (or that of its Affiliates, Subcontractors) under the Agreement, (ii) the design, construction, use, operation or ownership of the Work (including the Equipment, Contractor Deliverables or any portion of any of them), or (iii) Owner's use of any license granted hereunder. Without limiting the provisions of Section 7.4, if Owner is enjoined from completing the Project or any part thereof, or from the use, operation or enjoyment of the Project or any part thereof, as a result of such claim or legal action or any litigation based thereon, Contractor shall, in addition to its indemnification obligations hereunder, promptly use commercially reasonable efforts to have such injunction removed at no cost to Owner. Contractor shall timely notify Owner in writing of any claims which Contractor may receive alleging infringement of patents or other proprietary rights that may affect Contractor's performance of the Work, provided that in the event that such efforts are not effective within a period of sixty (60) days after the imposition of such injunction, Owner may take such steps as may be necessary to remove the injunction, including obtaining any necessary license, at Contractor's sole expense;

(g) any cancellation or invalidation of any insurance policy or part thereof procured under Article XI as a result of Contractor's failure to comply with any of the requirements set forth in such policy or any other act by Contractor or any Subcontractor (but only to the extent Contractor knows the requirements and they are attached hereto);

(h) any failure of Contractor to comply with, or failure of the Work to comply with, or be capable of operating in compliance with, Applicable Laws, the conditions or provisions of Applicable Permits, Prudent Industry Practices, any applicable Real Property Requirements; or

(i) any claims with respect to employer's liability or worker's compensation filed by any employee of Contractor or any of its Subcontractors, except to the extent caused by the negligent acts or omissions of Owner, Equipment Provider or Other Owner Contractors.

10.1.2 Owner's Indemnity. Owner shall defend, indemnify and hold harmless, Contractor and its directors, officers, agents, employees, successors and assigns from and against any and all losses, costs, damages, injuries, liabilities, claims, demands, penalties, assessments, interest and causes of action, expenses, including reasonable attorney's fees, incurred by or asserted against any such Person (a) as a result of the injury or death of any Person, including employees of Owner, Contractor or any Person employed by any of them for whose acts any of them may be liable, but only to the extent caused by Owner's negligent acts or omissions, (b) as a result of any loss of or damage to property, but only to the extent caused by from Owner's negligent acts or omissions, (c) any claims by any Governmental Authority for any Owner Taxes or for any claims directly arising from following Owner's direction to seek exemptions or rebates for certain taxes as described in Section 4.2.1(b); or (d) as a result of any release of a Pre-

Existing Hazardous Material, except to the extent Contractor has an indemnification obligation with respect thereto pursuant to Section 10.1.1.

10.2 Indemnification Procedure.

10.2.1 Notice of Proceedings. The Person claiming to be indemnified under the terms of this Article X (the "Indemnified Person") shall give the Party from which indemnification is sought (the "Indemnifying Party") written notice of commencement of any legal action or of any claims against such Indemnified Person in respect of which indemnification will be sought, together with a copy of such claim, process or other legal pleading. Failure of the Indemnified Person to give such notice will not reduce or relieve the Indemnifying Party of liability hereunder unless and to the extent that the Indemnifying Party was precluded from defending such claim, action, suit or proceeding as a result of the failure of the Indemnified Person to give such notice. In any event, the failure to so notify shall not relieve the Indemnifying Party from any liability that it may have to the Indemnified Person otherwise than under this Article X.

10.2.1 Conduct of Proceedings. Each Party and each other Indemnified Person shall have the right, but not the obligation, to contest, defend and litigate any claim, action, suit or proceeding by any third party alleged or asserted against it arising out of any matter in respect of which it is entitled to be indemnified hereunder and the reasonable costs and expenses thereof (including reasonable attorneys' fees and expert witness fees) shall be subject to the said indemnity; provided that the Indemnifying Party shall be entitled, at its option, to assume and control the defense of such claim, action, suit or proceeding at its expense upon its giving written notice thereof to the Indemnified Person, and such Indemnifying Party shall conduct with due diligence and in good faith the defense of any claim against such party, whether or not the Indemnifying Party shall be joined therein, and the Indemnified Person shall cooperate with the Indemnifying Party in such defense. The Indemnified Person may elect to participate through separate counsel in the defense of any such claim, but the fees and expenses of such counsel shall be at the expense of such Indemnified Person unless (a) there exists a material conflict of interest between the Indemnifying Party and such Indemnified Person in the conduct of the defense of such claim or (b) the Indemnifying Party did not employ counsel to assume the defense of such claim within a reasonable time after notice of the commencement thereof or (c) the Indemnified Person reasonably concludes and specifically notifies the Indemnifying Party that there may be specific defenses available to it which are different from or additional to those available to the Indemnifying Party. In each of such cases the Indemnifying Party shall not have the right to control the defense or settlement of such claim and the reasonable fees and expenses of counsel engaged by the Indemnified Person shall be at the expense of the Indemnifying Party. Indemnifying Party shall give prompt written notice to Indemnified Person of any proposed settlement of a Indemnified Claim. Indemnifying Party may not, without Indemnified Person's prior written consent, settle or compromise any claim or consent to the entry of any judgment regarding which indemnification is being sought hereunder unless such settlement, compromise or consent (i) includes an unconditional release of Indemnified Person from all liability arising out of such claim, (ii) does not contain any admission or statement suggesting any wrongdoing or liability on behalf of Indemnified Person, and (iii) does not contain any equitable order, judgment or term (other than the fact of payment or the amount of such payment) that in any

manner affects, restrains or interferes with the business of Indemnified Person or any of its Affiliates.

10.2.2 Contributory Negligence. If the joint, concurring, comparative or contributory fault or negligence of the Parties gives rise to damages for which the Parties are entitled to indemnification under this Article X, then such damages shall be allocated between the Parties in proportion to their respective degrees of fault or negligence contributing to such damages.

10.2.3 Survival of Indemnities. The indemnities set forth in this Article X shall survive the termination or expiration of this Agreement.

ARTICLE XI

INSURANCE

From the first to occur of the LNTP Date or the Notice to Proceed Date through and including the Final Completion Date, except as otherwise specified, Owner and Contractor shall procure and maintain, or cause to be procured and maintained, the insurance coverages set forth in Exhibit P-1 and identified therein as Owner's or Contractor's responsibility with one or more duly licensed insurance carrier(s).

ARTICLE XII

DEFAULT, TERMINATION AND SUSPENSION

12.1 Contractor Default.

12.1.1 Contractor Events of Default. The occurrence of any one or more of the following events shall constitute an event of default by Contractor hereunder ("Contractor Event of Default"):

(a) any of the following occurs (i) Contractor consents to the appointment of or taking possession by, a receiver, a trustee, custodian, or liquidator of itself or of a substantial part of its assets, or fails or admits in writing its inability to pay its debts as they become due, or makes a general assignment for the benefit of creditors; (ii) Contractor files a voluntary petition in bankruptcy or a voluntary petition or an answer seeking reorganization in a proceeding under any applicable bankruptcy or insolvency laws or an answer admitting the material allegations of a petition filed against it in any such proceeding, or seeks relief by voluntary petition, answer or consent, under the provisions of any now existing or future bankruptcy, insolvency or other similar law providing for the liquidation, reorganization, or winding up of corporations, or providing for an agreement, composition, extension, or adjustment with its creditors; (iii) a substantial part of Contractor's assets is subject to the appointment of a receiver, trustee, liquidator, or custodian by court order and such order shall remain in effect for more than thirty (30) days; or (iv) Contractor is adjudged bankrupt or insolvent, has any property sequestered by court order and such order shall remain in effect for more than thirty (30) days, or has filed against it a petition under any bankruptcy, reorganization,

arrangement, insolvency, readjustment of debt, dissolution or liquidation law of any jurisdiction, whether now or hereafter in effect, and such petition shall not be dismissed within sixty (60) days of such filing;

(b) Contractor fails, for any reason, (i) to pay when due Delay Liquidated Damages as required herein or (ii) to make any other payment or payments required to be made to Owner under the Agreement within ten (10) Business Days after receipt of written notice from Owner of Contractor's failure to make such other payment or payments (except to the extent Contractor disputes such other payment or payments in good faith and in accordance with the terms of this Agreement);

(c) Contractor fails to comply with any material provision of any Applicable Law, Applicable Permit, or applicable Real Property Requirement, the effects of which have not been cured to Owner's reasonable satisfaction within ten (10) Business Days after notice from Owner, provided, if such failure to comply is not capable of being cured within ten (10) Business Days, Contractor shall not be in default so long as Contractor commences to cure within ten (10) Business Days and thereafter diligently proceeds to cure such breach in a manner reasonable satisfactory to Owner;

(d) either of the following occurs: (i) Contractor fails to make payments when due to Subcontractor for services, materials or equipment beyond applicable notice and cure periods, unless such payments are reasonably disputed by Contractor and any Liens relating to such disputed payments are satisfied or bonded off by Contractor; or (ii) Contractor suspends performance of a material portion of the Work resulting in the Work not progressing substantially in accordance with the Project Schedule (other than as permitted under Article VIII or pursuant to a Change Order); and in each instance as described in each of sub-clauses (i) and (ii) of this Section 12.1.1(d), the impacts of such condition remain un-remedied for five calendar days following written notice thereof to Contractor;

(e) any material breach by Contractor of any representation or warranty contained in Article XV, the impacts of which have not been cured to Owner's reasonable satisfaction within ten (10) Business Days after notice from Owner;

(f) Contractor fails to: (i) provide a written recovery plan as required in Section 2.6.3; or (ii) implement the recovery plan in a diligent and timely manner.

(g) Contractor reaches the limitations of Delay Liquidated Damages set forth in Section 6.10.2 before Contractor achieves all of the Key Milestones;

(h) the transfer by Contractor of (i) all or a substantial portion of the rights and/or obligations of Contractor hereunder, except for an assignment permitted hereunder, or (ii) all or a substantial portion of the assets or obligations of Contractor;

(i) any failure by Contractor to maintain the insurance coverages required of it in accordance with Article XI, the impacts of which have not been cured to Owner's reasonable satisfaction within ten (10) Business Days after notice from Owner;

(j) Contractor fails to provide and maintain in effect the ***[Parent Guarantee and/or Payment and Performance Bond]*** as required under Section 2.12 by the date that is three (3) Days after the Effective Date; or

(k) Contractor is in breach of any provision of this Agreement or has failed to perform its obligations under the Agreement (other than those breaches specified in this Section 12.1.1 (a) through (l)) and (i) such breach is not cured by Contractor within thirty (30) days after notice thereof from Owner, or (ii) if such breach is not capable of being cured within such thirty (30) day period, Contractor (A) fails to commence to cure such breach within such thirty (30) day period, or (B) fails to thereafter diligently proceed to cure such breach in a manner reasonably satisfactory to Owner in its sole discretion.

12.1.2 Termination for Cause. Upon the occurrence and during the continuation of any Contractor Event of Default hereunder, Owner, in addition to its right to pursue any other remedy given under this Agreement or now or hereafter existing at law or in equity or otherwise, shall have the right to terminate this Agreement by written notice to Contractor (a "Termination for Cause"). A Termination for Cause shall be effective upon delivery of Owner's notice with respect thereto. In the event of a termination by Owner under this Article 12, Owner shall have the right to take possession of and use all Contractor Deliverables and all of the equipment owned by Contractor or an Affiliate and located at the Job Site on the date of such termination for the purpose of completing the Work (provided that Owner will bear the risk of loss or damage to the same thereafter, until turnover back to Contractor or the Affiliate) and may employ any other Person to complete the Work by whatever method that Owner may deem necessary. In addition, Owner may make such expenditures as in Owner's sole judgment will accomplish the timely completion of the Work in accordance with the terms hereof. Owner shall, within a reasonable period of time after the Work is finally completed by the work of one or more replacement contractors, determine the total cost to Owner for completing the Work in accordance with the Scope of Work, and the other requirements of this Agreement, including all sums previously paid or then owed to Contractor pursuant to this Agreement. In contracting with such replacement contractors, Owner shall, to the extent practicable, cause the Work to be completed in accordance with the Agreement and shall employ reasonable efforts to mitigate the costs incurred in connection with completion of the Work. If the Contract Price is less than the sum of (i) all costs and expenses incurred by Owner to engage a substitute contractor to complete (or cure deficiencies in) the Work, including overhead and legal, engineering and other professional expenses, (ii) all other costs, expenses and damages suffered by Owner as a result of a default or breach by Contractor of the requirements of this Agreement and the termination of the of the Agreement as a result thereof, and (iii) all amounts previously paid to Contractor pursuant to this Agreement, Contractor shall pay to Owner on demand the amount of such difference. Any amount owed by Owner to Contractor for the completion of the Work shall be retained by Owner until after completion of the Work and applied by Owner to pay any amounts and damages owed by Contractor pursuant to this Section 12.1.2 or otherwise. Any excess of the amount retained over the amount due under this Section 12.1.2 shall be remitted to Contractor within sixty (60) days after the Final Completion Date.

12.1.3 Other Owner Remedies. Upon the occurrence and during the continuance of a Contractor Event of Default but prior to termination of this Agreement by Owner, Owner may, without prejudice to any of its other rights or remedies, (a) seek performance by any

guarantor or surety of Contractor's obligations hereunder, (b) seek equitable relief to cause Contractor to take action or to refrain from taking action pursuant to this Agreement, or to make restitution of amounts improperly received under this Agreement, (c) make such payments or perform such obligations as are required to cure such Contractor Event of Default, make a claim against any security provided pursuant to this Agreement and/or offset the cost of such payment or performance against payments otherwise due to Contractor under this Agreement, provided that Owner shall be under no obligation to cure any such Contractor Event of Default, or (d) otherwise seek damages, including proceeding against any bond, guarantee, letter of credit, or other security given by or for the benefit of Contractor for its performance under this Agreement.

12.2 Owner Default. Owner's failure to pay to Contractor any required payment that is not in dispute, which failure continues for thirty (30) Days after written notice of failure has been received by Owner from Contractor, shall constitute an event of default by Owner hereunder (an "Owner Event of Default"). Upon any Owner Event of Default, Contractor may terminate this Agreement thirty (30) Days after giving written notice thereof to Owner so long as the amount owed by Owner (other than any amount disputed in accordance with the terms of this Agreement) is not paid within such thirty (30)-day period (a "Contractor Termination for Cause"). In the event of a Contractor Termination for Cause, Contractor shall be entitled to recover an amount equal to the Termination Payment. Unless Contractor terminates this Agreement pursuant to the foregoing provisions, Contractor shall not suspend or delay performance of the Work because of any Owner Event of Default. Contractor shall continue performance of the Work during any dispute over payment, so long as Owner continues to pay all undisputed amounts. Other than as stated above, Contractor will have no right to terminate this Agreement, and Contractor acknowledges that its sole and exclusive remedies for any failure of Owner to comply with its obligations under this Agreement (other than nonpayment as described above) are limited to receipt of a Change Order as described in Section 9.5.

12.3 Termination Without Cause. Owner may for its convenience terminate this Agreement after giving notice to Contractor in which event Contractor shall be entitled to be paid the Termination Payment under Section 12.4. As a condition to any termination by Owner pursuant to this Section 12.3 (a "Termination Without Cause"), Owner must provide written notice to Contractor of the Termination Without Cause at least three (3) Business Days prior to the effective date of such termination. If, at the date of termination under this Section 12.3, Contractor has properly performed services or purchased, prepared or fabricated off the Project Site any materials or Equipment for subsequent incorporation at the Project Site, Owner shall have the option of having such materials or Equipment delivered to the Project Site or to such other place as Owner shall reasonably direct.

12.4 Termination Payment.

12.4.1 Termination Payments Due to Contractor. Upon a termination of this Agreement pursuant to Section 12.2 or Section 12.3 and subject to Owner's rights under Sections 4.6 and 4.8 Contractor shall be entitled to a payment (the "Termination Payment"), which shall equal the sum of the following, without duplication: (a) that portion of the Contract Price that is applicable to Work completed up to the date of termination that has not previously been paid to Contractor (as determined below); (b) the expenses reasonably incurred by Contractor in withdrawing Contractor's Equipment and Personnel from the Project Site and in otherwise

demobilizing plus ten percent (10%) of such expenses; and (c) the expenses reasonably incurred by Contractor in terminating contracts with Subcontractors pertaining to the Work (excluding fees of any Affiliates of Contractor) plus ten percent (10%) of such expenses, except to the extent Owner has instructed Contractor not to terminate such contracts, in which event such contract will be assigned to Owner, subject to Owner's assumption of same and, if required, Owner's adequate assurance to such Subcontractors regarding Owner's ability to pay. The Termination Payment shall not include any costs incurred by Contractor after the date of the event giving rise to such termination that Contractor reasonably could have mitigated. Contractor shall use all reasonable, diligent efforts to mitigate the costs associated with termination of this Agreement, including identifying and pursuing other uses for Equipment or supplies manufactured or obtained pursuant to this Agreement.

12.4.2 Payment of Termination Payment. Contractor shall submit an invoice to Owner for the Termination Payment with the supporting information and documentation of any fees or expenses claimed by Contractor pursuant to Section 12.4.1. Upon review and agreement that such invoice is proper, Owner shall pay such invoice within thirty (30) days after its receipt of same unless it disputes in good faith certain elements thereof, in which event only the undisputed portion of the Termination Payment need be made within such thirty (30) day period; provided, that payments for termination under Section 12.3 shall be due Contractor within thirty (30) days after receipt of a substantiated invoice and Owner's receipt of any and all Equipment and Work under Sections 12.3 and 12.5. As a condition precedent to receiving any Termination Payment, Contractor shall comply with Section 12.5 in its entirety.

12.4.3 Termination Payment Contractor's Sole Remedy. Payment of the Termination Payment shall be the sole and exclusive liability of Owner, and the sole and exclusive remedy of Contractor, with respect to termination of this Agreement under Section 12.2 or Section 12.3, and in such event Owner shall have no further liability to Contractor notwithstanding the actual amount of damages that Contractor may have sustained in connection with such termination. Calculation of the Termination Payment has been agreed upon and fixed hereunder because of the difficulty of ascertaining the exact amount of such damages Contractor will actually sustain in the event of a termination of this Agreement pursuant to Section 12.2 or Section 12.3, and Owner and Contractor agree that the calculation of the Termination Payment is reasonable.

12.5 Actions Required Following Termination.

12.5.1 Discontinuation of Work. Upon termination of this Agreement under Sections 12.1 or 12.3, Owner shall be immediately released from any and all obligations to Contractor (except for Owner's obligation to pay any amount specified in Section 12.4, if applicable), Contractor shall follow Owner's directions for the orderly turnover of the Project Site and the Work, and except as directed by Owner, Contractor shall remove from the Project Site its Personnel, all Contractor's Equipment, waste, rubbish and Hazardous Material brought onto the Project Site by Contractor or its Subcontractors or for which Contractor is otherwise responsible, and Owner shall be entitled to take exclusive possession of the Work, the Project Site, and any and all Equipment (including materials delivered or en route to the Project Site). Contractor immediately shall take such steps as are reasonably necessary to preserve and protect

Work completed and in progress and to protect materials, equipment and supplies at the Project Site, stored off-site, or in transit.

12.5.2 Cancellation and Transfer of Subcontracts and Other Rights. If requested by Owner in the event of termination of this Agreement, Contractor will cancel existing contracts with Subcontractors upon terms as directed by Owner. Any payments to be made to a Subcontractor as a result of any such termination shall be paid by Contractor (subject to Section 12.4, in the event of a termination under Section 12.3). In the event of termination of this Agreement Contractor shall also, as and to the extent requested by Owner, (a) irrevocably assign and deliver to Owner such Subcontracts, purchase orders, bonds, warranties and options made by Contractor in performance of the Work (but in no event shall Owner be liable for any action or default of Contractor occurring prior to such delivery and assignment), (b) provide to Owner without charge a license to use all rights to patented copyrighted, licensed or proprietary materials of Contractor and Subcontractors in connection with the Work, except as otherwise restricted herein, and (c) deliver to Owner originals of the Agreement, originals of all Drawings, to the extent available, Contractor Deliverables in process (except that Contractor may keep for its records copies, and, if sufficient originals exist, an original set, of the Agreement executed by Owner), all other materials relating to the Work, and all papers and documents relating to Applicable Permits, orders placed, bills and invoices, Lien releases and financial management under this Agreement. All deliveries hereunder shall be made free and clear of any Liens, security interests or encumbrances, except such as may be created by Owner. Except as provided herein, no action taken by Owner or Contractor after the termination of this Agreement shall prejudice any other rights or remedies of Owner or Contractor provided by Applicable Laws, the Agreement or otherwise upon such termination. In addition, Contractor shall assist Owner in preparing an inventory of all Equipment in use or in storage at the Project Site, and Contractor shall take such other action as required hereunder upon termination of this Agreement.

12.5.3 Surviving Obligations. This Article XII shall survive the termination or expiration of this Agreement.

12.6 Suspension by Owner for Convenience. Owner may suspend all or a portion of the Work to be performed under the Agreement at any time for any reason in its sole discretion by giving written notice thereof to Contractor. Such suspension shall continue for the period specified in the notice of suspension; provided that Contractor agrees to resume performance of the Work promptly upon receipt of notice from Owner. Upon receiving any such notice of suspension, unless the notice requires otherwise, Contractor shall: (a) immediately discontinue the Work on the date and to the extent specified in the notice; (b) place no further orders or subcontracts for Equipment, services or materials with respect to suspended Work, other than to the extent required in the notice; (c) promptly make every reasonable effort to obtain suspension, with terms satisfactory to Owner, of all orders, subcontracts and rental agreements to the extent they relate to performance of suspended Work; (d) continue to protect and maintain the Work performed, including those portions on which Work has been suspended; and (e) take any other reasonable steps to minimize costs and expenses associated with such suspension. Contractor shall use reasonable commercial efforts to include a suspension for convenience provision with terms similar to the foregoing in all subcontracts. After the conclusion of any suspension hereunder, Contractor will be entitled to a Change Order to the

extent described in Section 9.5.1(b). If a suspension of Work continues for more than one hundred and eighty (180) days in the aggregate, Contractor may terminate this Agreement, which termination shall be deemed a Termination Without Cause.

ARTICLE XIII

TITLE AND RISK OF LOSS

13.1 Title to Project and the Work. Contractor warrants and guarantees that legal title to and ownership of the Work (including all Equipment) shall pass to Owner, free and clear of any and all Liens upon the earlier of (a) payment to Contractor of the portion of the Contract Price attributable to such Work and Equipment, and (b) in the case of Equipment, the delivery of such Equipment to the Project Site; provided that for all Equipment, title shall pass to Owner upon such payment only if title has previously been transferred to Contractor, otherwise, title shall pass to Owner at such time as Contractor has acquired title to the Equipment, but in no event later than delivery of such Equipment to the Project Site.

13.2 Title to Contractor Deliverables. Except as otherwise provided in this Article XIII, title to Contractor Deliverables, specifications and like materials (including the Job Books contents) which are owned by Contractor shall be transferred to Owner upon creation and delivered to Owner upon Project Substantial Completion. In addition, Contractor grants to Owner an irrevocable, royalty free, non-exclusive license to use and reproduce such Contractor Deliverables, specifications and other design documentation to which Contractor does not have title but has the right to grant sub-licenses for the purpose of completing, repairing, operating, maintaining, rebuilding and expanding the Project. Owner shall have the right to assign the benefit of such license to any financing parties in connection with granting a security interest in the Project, to a purchaser in connection with a transfer of the Project, or to any subsequent purchaser or assignee of same. Any such purchaser or assignee shall acquire such license subject to the same terms and restrictions as stated in this Section 13.2. Owner may retain the necessary number of copies of all such documents for purposes of construction, operation, maintenance and repair of the Project. Any costs to register such licenses in the United States shall be paid by Owner.

13.3 Risk of Loss. Notwithstanding passage of title as provided in Section 13.1, from the date hereof until the Project Substantial Completion Date, Contractor hereby assumes the risk of loss for all Equipment upon Delivery and the Work, including: (a) all Work completed on or off the Project Site and (b) all Work in progress. If any loss, damage, theft or destruction occurs to the Work or other items, on or off the Project Site, for which Contractor has so assumed the risk of loss hereunder, Contractor shall, at the option of Owner and at Contractor's cost, promptly repair or replace the property affected thereby. In such event, Contractor shall have access to Owner's Builder's All Risk Policy, provided that in the event of a covered loss, Contractor shall pay any applicable deductible amount. Risk of loss for the Project and the Work shall pass to Owner (excluding Contractor's Equipment and other items to be removed by Contractor, which shall remain the responsibility of Contractor) on the Project Substantial Completion Date, provided, however, Contractor shall continue to be responsible for claims, physical loss or damage to the Work to the extent resulting from Contractor's or its Personnel's negligent acts or omissions, and/or failure to comply with the requirements of the Agreement.

Notwithstanding the foregoing, if Contractor is obligated by the terms of this Agreement to perform additional Work subsequent to the date of completion for such Work, Contractor shall bear the risk of loss and damage with respect to such Work until such additional Work is complete.

ARTICLE XIV

DISPUTE RESOLUTION

14.1 Referral to Senior Management. In the event of any controversy, claim or dispute between the Parties arising out of or related to this Agreement ("Dispute"), the Parties' Project representatives will first attempt to resolve the Dispute informally through negotiation and consultation. If they are unable to do so, then within three (3) Business Days following the date of delivery of a written request by either Party, (i) each Party shall appoint as its representative a senior officer, and (ii) such senior officers shall meet, negotiate and attempt in good faith to resolve the Dispute quickly, informally and inexpensively.

14.2 Mediation. Any Dispute that is not resolved pursuant to Section 14.1 may be submitted for mediation before a single mediation in accordance with the provisions contained herein and in accordance with the Commercial Mediation Procedures of the AAA in effect at the time of the mediation ("AAA Procedures"); provided, however, that in the event of any conflict between the procedures herein and the AAA Procedures the procedures herein shall control. The mediator will be named by mutual agreement of the Parties or by obtaining a list of five (5) qualified Persons from the Parties and alternately striking names. All mediation shall be administered by the AAA. All mediation shall take place in the City of Portland, Oregon, unless otherwise agreed to by the Parties. Each Party shall be required to exchange documents to be used in the mediation not less than five (5) Business Days prior to the mediation. The Parties shall use all commercially reasonable efforts to conclude the mediation as soon as practicable. All aspects of the mediation shall be treated as confidential. Neither the Parties nor any mediator may disclose the content or results of the mediation, except as necessary to comply with legal, audit or regulatory requirements. Before making any such disclosure, a Party shall give written notice to the other Party and shall afford such Party a reasonable opportunity to protect its interests. Each Party shall be responsible for its own expenses and one-half of any mediation expenses incurred to resolve the dispute. The mediator will provide the Parties with a fee and expense schedule in advance of mediation. Mediation will terminate by: (a) written agreement signed by both Parties, (b) determination by the mediator that the Parties are at an unresolvable impasse, or (c) two unexcused absences by either Party from the mediation sessions. The mediator will never participate in any claim or controversy covered by this Article as a witness, collateral contract, or attorney and may not be called as a witness to testify in any proceeding involving the subject matter of mediation. O.R.S. §§ 36.100 to 36.238 will apply to the entire process of mediation.

14.3 Legal Action. If the Parties are still unable to resolve their differences after good faith consideration of a resolution through mediation pursuant to Section 14.2, then each of the Parties hereby irrevocably consents and agrees that any legal action or proceedings with respect to this Agreement may be brought in any of the courts of the State of Oregon located in the City of Portland or the courts of the United States of America for the District of Oregon

having subject matter jurisdiction. By execution and delivery of this Agreement and such other documents executed in connection herewith, each Party hereby (a) accepts the exclusive jurisdiction of the aforesaid courts, (b) irrevocably agrees to be bound by any final judgment (after any and all appeals) of any such court with respect to such documents, (c) irrevocably waives, to the fullest extent permitted by law, any objection it may now or hereafter have to the laying of venue of any action or proceeding with respect to such documents brought in any such court, and further irrevocably waives, to the fullest extent permitted by law, any claim that any such action or proceeding brought in any such court has been brought in any inconvenient forum, (d) agrees that services of process in any such action or proceeding may be effected by mailing a copy thereof by registered or certified mail (or any substantially similar form of mail), postage prepaid, to such Party at its address set forth in Section 16.4, or at such other address of which the Parties have been notified

14.4 Waiver of Jury Trial. EACH PARTY IRREVOCABLY WAIVES, TO THE FULLEST EXTENT PERMITTED BY APPLICABLE LAW, ANY AND ALL RIGHTS TO TRIAL BY JURY IN ANY LEGAL PROCEEDING ARISING OUT OF OR RELATING TO THIS AGREEMENT OR THE TRANSACTIONS CONTEMPLATED HEREBY.

14.5 Attorneys' Fees. If either Party institutes any legal suit, action or proceeding against the other party arising out of or relating to this Agreement, including, but not limited to, contract, equity, tort, fraud and statutory claims, the prevailing party in the suit, action or proceeding will be entitled to receive, in addition to all other remedies to which the prevailing party may be entitled, the costs and expenses incurred by the prevailing party in conducting the suit, action or proceeding, including reasonable attorneys' fees and expenses, court costs and other legal expenses such as expert witness fees, and all fees, taxes, costs and expenses incident to appellate, bankruptcy and post-judgment proceedings

14.6 Survival. The provisions set forth in this Article XIV shall survive the termination or expiration of this Agreement.

ARTICLE XV

REPRESENTATIONS AND WARRANTIES

15.1 Contractor Representations. Contractor represents and warrants the following:

15.1.1 Organization. It is a corporation duly organized, validly existing and in good standing under the laws of the state of its organization, and is duly authorized and qualified to do business in the State where the Project is located, and all other jurisdictions in which the nature of the business conducted by it makes such qualification necessary and where failure to so qualify would have a material adverse effect on its ability to perform any of its obligations under this Agreement.

15.1.2 No Violation of Law; Litigation. It is not in violation of any Applicable Laws or Applicable Permits or judgments entered by any Government Authority which violations, individually or in the aggregate, would affect its performance of any of its obligations

under this Agreement. Except as Contractor has disclosed in writing to the Owner prior to the Effective Date, there are no legal, administrative or arbitration proceedings or actions, controversies, investigations, actions or other proceedings, now pending or (to the best knowledge of Contractor) threatened against Contractor which, if adversely determined, could reasonably be expected to effect on the ability of Contractor to perform any of its obligations under this Agreement. Contractor does not know of any basis for any such proceedings, controversies, actions or investigations.

15.1.3 Licenses. It is the holder of all governmental consents, licenses, permissions and other authorizations and Permits required to operate and conduct its business now and as contemplated by this Agreement.

15.1.4 No Breach. None of the execution, delivery and performance of this Agreement, the consummation of the transactions herein contemplated, or compliance with the terms and provisions hereof, shall conflict with or result in a violation or breach of the terms, conditions or provisions of, or require any consent under, the charter or by-laws of Contractor, or any Applicable Law or regulation, order, writ, injunction, award, judgment or decree of any court, or any agreement, contract, indenture or other instrument to which Contractor is a party or by which it or its assets is bound or to which it or its assets is subject, or constitute a default under any such agreement or instrument.

15.1.5 Corporate Action. It has all necessary power and authority to conduct its business, own its properties and to execute, deliver and perform its obligations under this Agreement; the execution, delivery and performance by Contractor of this Agreement have been duly authorized by all requisite corporate action; and this Agreement has been duly and validly executed and delivered by Contractor and constitutes the legal, valid and binding obligation of Contractor enforceable in accordance with its terms, except as the enforceability thereof may be limited by bankruptcy, insolvency, reorganization or moratorium or other similar laws relating to the enforcement of creditors' rights generally and by general equitable principles.

15.1.6 Experience. It has by itself and through its Subcontractors, full experience and proper qualifications to perform the Work, including to construct the Project and to erect and install the equipment.

15.1.7 Intellectual Property. It owns or has the right to use all Intellectual Property Rights necessary to perform the Work without conflict with the rights of others.

15.1.8 Solvency. It is financially solvent, able to pay its debts as they mature, and possessed of sufficient working capital to complete its obligations under this Agreement.

15.1.9 Certifications. All Persons who will perform any portion of the Work have and will have all business and professional certifications required by Applicable Law to perform their respective services under this Agreement.

15.1.10 Site Access. The access rights granted to or obtained by Contractor to the Project Site are adequate for the performance of the Work and operation of the Project.

15.2 Owner Representations. Owner represents and warrants that:

15.2.1 Organization. It is a _____company duly formed, validly existing and in good standing under the laws of the State of _____, and is duly authorized and qualified to do business in the State where the Project is located and all other jurisdictions in which the nature of the business conducted by it makes such qualification necessary and where failure to so qualify would have a material adverse effect on its ability to perform this Agreement.

15.2.2 No Breach. None of the execution and delivery of this Agreement, the consummation of the transactions herein contemplated, or compliance with the terms and provisions hereof and thereof, conflicts with or will result in a breach of, or require any consent under, the limited liability company agreement of Owner, or any Applicable Law or regulation, order, writ, injunction or decree of any court, or any agreement or instrument to which Owner is a party or by which it is bound or to which it is subject, or constitute a default under any such agreement or instrument.

15.2.3 Corporate Action. It has all necessary power and authority to conduct its business, own its properties and to execute, deliver and perform its obligations under this Agreement; the execution, delivery and performance by Owner of this Agreement have been duly authorized by all requisite limited liability company action; and this Agreement has been duly and validly executed and delivered by Owner and constitutes the legal, valid and binding obligation of Owner enforceable in accordance with its terms, except as the enforceability thereof may be limited by bankruptcy, insolvency, reorganization or moratorium or other similar laws relating to the enforcement of creditors' rights generally and by general equitable principles.

15.3 Survival of Representations and Warranties. The representations and warranties of Contractor herein shall survive execution and termination of this Agreement.

ARTICLE XVI

MISCELLANEOUS PROVISIONS

16.1 Confidentiality and Publicity.

16.1.1 Confidential Information and Permitted Disclosures. Each Party shall hold in confidence (a) any information provided or supplied by the other Party or its Personnel that is marked to be confidential, including such information as may have been provided or supplied prior to the Effective Date, (b) the commercial terms of any leases or other documents related to the Real Property Rights, and (c) the contents of this Agreement (collectively, "Confidential Information"). Both Parties shall inform their Affiliates, Subcontractors, suppliers and Personnel of their obligations under this Section 16.1 and require such Persons to adhere to the provisions hereof. Notwithstanding the foregoing, the following categories of information will not constitute Confidential Information:

(a) information that was in the public domain prior to receipt thereof by such Party or which subsequently becomes part of the public domain by publication or

otherwise except by a wrongful act of such Party or its Affiliates, Subcontractors, employees, directors, officers, agents, advisers or representatives;

(b) information that such Party can show was lawfully in its possession prior to receipt thereof from the other Party through no breach of any confidentiality obligation;

(c) information received by such Party from a third party having no obligation of confidentiality with respect thereto;

(d) information at any time developed independently by such Party providing it is not developed from otherwise Confidential Information.

16.1.2 Permitted Disclosures. Notwithstanding anything herein to the contrary, a Party may disclose Confidential Information as follows:

(a) Confidential Information may be disclosed pursuant to and in conformity with Applicable Law or in connection with any legal proceedings described in Article XIV, or by Owner to the Oregon Public Utility Commission and/or the independent evaluator retained by PGE and approved by the Oregon Public Utility Commission in connection with the Project, provided that the Party required to disclose such information shall give prior notice to the other Party of such required disclosure and, if so requested by the other Party, shall use all reasonable efforts to oppose the requested disclosure as appropriate under the circumstances or to seek, through a protective order or other appropriate mechanism, to maintain the confidentiality of the Confidential Information;

(b) Confidential Information may be disclosed as required to be disclosed under securities laws applicable to publicly traded companies and their subsidiaries;

(c) Confidential Information may be disclosed to Affiliates, Subcontractors, employees, directors, officers, agents, advisors or representatives of such Party as necessary in connection with the Project; provided that such Persons are informed of the confidential nature of the Confidential Information, and such Party shall be liable to the other for any disclosure by such Person in violation of the terms of this Section; and

(d) Owner may disclose a copy of this Agreement to any actual or potential financing parties and/or insurers.

16.1.3 Consent. Notwithstanding the foregoing, either Party may disclose Confidential Information with the express written consent of the other Party, which consent shall not be unreasonably conditioned, withheld, or delayed.

16.1.4 Publicity. Until expiration of the Warranty Period, neither Party shall issue any press or publicity release or otherwise release, distribute or disseminate any Confidential Information for publication concerning this Agreement or the participation of the other Party in the transactions contemplated hereby without the prior written consent of the other Party; provided, however, that such limitation on disclosure shall not apply to disclosures or reporting required by a Government Authority if the Party seeking disclosure informs the other

Party of the need for such disclosure and, if reasonably requested by the other Party, seeks, through a protective order or other appropriate mechanism, to maintain the confidentiality of Confidential Information.

16.1.5 Right to Relief. It is agreed that each Party shall be entitled to relief both at law and in equity, including injunctive relief and specific performance, in the event of any breach or anticipated breach of this Section, without proof of any actual or special damages.

16.1.6 Ownership of Confidential Information. All right and title to, and interest in, a Party's Confidential Information shall remain with such Party. All Confidential Information obtained, developed or created by or for Contractor exclusively for the Project, including copies thereof, is the exclusive property of Owner whether delivered to Owner or not. No right or license is granted to Contractor or any third party respecting the use of Confidential Information by virtue of this Agreement, except to the extent required for Contractor's performance of its obligations hereunder. Contractor shall deliver the Confidential Information, including all copies thereof, to Owner upon request.

16.1.7 Survival. The Parties' obligations under this Article XVII shall remain in force during the term of this Agreement and for a period of five (5) years after Final Completion.

16.2 Consequential Damages. In no circumstances shall either Party (or the parent companies and affiliates of each, and their respective members, shareholders, officers, directors, agents and employees) be liable to the other Party (or its parent companies and affiliates, and their respective members, shareholders, officers, directors, agents and employees) for any consequential, incidental, indirect, special, exemplary or punitive damages (including loss of power, loss of production, loss of actual or anticipated profits, revenues or product; increased expense of borrowing or financing, claims of Owner's customers and damage to property or equipment, and increased cost of capital) (collectively, "Consequential Damages") arising out of this Agreement; and, regardless of whether any such claim arises out of breach of contract, guarantee or warranty, tort, (including negligence and strict liability), product liability, indemnity, contribution, strict liability or any other legal or equitable theory. Increased expense of borrowing or financing, and increased cost of capital arising by virtue of a contractual obligation owed to an off-taker or purchaser of electricity generated by the Work are agreed for the purposes of this Agreement to be Consequential Damages. For avoidance of doubt, third party indemnification claims for loss of actual or anticipated profits, revenues or product shall not constitute Consequential Damages under this Agreement.

16.3 Limitation on Liability. Notwithstanding anything to the contrary contained in this Agreement, in no event shall Contractor be liable to Owner for any damages, claims, demands, suits, causes of action, losses, costs, expenses and/or liabilities in excess of an amount equal to one hundred percent (100%) of the Contract Price, as adjusted for Change Orders (other than those which reduce the Contract Price related to damages of Owner hereunder), regardless of whether such liability arises out of breach of contract, tort, product liability, contribution, strict liability or any other legal theory; *provided, however*, that the preceding limitation of liability shall not apply to, and no liability amounts shall be apply against such limitation of liability for (a) liabilities resulting from the negligence, fraud, willful misconduct or illegal or unlawful acts of Contractor or its Personnel (including their Labor), (b) liabilities arising out of

Contractor's obligations to indemnify Owner or other indemnitees for third party claims under this Agreement, or (c) costs incurred by Contractor (and, in the event Contractor fails to perform, Owner) in performing Warranty Service, or (d) any taxes payable by Contractor; (e) damages for risks required to be insured by Contractor under this Agreement, or (f) costs incurred by Contractor (and in the event of Contractor Default, Owner) in achieving Project Substantial Completion.

16.4 Notice. All notices and other communications required or permitted by this Agreement or by law to be served upon or given to a Party by any the other Party shall be in writing signed by the Party giving such notice and shall be deemed duly served, given and received (i) when actually received by the Party to whom it is sent, if served personally or if delivered by nationally recognized courier service to the Party to whom notice is to be given, (ii) when received by the Party to whom it is sent, if sent in the form of a signed letter on the sending Party's letterhead, transmitted by email in Portable Document Format (pdf) or similar format; (iii) when received (with confirmation of receipt) if delivered by facsimile or email, or (iv) at the end of the first Business Day following actual delivery, if mailed by first class registered or certified mail, return receipt requested, postage prepaid, addressed to the appropriate Party, at the address and/or facsimile numbers of such Party set forth below (or at such other address as such Party may designate by written notice to the other Party in accordance with the Section):

If to Owner:	**If to Contractor:**
with a copy to :	with a copy to :

16.5 Time of the Essence. Time is of the essence in the performance of the Work in accordance with the requirements of this Agreement.

16.6 No Rights in Third Parties. Except as otherwise set forth herein including in Section 3.2, hereof, with respect to the rights of permitted successors and assigns, and the rights of indemnitees under Article X, (a) nothing in this Agreement nor any action taken hereunder shall be construed to create any duty, liability or standard of care to any Person that is not a Party, (b) no Person that is not a Party shall have any rights or interest, direct or indirect, in this Agreement or the services to be provided hereunder and (c) this Agreement is intended solely for the benefit of the Parties, and the Parties expressly disclaim any intent to create any rights in any third party as a third-party beneficiary to this Agreement or the services to be provided hereunder.

16.7 Entire Agreement. This Agreement contains the entire understanding of the Parties with respect to the subject matter hereof and supersedes all prior agreements, arrangements, discussions, undertakings and commitments (whether written or oral) with respect

thereto. All the Exhibits (Exhibit A-1 through Exhibit T-2) attached hereto are incorporated into and made a part of this Agreement. There are no other oral understandings, terms or conditions and neither Party has relied upon any representation, express or implied, not contained in this Agreement.

16.8 Amendments. No amendment or modification of this Agreement shall be valid or binding upon the Parties unless such amendment or modification shall be in writing and duly executed by authorized officers of both Parties. For the avoidance of doubt, emails between the Parties shall not be considered a writing for purposes of this Section 16.9.

16.9 GOVERNING LAW. THIS AGREEMENT SHALL BE GOVERNED BY AND CONSTRUED IN ACCORDANCE WITH THE LAWS OF THE STATE OF OREGON, WITHOUT REGARD TO CONFLICT OF LAW PRINCIPLES.

16.10 Right of Waiver. No delay, failure or refusal on the part of any Party to exercise or enforce any right under this Agreement shall impair such right or be construed as a waiver of such right or any obligation of another Party, nor shall any single or partial exercise of any right hereunder preclude other or future exercise of any right. The failure of a Party to give notice to the other Party of a breach of this Agreement shall not constitute a waiver thereof. Any waiver of any obligation or right hereunder shall not constitute a waiver of any other obligation or right, then existing or arising in the future. Each Party shall have the right to waive any of the terms and conditions of this Agreement that are for its benefit. To be effective, a waiver of any obligation or right must be in writing and signed by the Party waiving such obligation or right.

16.11 Severability. If any provision of this Agreement is held to be illegal, invalid, or unenforceable under present or future laws, such provision shall be fully severable; this Agreement shall be construed and enforced as if such illegal, invalid or unenforceable provision had never comprised a part of this Agreement; and the remaining provisions of this Agreement shall remain in full force and effect and shall not be affected by the illegal, invalid, or unenforceable provision or by its severance from this Agreement. Furthermore, in lieu of such illegal, invalid or unenforceable provision, there shall be added automatically as a part of the this Agreement a provision as similar in its terms to such illegal, invalid or unenforceable provision as may be possible and be legal, valid and enforceable.

16.12 Successors and Assigns; Assignment. Subject to the following, this Agreement shall be binding upon the Parties, their successors and permitted assigns. Except as set forth herein, this Agreement and all of Contractor's rights, duties and obligations under this Agreement are personal in nature and shall not be assigned, delegated or otherwise disposed of by Contractor without the prior written consent of Owner. Owner may assign this Agreement in whole or in part; provided that Contractor is provided written notice as soon as reasonably possible following such assignment. Contractor agrees and acknowledges that any third party receiving such an assignment provided it assumes all obligations hereunder, in writing, shall be entitled to exercise any and all rights of Owner under this Agreement in accordance with the terms hereof (in its own name or in the name of Owner) and Contractor shall comply in all respects with such exercise. Provided the assignee assumes, in a writing reasonably satisfactory to Contractor, all obligations of Owner hereunder, Owner shall be released upon assignment.

Nothing in this Section 16.13 shall affect Owner's ability to collaterally assign this Agreement to any financing parties.

16.13 Survival. All provisions of the Agreement that are expressly or by implication to come into or continue in force and effect after the expiration or termination of this Agreement, including Articles VII, X and XIII, shall remain in effect and be enforceable following such expiration or termination. The representations and warranties of Contractor contained herein shall survive the execution and delivery hereof and thereof.

16.14 Expenses and Further Assurances. Each Party shall pay its own costs and expenses in relation to the negotiation, preparation execution and carrying into effect this Agreement. Contractor and Owner agree to provide such information, execute and deliver any instruments and documents and to take such other actions as may be necessary or reasonably requested by the other Party (at the cost and expense of the other Party) in order to give full effect to this Agreement and to carry out the intent of this Agreement.

16.15 Counterparts. This Agreement may be executed in any number of counterparts and each counterpart shall represent a fully executed original as if executed by both Parties, with all such counterparts together constituting but one and the same instrument.

16.16 Status of Contractor; No Partnership; No Agency. Contractor shall be an independent contractor with respect to any and all Work performed and to be performed under the Agreement. The Agreement shall not be interpreted or construed to create an association, joint venture or partnership relationship among or between the Parties or any similar relationship, obligations or liabilities. Neither Party shall have any right, power or authority to enter into any agreement or undertaking for, act on behalf of, or to act as or be an agent or representative of, or to otherwise bind or obligate the other Party.

16.17 Compliance with Applicable Laws. Contractor and its Subcontractors are familiar with and shall comply with and observe, all Applicable Laws, including but not limited to the federal Foreign Corrupt Practices Act (15 U.S.C.S. §§ 78a and 78m et seq.) ordinances, rules, regulations, executive orders, all applicable safety orders and all orders or decrees of administrative agencies, courts or other legally constituted authorities having jurisdiction or authority over Contractor and its Subcontractors, Owner or the Equipment which may now or hereafter exist.

[Signatures on following page]

IN WITNESS WHEREOF, the Parties have caused this Agreement to be executed by their duly authorized representatives as of the date and year first above written.

Owner:

By: _____
Name: _____
Title: _____

Contractor:

By: _____

17 Appendix F – Required Bidder Profile

The form below is illustrative of information that will be collected in an online form at: PortlandGeneralRFP.accionpower.com. Please consider the following multi-page form as a guide when preparing your bid, but note that in the event of differences between this form and the electronic version, the electronic version shall control. Check boxes (☐) indicate documents that are likely to be provided as attachments to the form.

For early-stage ownership proposals, including acquisition of project development or natural resource rights, please fill out sections as applicable.

Company Name:		
Name of Contact:		
Title:		
Mailing Address:		
Telephone:	Fax:	E-mail:

Bidder's general background and principal business:

Legal entity that would be the contracting party to a power purchase contract or an asset purchase agreement with PGE. State whether this entity will be formed for the sole purpose of the project and a description of the ownership and debt arrangements:

Bidder's senior unsecured debt rating: ☐ Standard & Poor's ☐ Moody's Investor Services., Inc. ☐ Fitch Ratings ☐ DBRS

18 Appendix G – Required Bid Information

The form below is illustrative of information that will be collected in an online form at: PortlandGeneralRFP.accionpower.com. Please consider the following multi-page form as a guide when preparing your bid, but note that in the event of differences between this form and the electronic version, the electronic version shall control. Check boxes (☐) indicate documents that are likely to be provided as attachments to the form.

For early-stage ownership proposals, including acquisition of project development or natural resource rights, please fill out sections as applicable.

1. Project Description, Transaction Type and Price

Project Summary Information
Project name: Developer: Project Location (County and State): Technology (i.e. Wind, Solar, etc.): Commence construction date: Proposed Commercial Operation Date (COD): Nameplate capacity (MW): Transaction Structure(s) proposed: Federal Tax Benefits obtained: Expected annual energy generation (MWh) for the first 12 months after COD: Annual anticipated degradation (if applicable):

Transaction Structure and Pricing
Elect Transaction Type(s) contemplated for this Project: ❑ Sale of energy (PPA) ❑ Ownership (APA or APA and EPC) ❑ Other
Provide an executive summary of the project and transaction structure(s) proposed. Alternate structures that differ from the core transaction types may be proposed and should be described here as well. (Separate Word document can be uploaded with supporting material.)
Term Sheet and Form Agreement: ❑ Upload the corresponding term sheet with redline changes, if any, to terms. If Bidder is proposing an alternate structure that vastly differs, a new term sheet should be created and uploaded. ❑ Bidders are strongly encouraged to also upload a redline mark-up of the corresponding form agreement.

- ❑ If offering a structure that vastly differs from those proposed, please upload a complete term sheet.

PPA Proposal Pricing and Key Terms

Provide key PPA pricing and terms (may also be provided as part of the term sheet). NOTE: All 3rd party scheduling, integration and forecasting costs must be included as part of the PPA price.

- ❑ Expected Capacity MW:
- ❑ Expected Facility Output (MWh for each Contract Year):
- ❑ Required Capacity (MW):
- ❑ Contract Term (i.e. 20 years)
  - Base Case (Years):
  - Option 2 (Years):
- ❑ Contract Price Flat $/MWh:
  - Base Case $/MWh:
  - Option 2 $/MWh:
- ❑ Contract Price Escalating $/MWh:
  - Base Case Year 1 $/MWh:
  - Base Case Annual Escalation Factor (%):
  - Option 2 Year 1 $/MWh:
  - Option 2 Annual Escalation Factor (%):
- ❑ Point of Delivery:
- ❑ Interconnection Service Designation (check which applies):
  - Network Resource Interconnection Service
  - Energy Resource Interconnection Service
  - Other (please explain):
  - Interconnection Provider
  - Interconnection Request Number:
- ❑ Transmission Service
  - Long-term, Firm, Point-to-Point Transmission Service with roll-over rights
  - Other (please explain):
  - Transmission Provider:
  - Transmission Service Request Number:
- ❑ Performance Assurance
  - Pre-COD Security ($25/kw amount requested):
  - Delivery Period Security (or post-COD) (12 month):
- ❑ Output Guarantee
  - Conforms with Form PPA.
  - Other- Please describe.
- ❑ Firmness of Energy
  - 15-minute firm to schedule consistent with Form PPA
  - Other – Please describe.
- ❑ PPA Contract Extension
  - Please describe whether there is an option to extend the PPA term at a known price. If so, provide pricing proposal, if different from base term Contract Price.

Ownership Proposal Pricing Requirements

- ❑ Provide Asset Purchase Agreement (APA) Price
  - Identify timing and proposed milestone payments if any payments proposed prior to Close of fully-developed asset sale.
  - Identify assets associated with APA (i.e. permits, interconnection agreements, transmission service agreements, environmental studies, lease options, etc.). If any assets would not be provided

❑ Provide Total Engineering Procurement and Construction Price - Provide initial Milestone Payment Schedule and events / completed tasks / equipment / associated with each milestone payment as well as approximate dates. Clarify major equipment manufacturers that are assumed as part of the bid - Milestone payment schedule will be provided electronically through the provided Excel template.
Provide a pro forma forecast for all project construction and operating costs for the expected life of the project. Construction costs must include, but are not limited to, all costs necessary to develop, permit, construct, and place the facility in service. Operating costs must include, but are not limited to, fixed O&M, variable O&M, wheeling and transmission, third-party ancillary services, land leases and royalties, property taxes and local fees, insurance, and capital expenses. Bidders must include all costs in their submission of pro forma forecasts, inclusive of all taxes excluding income tax. Pro forma forecasts will be provided electronically through the provided Excel template.

2. Project Development Criteria and Developer Experience

Project Development
Please supply the following Project Development Criteria whether submitting proposal for ownership or long-term energy purchase consideration or both.
Project name:
Site Control: Site control is an important factor in our RFP evaluation, and should be interpreted to include the site itself, along with all required easements and access required for the site. ❑ Identify the project site by identifying the land parcel(s) contemplated, land owners and status of control of each land parcel (i.e. ownership, lease, option to lease or own, letter of intent, etc.). ❑ Identify the project easements for transmission gen-tie lines, site access or other required easements and identify the status of control of each. ❑ Provide a project map that contains the site and easements mentioned above. ❑ If the Bidder does not have control over the project site and/or easement(s), identify parcel(s) not under control, describe actions already taken to obtain control of these parcels and/or the site as well as next steps and timing to obtain control.
Experience of Developer Team Provide the following information: ❑ Describe the developer's participation in successfully developing power production projects in the U.S., emphasizing projects located in the Pacific Northwest (whether in development or constructed) and those that are similar to the project proposed in the bid. Provide a synopsis of the developer's role (i.e. development, construction, long-term owner for a PPA or seller of asset, etc.). Identify customers of projects and aforementioned structures. Identify suppliers that have been used for projects (i.e. Vestas, General Electric, etc.). ❑ List members of the development and management team and provide a brief, summary resume of each individual (include a description of that individual's training, experience, function(s) performed for the project and area(s) of expertise). ❑ Describe business-related litigation or regulatory investigations in which the developer or development team members were previously (in the last 7 years), are currently, or are expected to be engaged.

Interconnection, Transmission and Point of Delivery

- ❑ Identify the Point of Interconnection for the project.
- ❑ Provide the interconnection agreement, key interconnection dates and all associated studies completed as part of the interconnection process for the project. If not yet obtained, provide the draft interconnection agreement and a summary of the status as well as expected target date for execution. Describe any risks and mitigation strategies for achieving completion of the agreement and the interconnection facilities in order to support timely project COD.
- ❑ Identify the transmission service (preference given to long-term firm point-to-point transmission) secured for delivery to PGE's System and the assignment reference (ARef) number, start date, term, transmission provider, special service conditions (e.g., conditional firm bridge service) and roll-over rights associated with the transmission service. If any re-directs or modifications to service are anticipated, please describe the process, timing and risks.
- ❑ Provide the Transmission Service Agreement(s) (or Precedent Transmission Service Agreement) and all associated agreements, studies, and exhibits and if applicable, identify the timing associated with completion and transmission service. Describe any required upgrades, anticipated costs, and risks to service commencement.
- ❑ Identify the Point of Delivery associated with Project (for PPA or ASA/EPC; identify anticipated points and include transmission plan description to PGE System if not fully secured).

  <u>BPAT.PGE at point:</u>
  - Pearl 230 kV (Sherwood)
  - McLoughlin 230 kV
  - Keeler 230 kV (St. Marys)
  - Rivergate 230 kV
  - Bethel 230 kV
  - Troutdale 230 kV (Blue Lake)

  <u>PACW.PGE at point:</u>
  - Bethel 230 kV
  - Gresham 230 kV
  - Linneman 230 kV
  -)

Scheduling and Integration Services

- ❑ Identify the 3rd Party Scheduling Agent for the project.
- ❑ If the renewable technology is intermittent in nature, describe the plan for the 3rd party integration services in order to provide 15-minute firm schedules required as part of the PPA submission. The description of the plan for integration should include, at minimum, a narrative describing the services being purchased and the service provider (if applicable), the operating characteristics of the resource(s) or system(s) that will be used for integration, and a description of the fueling and transmission plan for the integrating resource(s) or system(s). If offering an alternate firming schedule (i.e. hourly firm), please describe and provide aforementioned information.
- ❑ Provide the 3rd party responsible for providing the forecasts for the firm schedule submission (see PPA term).

Qualification Strategy for Federal Tax Benefits

- ❑ Identify the federal tax benefit (i.e. PTC, ITC) assumed as part of the PPA price submission and/or what can be achieved via the ownership structure.
- ❑ Describe the strategy to capture the applicable federal tax benefit (i.e. commencement of significant construction or safe harbor), the assuredness of this strategy, any risks associated with this strategy, and the plan to mitigate these risks. Provide the name of the tax counsel and/or other entities reviewing the tax strategy for obtaining the federal tax benefit. Has an opinion been obtained from tax counsel?

- ❑ Provide any other relevant details (i.e. upload tax counsel opinion or other materials).

Schedule

- ❑ Provide a Level 1 schedule demonstrating the development and construction (if applicable) of the project, including but not limited to finalization of permits, studies, site control, project design, roads, foundations, substation, transmission, interconnection, fuel supply (if applicable), approvals, major equipment orders, major equipment delivery, pre-construction and construction milestones. Clarify items pending versus completed. Schedule should be presented in Gantt chart form.
- ❑ If bidding an existing project, provide a detailed description of the project, its major components, description of the Operation and Maintenance record, schedule of outages, etc.

Permitting, Environmental and Studies

Please respond to this section as well as the technology specific requested information. If you are offering a technology that is not listed, please provide information of similar detail.

- ❑ List all of the permits, licenses, environmental studies, cultural resources studies and other approvals (regulatory, zoning, etc.) that are required for the construction and operation of the project in a table. Include the jurisdictional entity or entity performing the work and the status. If any have been obtained by the date of the bid submission, provide the date obtained. For those that are still in process, identify the date these are expected and provide a summary of risks and risk mitigation strategies that will be utilized to stay on the anticipated schedule. For status of items not yet complete, consider identifiers such as: "In-process/on-track", "Not yet started", "In-process/delayed", "Application in process", etc. See sample from template below; please complete template provided for submission. Additional materials can be uploaded to supplement if desired.
- ❑ Provide an overview of any opposition that has occurred to date and measures taken to manage this opposition. If any opposition is expected, describe plans to manage these (i.e. community outreach, etc.).

Sample of format for summary of permits, licenses, studies, etc.:

Permit/Study/License/Other	Status	Date	Entity	Risks and Mitigation Strategies
Site Permit	Done	5/1/2016	OEFSC	N/A

Permitting, Environmental and Studies – Wind

Wind Projects Under Development and Existing Wind Resources

- ❑ Please specify the total acres disturbed by your project.
- ❑ Are there any known areas of contamination within the project boundary?
- ❑ Describe how water quality (groundwater and surface water) is affected by the project.
- ❑ Characterize the ambient day and night sound environment in the area surrounding the project site.
- ❑ If the project site or contiguous areas contain any species of plant or animal life identified as threatened or endangered, please list the species and explain mitigation measures.
- ❑ If the project site contains any plants or animals being proposed or considered as candidates for threatened or endangered lists, please list and explain mitigation measures.
- ❑ If the project site contains any animals protected under federal or state law, like under the Migratory Bird Act Treaty, please list and explain mitigation measures.
- ❑ Provide copies of wildlife studies that have been performed for the project.
- ❑ Briefly describe any environmental mitigation methods, both required and volunteered, that are included as part of an operating project or will be included as part of a proposed project.
- ❑ Has the project area been subject to a cultural resources survey?
- ❑ Are there any sites that are listed on the National Register of Historic Places within the project area?
- ❑ Provide copies of cultural resource studies that have been conducted for the project.

- ❑ Please indicate if pertinent Tribal Governments have been notified of the project.
- ❑ Have the area Tribes raised any Traditional Cultural Property (TCP) concerns or other issues?

Wind Projects Under Development

- ❑ Is the proposed project consistent with the recommended uses of adopted local and state land use plans?
- ❑ Will the project need a zoning change?
- ❑ If there is likely to be public controversy related to the proposed project, please explain.
- ❑ Provide estimates for the day and night noise levels of the proposed project. Provide all studies that have been completed.
- ❑ Describe proposed sound attenuation strategies or equipment planned for the project.
- ❑ Give the distance in miles that the project, or its effect, will be visible from state parks, forest preserves, and game refuges; national wildlife refuges, natural landmarks, and park service lands; rivers designated as wild, scenic or recreational; designated wilderness areas; other outstanding natural features.
- ❑ Will the project impact or have the potential to impact an existing archaeological or historic site or structure (i.e. >50 years or older)?
- ❑ Are any visual impacts to existing historic buildings expected from the project?

Existing Wind Projects

- ❑ Describe any ongoing noise issues.
- ❑ Discuss status of compliance with any project permits, plans, and applicable regulations; including but not limited to wildlife and natural resources, cultural resources, waste, etc.
- ❑ Discuss avian mortality at the site and what is being done to minimize it. Please provide reports detailing records of avian mortality.
- ❑ List the number and severity of any regulatory citations in operating the facility.

Permitting, Environmental and Studies – Solar

Solar Projects Under Development and Existing Solar Resources

- ❑ Please specify the total acres disturbed by your project.
- ❑ Are there any known areas of contamination within the project boundary?
- ❑ Describe any water requirements for production, cooling, or cleaning and the water rights/ plans associated with meeting these needs.
- ❑ Describe how water quality (groundwater and surface water) is affected by the project.
- ❑ Describe any type and quantity of wastewater discharge (in gallons per MWh).
- ❑ Characterize the ambient day and night sound environment in the area surrounding the project site.
- ❑ If the project site or contiguous areas contain any species of plant or animal life identified as threatened or endangered, please list the species and explain mitigation measures.
- ❑ If the project site contains any plants or animals being proposed or considered as candidates for threatened or endangered lists, please list and explain mitigation measures.
- ❑ If the project site contains any animals protected under federal or state law, like under the Migratory Bird Act Treaty, please list and explain mitigation measures.
- ❑ Provide copies of wildlife studies that have been performed for the project.
- ❑ Briefly describe any environmental mitigation methods, both required and volunteered, that are included as part of an operating project or will be included as part of a proposed project.
- ❑ Has the project area been subject to a cultural resources survey?
- ❑ Are there any sites that are listed on the National Register of Historic Places within the project area?
- ❑ Provide copies of cultural resource studies that have been conducted for the project.
- ❑ Please indicate if pertinent Tribal Governments have been notified of the project.
- ❑ Have the area Tribes raised any Traditional Cultural Property (TCP) concerns or other issues?

Solar Projects Under Development

- ❑ Is the proposed project consistent with the recommended uses of adopted local and state land use plans?
- ❑ Will the project need a zoning change?
- ❑ If there is likely to be public controversy related to the proposed project, please explain.
- ❑ Provide estimates for the day and night noise levels of the proposed project. Provide all studies that have been completed.
- ❑ Will the project impact or have the potential to impact an existing archaeological or historic site or structure (i.e. >50 years or older)?
- ❑ Are any visual impacts to existing historic buildings expected from the project?
- ❑ Give the distance in miles that the project, or its effect, will be visible from state parks, forest preserves, and game refuges; national wildlife refuges, natural landmarks, and park service lands; rivers designated as wild, scenic or recreational; designated wilderness areas; other outstanding natural features.

Existing Solar Projects

- ❑ Describe any ongoing noise issues.
- ❑ Discuss status of compliance with any project permits, plans, and applicable regulations; including but not limited to wildlife and natural resources, cultural resources, waste, etc.
- ❑ List the number and severity of any regulatory citations in operating the facility.

Permitting, Environmental and Studies – Geothermal

- ❑ Please provide emission amounts (Lbs./MWh) for all permitted emissions.
- ❑ Describe the air pollution controls used on the project, *e.g.*, type, emissions controlled and removal efficiency.
- ❑ Describe whether the proposed project will exceed any criteria of the National Ambient Air Quality Standards (NAAQS) for any pollutant when operating on either primary or backup fuel. Also describe the "Prevention of Significant Deterioration Increment Consumption" due to this project, as applicable.
- ❑ Please specify the total acres disturbed by your project.
- ❑ Is the proposed project consistent with the recommended uses of adopted local and state land use plans?
- ❑ Will the project need a zoning change?
- ❑ If there is likely to be public controversy related to the proposed project, please explain.
- ❑ Are there any known areas of contamination within the project boundary?
- ❑ Describe any water requirements for production, cooling, or cleaning and the water rights/ plans associated with meeting these needs.
- ❑ Describe how water quality (groundwater and surface water) is affected by the project.
- ❑ Please describe the total amount of waste (in lbs. per MWh) directly related to power production.
- ❑ Describe any type and quantity of wastewater discharge (in gallons per MWh).
- ❑ Characterize the ambient day and night sound environment in the area surrounding the project site.
- ❑ Provide estimates for the day and night noise levels of the proposed project. Provide all studies that have been completed.
- ❑ For existing projects, describe any ongoing noise issues.
- ❑ Describe proposed sound attenuation strategies or equipment planned for the project.
- ❑ Give the distance in miles that the project, or its effect, will be visible from state parks, forest preserves, and game refuges; national wildlife refuges, natural landmarks, and park service lands; rivers designated as wild, scenic or recreational; designated wilderness areas; other outstanding natural features.
- ❑ If the project site or contiguous areas contain any species of plant or animal life identified as

threatened or endangered, please list the species and explain mitigation measures.

- ❑ If the project site contains any plants or animals being proposed or considered as candidates for threatened or endangered lists, please list and explain mitigation measures.
- ❑ If the project site contains any animals protected under federal or state law, like under the Migratory Bird Act Treaty, please list and explain mitigation measures.
- ❑ Provide copies of wildlife studies that have been performed for the project.
- ❑ Briefly describe any environmental mitigation methods, both required and volunteered, that are included as part of an operating project or will be included as part of a proposed project.
- ❑ For existing projects, discuss status of compliance with any project permits, plans, and applicable regulations; including but not limited to wildlife and natural resources, cultural resources, waste, etc.
- ❑ For existing projects, list the number and severity of any regulatory citations in operating the facility.
- ❑ Has the project area been subject to a cultural resources survey?
- ❑ Will the project impact or have the potential to impact an existing archaeological or historic site or structure (i.e. >50 years or older)?
- ❑ Are there any sites that are listed on the National Register of Historic Places within the project area?
- ❑ Provide copies of cultural resource studies that have been conducted for the project.
- ❑ Are any visual impacts to existing historic buildings expected from the project?
- ❑ Please indicate if pertinent Tribal Governments have been notified of the project.
- ❑ Have the area Tribes raised any Traditional Cultural Property (TCP) concerns or other issues?

Permitting, Environmental and Studies – Hydroelectric

- ❑ For proposed hydroelectric projects, discuss whether in-stream flow studies will be required, or have been performed, and the results from such studies.
- ❑ For proposed hydroelectric projects, discuss major license conditions affecting resource management including, but not limited to, whether fish passage facilities will be required.
- ❑ Please specify the total acres disturbed by your project.
- ❑ Is the proposed project consistent with the recommended uses of adopted local and state land use plans?
- ❑ Will the project need a zoning change?
- ❑ If there is likely to be public controversy related to the proposed project, please explain.
- ❑ Describe how water quality (groundwater and surface water) is affected by the project.
- ❑ Give the distance in miles that the project, or its effect, will be visible from state parks, forest preserves, and game refuges; national wildlife refuges, natural landmarks, and park service lands; rivers designated as wild, scenic or recreational; designated wilderness areas; other outstanding natural features.
- ❑ If the project site or contiguous areas contain any species of plant or animal life identified as threatened or endangered, please list the species and explain mitigation measures.
- ❑ If the project site contains any plants or animals being proposed or considered as candidates for threatened or endangered lists, please list and explain mitigation measures.
- ❑ If the project site contains any animals protected under federal or state law, like under the Migratory Bird Act Treaty, please list and explain mitigation measures.
- ❑ Provide copies of any applicable studies that have been performed for the project.
- ❑ Briefly describe any environmental mitigation methods, both required and volunteered, that are included as part of an operating project or will be included as part of a proposed project.
- ❑ For existing projects, discuss status of compliance with any project permits, plans, and applicable regulations; including but not limited to wildlife and natural resources, cultural resources, waste, etc.
- ❑ For existing projects, list the number and severity of any regulatory citations in operating the facility.
- ❑ Has the project area been subject to a cultural resources survey?
- ❑ Will the project impact or have the potential to impact an existing archaeological or historic site or structure (i.e. >50 years or older)?
- ❑ Are there any sites that are listed on the National Register of Historic Places within the project area?

- ❑ Provide copies of cultural resource studies that have been conducted for the project.
- ❑ For proposed hydroelectric projects, discuss whether a Cultural Resources Management Plan has been prepared.
- ❑ Are any visual impacts to existing historic buildings expected from the project?
- ❑ Please indicate if pertinent Tribal Governments have been notified of the project.
- ❑ Have the area Tribes raised any Traditional Cultural Property (TCP) concerns or other issues?

Permitting, Environmental and Studies - Biomass, Biogas and Solid Waste

- ❑ Please provide emission amounts (Lbs./MWh) for all permitted emissions.
- ❑ Describe the air pollution controls used on the project, *e.g.*, type, emissions controlled and removal efficiency.
- ❑ Describe whether the proposed project will exceed any criteria of the National Ambient Air Quality Standards (NAAQS) for any pollutant when operating on either primary or backup fuel. Also describe the "Prevention of Significant Deterioration Increment Consumption" due to this project, as applicable.
- ❑ Please specify the total acres disturbed by your project.
- ❑ Is the proposed project consistent with the recommended uses of adopted local and state land use plans?
- ❑ Will the project need a zoning change?
- ❑ If there is likely to be public controversy related to the proposed project, please explain.
- ❑ Are there any known areas of contamination within the project boundary?
- ❑ Describe any water requirements for production, cooling, or cleaning and the water rights/ plans associated with meeting these needs.
- ❑ Describe how water quality (groundwater and surface water) is affected by the project.
- ❑ Please describe the total amount of waste (in lbs. per MWh) directly related to power production.
- ❑ Describe any type and quantity of wastewater discharge (in gallons per MWh).
- ❑ Characterize the ambient day and night sound environment in the area surrounding the project site.
- ❑ Provide estimates for the day and night noise levels of the proposed project. Provide all studies that have been completed.
- ❑ Describe proposed sound attenuation strategies or equipment planned for the project.
- ❑ For existing projects, describe any ongoing noise issues.
- ❑ Give the distance in miles that the project, or its effect, will be visible from state parks, forest preserves, and game refuges; national wildlife refuges, natural landmarks, and park service lands; rivers designated as wild, scenic or recreational; designated wilderness areas; other outstanding natural features.
- ❑ If the project site or contiguous areas contain any species of plant or animal life identified as threatened or endangered, please list the species and explain mitigation measures.
- ❑ If the project site contains any plants or animals being proposed or considered as candidates for threatened or endangered lists, please list and explain mitigation measures.
- ❑ If the project site contains any animals protected under federal or state law, like under the Migratory Bird Act Treaty, please list and explain mitigation measures.
- ❑ Provide copies of wildlife studies that have been performed for the project.
- ❑ Briefly describe any environmental mitigation methods, both required and volunteered, that are included as part of an operating project or will be included as part of a proposed project.
- ❑ For existing projects, discuss status of compliance with any project permits, plans, and applicable regulations; including but not limited to wildlife and natural resources, cultural resources, waste, etc.
- ❑ For existing projects, list the number and severity of any regulatory citations in operating the facility.
- ❑ Has the project area been subject to a cultural resources survey?
- ❑ Will the project impact or have the potential to impact an existing archaeological or historic site or structure (i.e. >50 years or older)?
- ❑ Are there any sites that are listed on the National Register of Historic Places within the project area?

- ❑ Provide copies of cultural resource studies that have been conducted for the project.
- ❑ Are any visual impacts to existing historic buildings expected from the project?
- ❑ Please indicate if pertinent Tribal Governments have been notified of the project.
- ❑ Have the area Tribes raised any Traditional Cultural Property (TCP) concerns or other issues?

Permitting, Environmental and Studies - Wave

- ❑ If there is likely to be public controversy related to the proposed project, please explain.
- ❑ Give the distance in miles that the project, or its effect, will be visible from state parks, forest preserves, and game refuges; national wildlife refuges, natural landmarks, and park service lands; rivers designated as wild, scenic or recreational; designated wilderness areas; other outstanding natural features.
- ❑ If the project site or contiguous areas contain any species of plant or animal life identified as threatened or endangered, please list the species and explain mitigation measures.
- ❑ If the project site contains any plants or animals being proposed or considered as candidates for threatened or endangered lists, please list and explain mitigation measures.
- ❑ If the project site contains any animals protected under federal or state law, like under the Migratory Bird Act Treaty, please list and explain mitigation measures.
- ❑ Provide copies of any applicable studies that have been performed for the project.
- ❑ Briefly describe any environmental mitigation methods, both required and volunteered, that are included as part of an operating project or will be included as part of a proposed project.
- ❑ For existing projects, discuss status of compliance with any project permits, plans, and applicable regulations; including but not limited to wildlife and natural resources, cultural resources, waste, etc.
- ❑ Has the project area been subject to a cultural resources survey?
- ❑ Will the project impact or have the potential to impact an existing archaeological or historic site or structure (i.e. >50 years or older)?
- ❑ Are there any sites that are listed on the National Register of Historic Places within the project area?
- ❑ Provide copies of cultural resource studies that have been conducted for the project.
- ❑ Are any visual impacts to existing historic buildings expected from the project?
- ❑ Please indicate if pertinent Tribal Governments have been notified of the project.
- ❑ Have the area Tribes raised any Traditional Cultural Property (TCP) concerns or other issues?

3. Project Resource Characteristics

Project Resource

Provide Project Resource Information as requested below and additional information that the Bidder deems relevant or pertinent to PGE's evaluation of its proposal.

Project Technical Description

- ❑ For PPA's and ownership proposals that include construction, provide a description of the facility and its major equipment. Describe the technology used (or planned for use—or if more than one option, identify these) for the generation of electricity, including major manufacturers
- ❑ For Wind or Solar ownership proposals, confirm that all technical specifications in Appendix H.1 (for Wind proposals) or Appendix H.2 (for Solar proposals) are met. Otherwise, provide a redline mark-up of the technical specifications for the proposal.
- ❑ Provide a project layout drawing including all major equipment and balance of plant equipment
- ❑ Provide a project Single Line Diagram

Project Resource Characteristics

Depending on technology, provide the required resource characteristics for bid evaluation as identified below. Please note that the Form PPA and PPA term sheet contemplate Output production guarantees; any exceptions to PGE's proposal must be included as part of this submission (see Section 1).

Project Resource – New Wind Project

- ❑ Provide the proposed site layout that is the basis for the Net Capacity Factor (NCF). Describe the level of work done at this juncture to determine buildable land and describe set-backs that are assumed.
- ❑ Provide the P50, P75, P90 and P10 annual NCF projection for the project and the turbine and hub-height (etc.) assumed for these projections through the contract term.
- ❑ Provide a 12X24 profile of the P50 facility NCF in Excel format.
- ❑ Provide any assessment reports that have been prepared for the project and augment them, if necessary, to include the following information:
  - ❑ Provide source and basis of the wind speed data used in the development of the energy projections for the project, including:
    - ❑ Location of the data collection.
    - ❑ Number of on-site and off-site meteorological stations used and types of meteorological instrumentation.
    - ❑ Heights of measurements and instrument tower design.
    - ❑ Periods of record for each meteorological data source used.
    - ❑ Specific elevations of each on-site meteorological measurement location.
    - ❑ Data quality assurance procedures.
    - ❑ Duration of valid on-site measurements (five or more years strongly preferred).
    - ❑ All available shear observation and calculation data.
    - ❑ Wind Rose for each tower and measurement location.
    - ❑ Long-term reference data, if not publicly available.
    - ❑ Methodology used to develop the estimated long-term, hub-height, average annual wind speed and wind direction frequency distribution(s) for the project site.
    - ❑ Roughness indexes.
    - ❑ Assumed collection losses and distance to nearest integration substation.
    - ❑ Assumed avian and bat curtailment incidence.
    - ❑ Time-of-day, monthly and annual representative hub-height wind speed

- frequency distributions at intervals of 0.5 m/s. Provide these tables electronically in an Excel file.
  - ❑ List of all adjacent wind facilities, either in operation or proposed, within 20 miles.
- ❑ Describe the equipment to be used and the layout of your wind project. Include the size, technology type and manufacturer of the individual wind turbine units.
- ❑ Provide the warranted or sales power curves (wind speed versus power output) for the wind turbine generators proposed. (Ensure power curve accounts for site specific air density.)
- ❑ Provide the detailed analysis used to estimate the net annual and monthly energy output of the wind project. All sources of losses should be listed and individually quantified, along with the basis for quantification. Consideration of existing or proposed external wind farms waking effects should be specifically addressed. Please provide wake model used in the analysis.

❑ Provide hourly (15 minute if available) energy production from the facility over valid period of on-site measurements as an Excel spreadsheet or csv file. The sum of the hourly time series is not expected to equal the annual P50 but should be based on wind measurements recorded on-site and include all losses to represent net hourly production for the project. Please provide a description of the methodology used to apply the hourly losses.

Project Resource - Existing Wind Project

❑ Provide a description of the facility, including the year built, the construction contractor, wind turbines used (make, model, hub height, power curve, etc.), major components used in the facility, major maintenance performed over the last years, description of operations and maintenance performed each year, the O&M provider, description of remaining warranty periods for existing equipment, etc.

❑ Provide the P50, P75, P90 and P10 Net Capacity Factor projection for the project through the contract term.

❑ Provide a 12X24 profile of the P50 facility NCF in Excel format.

❑ Project map with elevation, hub height, and ID for each turbine.

❑ List of all adjacent wind facilities, either in operation or proposed, within 20 miles.

❑ Provide monthly operating reports (MORs) for the period that the project has been in operation. At a minimum, MORs should include system availability, turbine availability, curtailment levels, and metered production.

❑ Identify the energy production measurement point and any losses to that point.

❑ Provide hourly and 15 minute net energy production records for the period that the project has been in operation in Excel or csv format.

❑ Curtailment logs including: facility level curtailment count, event timestamps, and MWh. For each event, specify the nature of curtailment(i.e. transmission curtailment, Oversupply Management Protocol, avian management)

❑ Hourly and 15 minute turbine availability for the period the project has been in operation.

❑ Hourly and 15 minute average wind speed, MWa, for each turbine for the period the project has been in operation.

❑ Provide any assessment reports that have been prepared for the project that utilize historical energy production data to forecast energy production for the remaining project life. Please include long-term reference data used in the assessment report to forecast energy production.

❑ Provide any wind assessments reports completed prior to project COD.

❑ Time-of-day, monthly and annual wind frequency distributions at intervals of 0.5 m/s from the pre-construction monitoring campaign. Provide these tables electronically in an Excel file.

❑ Methodology used to develop the estimated wind speed and wind direction frequency

distribution(s) for the project site from the pre-construction monitoring campaign.

- ❑ Provide hourly (15 minute if available) estimated energy production from the facility over the valid period of on-site meteorological (i.e. anemometer) measurements made prior to project COD. Include as an Excel spreadsheet or csv file. Please provide a description of the methodology used to estimate project energy production from meteorological measurements.

Project Resource – New Solar Project

- ❑ Describe the physical layout of the plant and provide associated schematics. Identify proposed technology including but not limited to manufacturer and supplier of the photovoltaic panels, the annual expected degradation (and warranty degradation), inverters, transformers, and racking (fixed tilt or tracking). Identify make and model where applicable.
- ❑ Describe the level of work done to create the layout included as part of the RFP bid.
- ❑ Provide the P50, P75, P90 and P10 annual NCF projection for the project through the contract term.
- ❑ Provide a 12X24 profile of the P50 facility NCF in Excel format.
- ❑ Provide hourly (15 minute if available) energy production from the facility over the valid period of irradiation data as an Excel spreadsheet or csv file. The sum of the hourly time series is not expected to equal the annual P50 but should be based on available solar data and include all losses to represent net hourly production for the project. Please provide a description of the methodology used to apply the hourly losses.
- ❑ Describe source and location of the meteorological data obtained and, if different from project site, provide an engineering review of its applicability to the proposed site.
- ❑ Identify locations of any operating sites where technology identical to that proposed is deployed, operational history of the technology, and maintenance requirements.
- ❑ Provide any available assessment reports for the project and augment them, if necessary, with a detailed description of the solar and climatic data that were recorded for the site, and how they were sampled and processed (minimum of five years of data strongly preferred).
- ❑ Describe in detail the analysis that used the solar and climatic data at the site (ground measurements strongly preferred) to estimate the net annual and monthly energy output from the project.
- ❑ Provide the meteorological data file and any applicable simulation files, if available (.MET, .PRJ, .PAN, .OND, .SIT, etc.)
- ❑ List and quantify all sources of losses, and provide the basis for the quantification.
- ❑ Provide soiling profile and describe any washing schedule including frequency and dates of cleaning planned, if applicable.
- ❑ Describe the operations and maintenance plan for the project, specifically project staffing and monitoring activities.
- ❑ Describe annual station loads including lighting, heating and cooling equipment, and monitoring system (i.e. DAS or SCADA).

Project Resource – Existing Solar Project

- ❑ Provide a description of the facility, including the year built, the construction contractor, major components datasheets used in the facility (including modules, inverters, transformers, racking), major maintenance performed over the last years, description of operations and maintenance performed each year, the O&M provider, description of remaining warranty periods for existing equipment, etc.
- ❑ Provide the P50, P75, P90 and P10 annual NCF projection for the project through the contract term.
- ❑ Provide a 12X24 profile of the P50 facility NCF in Excel format.
- ❑ Provide map or drawing of project including location of inverters, PV racking, etc.
- ❑ Provide monthly operating reports (MORs) for the period that the project has been in

operation. At a minimum, MORs should include system availability, curtailment levels, and metered production.

- ❑ Identify energy production measurement point and any losses to that point.
- ❑ Provide hourly (15 minute if available) net energy production records for the period the project has been in operation in Excel or csv format.
- ❑ Provide any assessment reports that have been prepared for the project that utilize historical energy production data to forecast energy production for the remaining project life. Please include long-term reference data used in the assessment report to forecast energy production.

Project Resource – Geothermal

- ❑ Provide a project overview which includes a description and map of the site location (including ownership of adjoining properties), years of development and geological summary of site.
- ❑ Describe the resource, the resource temperature profile, and proposed size of the facility as well as proposed technology, layout (include relevant diagrams/drawings, such as general arrangement drawings, heat balance diagrams, one-line diagrams, water mass balance, and major system P&IDs), operational characteristics and anticipated operation and maintenance (annual and major required over the life of the asset).
- ❑ Provide the P50, P75, P90 and P10 annual generation projection for the project through the contract term.
- ❑ Provide a 12X24 profile of the P50 facility generation in Excel format.
- ❑ Discuss the nature of the geothermal resource, and any challenges, including environmental, in drilling or conversion of the resource as a result of the geothermal characteristics. Provide the reservoir fluid quality analysis.
- ❑ Describe the water rights, permitting and licenses required, the process to obtain and maintain these, and their current status.
- ❑ Describe the status of the exploration program at the site, including information on the organizations performing the field work, a summary of the various data collected at the site, and the approach used for validating that data.
- ❑ Describe the analysis used to convert data obtained from the geothermal site into a reservoir model.
- ❑ Discuss the proposed geothermal power production technology appropriate for the site (also identified in description) and the proposed long-term drilling program for the site. Identify the type and quantity of working fluid (refrigerant), if applicable.
- ❑ Identify any innovative design or special operational features that will be required at this site.
- ❑ Provide 3rd party resource assessment.
- ❑ Provide the detailed analysis used to support the estimate of net annual and monthly energy output of the geothermal project.
- ❑ List and quantify all sources of losses, including degradation, and provide the basis for the quantification.
- ❑ Provide a milestone schedule for permitting, contracting, engineering, field development, construction, and commissioning, as applicable.

Project Resource – Hydroelectric

- ❑ Provide a description of the planned (or existing) resource, plant configuration, commercial operation date (or year built), equipment, equipment ratings, number of units, location, license details, etc. Include relevant diagrams and drawings.
- ❑ Include a table of projected monthly and annual water flows (average, adverse, and favorable) over the term of the proposed power purchase contract (or life of asset), including any assumptions for such projections, and a conversion of such flows into kilowatts and kilowatt-hours.
- ❑ Provide the P50, P75, P90 and P10 annual generation projection for the project through

the contract term. ❑ Provide a 12X24 profile of the P50 facility generation in Excel format. ❑ Identify the organization responsible for data collection and analysis, the period over which the data was collected (or forecast), a discussion of the approach used for collecting data, and data quality assurance procedures. ❑ Describe the analysis used to determine the project head assumptions. ❑ Provide 3rd party resource assessment reports for the project. ❑ Does the project have a certificate from the Low Impact Hydroelectric Institute indicating the project meets the requirements for classification as a low impact hydroelectric project? If not, is the project seeking a certification from the Low Impact Hydroelectric Institute? ❑ Does the project qualify as a renewable energy resource (thus generating Renewable Energy Credits and/or associated Environmental Attributes)?
Biomass, Biogas and Solid Waste ❑ Describe the technology and project being proposed, include a description of major equipment, etc. ❑ Discuss the status of fuel supply and transportation contracts with potential suppliers and any contingencies that could affect the availability of fuel supply to the facility. Provide fuel supply pricing and basis for long-term price projection. Describe annual fuel availability. Include assumptions regarding any tipping fees related to procurement of fuel. Describe the fuel transportation infrastructure (in place or to be put in place). If contracts have not been signed, provide copies of correspondence or other materials from these parties that demonstrate their level of commitment to the project. If fuel procurement infrastructure is not in place, describe how it will be put in place and the risks associated with this. What actions are needed to ensure this new infrastructure is developed in a timely manner to support the scheduled in-service date of the project? ❑ Provide documentation that will enable PGE to evaluate project fuel suppliers for current and future production and delivery capabilities, and financial strength. ❑ Provide the P50, P75, P90 and P10 annual generation projection for the project through the contract term. ❑ Provide a 12X24 profile of the P50 facility generation in Excel format. ❑ Provide responses to applicable items in Section 4.
Wave Energy ❑ Describe the technology and project being proposed, include a description of major equipment, etc. Describe the equipment to be used and the layout of your wave project. Include the size, technology type and manufacturer of the individual wave turbine units: ❑ Provide a resource assessment report which includes adequate information to develop net annual and monthly energy projection. ❑ Provide the P50, P75, P90 and P10 annual generation projection for the project through the contract term. ❑ Provide a 12X24 profile of the P50 facility generation in Excel format.

4. Operations and Maintenance Reliability and Outages

Operations and Maintenance (O&M) and Outages
❑ Describe the long-term O&M and asset management strategy. ❑ Provide a list of major component repairs and/or replacements (Generator, Bearings and

Gearboxes) for life of the project.

- ❑ Describe the experience and expertise of the project's current (or proposed, if applicable) O&M operator and the recent operating experience(s) of the plant(s).
- ❑ Describe applicable safety programs and training for the plant staff to ensure both safety and proper operation.
- ❑ Does or would the project have a long or short-term service agreement with the vendor for major equipment? Please describe.
- ❑ Does (or would) the project have access to support from a centralized engineering staff? If so, please describe.
- ❑ Provide a list of the major critical spare parts held in inventory by the project, either at the site or at a common inventory location, or indicate if such parts are readily available from the vendor. What is the policy and approach on critical spare parts? Are spare transformers installed at the site for backup?
- ❑ See also proposed PPA terms regarding PGE's rights with regard to plant operation and plant operation and maintenance.

Outages

- ❑ Describe the normal annual maintenance outages planned for the project (or typically employed if an existing facility. Include the timing of the year and the expected duration of these outages. Scheduled maintenance is strongly preferred to NOT occur between November 1 and February 28, and between July 1 and September 30. Details to be discussed as part of PPA negotiation.

5. Credit and Financial Information

Developer Corporate Structure, Financials and Credit

- ❑ Provide a diagram demonstrating the ownership of the project company and any parent company relationships above the project company. Identify ownership interests (majority and minority) as well as partners involved in the project in the diagram. Identify the proposed credit support provider (if proposing a parent) as part of the diagram. Ensure that the relationship to Bidder is clear.
- ❑ Provide 3 years of audited financials and latest quarter financials of the parent company / credit support provider (subject to confidentiality agreement if not public financials) as well as a forward-looking description of liquidity and capital resources.
- ❑ Provide the unsecured credit ratings of the Bidder the Bidder's credit support provider, the developer and the development team, as applicable. Provide the most recent summary, opinion or update by S&P, Moody's, Fitch and DBRS, as applicable.
- ❑ Provide the DUNS number of the Bidder, the Bidder's credit support provider, developer and the development team, as applicable.
- ❑ Provide a comprehensive statement of Guarantor's total outstanding credit support
- ❑ Provide redline mark-up to the credit terms expressed in the applicable agreements and/or as part of proposal. Provide sufficient detail regarding performance assurance and credit terms in any proposed alternate structures. See also Appendix L.

Project Financing and Commitments

- ❑ Describe whether the Bidder intends to internally finance construction of the project(s), or if it plans to obtain project financing from another source. Identify the financier or potential financiers and plan to secure financing if required. Provide details about prior 3rd party financing experience. Identify the extent to which the developer is committed to providing additional funds if necessary to complete the project.
- ❑ Describe whether the Bidder intends to seek third-party tax equity investment for the project. Describe the Bidders experience with securing tax equity investors for renewable projects (number of projects, locations, MWs, approximate total size of tax equity

investment secured, etc.).

- ❑ Describe any existing commitments by financial institutions and provide documentation supporting these commitments. *In lieu* of such information, describe the plans for securing such commitments.
- ❑ Provide a list of projects in the development and construction phase, identifying the manufacturer(s)/vendors of the major components, counterparties in power sales agreement(s), the stage of completion of the project, the estimated operational date and the original estimated operational date.
- ❑ If the decision to proceed with the generating project depends on obtaining power purchase agreements with third parties other than PGE, please identify the amount of the project output that needs to be subscribed before the Bidder will proceed with construction, and the amount of firm commitments through executed agreements that the Bidder already has for output from the project.
- ❑ Identify the counterparty, product amount and term of each executed agreement. If such information is confidential, please provide a summary of amounts committed.
- ❑ List the name telephone number and contact information of the Bidder's Commercial bank, Financial advisor, Bond underwriter and/or other financial trustee, advisor, counsel or lender.

4. Proposals with Dispatchable Renewable Technology

Proposal

- ❑ Provide a description of the proposal.

.

Monthly Energy and Peak Capacity

- ❑ Provide a table displaying by month the monthly energy for the entire term of the bid, as well as the peak capacity in MW (if applicable) to be supplied under the bid proposal, as metered at the POD. If appropriate, include the guaranteed heat rate (Btu/kWh-HHV) at rated output in the table, accompanied by a heat rate curve.
- ❑ Provide the P50, P75, P90 and P10 annual generation projection for the project through the contract term.

Firm Proposal Output Variability

- ❑ Alternate proposals that offer a delivery schedule other than a flat schedule must include a clear description of the proposed delivery schedule and its relationship with the actual production of the project or projects used for delivery.

  Supply in a table the variation in energy output by month during on-peak and off-peak hours (see sample table, below).Expand upon the information provided in the table if this format is insufficient to fully describe the output variability of the bid.

Monthly Output Variability of the Bid (MWh)

Month	*Average Energy On-Peak Hours ending 07-22, Monday to Saturday (MWh)*	*Average Energy Off-Peak Hours ending 23-06 and all-day Sunday (MWh)*
January		
February		
March		

	April			
	May			
	June			
	July			
	August			
	September			
	October			
	November			
	December			

Temperature Impacts

- ❑ To the extent that the guaranteed quantity of energy, peak capacity (if applicable) or heat rate in the bid is dependent on ambient temperature, clearly identify and describe the relationship and provide estimates for the range of variation.
- ❑ At a minimum, provide an estimate for the quantity of energy, peak capacity (if applicable) and heat rate for a hot summer day and a cold winter day.

Power Product Quality

- ❑ If the Bidder is offering only a portion of the project's firm energy to PGE, describe each entity's rights to the firm energy produced by the project.
- ❑ Describe the process for coordinating the differing operational requirements of the purchasers.

Dispatch

Completely describe all dispatch and operating schedule flexibility that will be available to PGE by contract.

For dispatch or curtailment describe:

- Minimum run time per dispatch call:
- Minimum down time per curtailment:
- Startup time and costs for a cold start:
- Startup time and costs for a hot start:
- Cost impact of dispatch, if any:
- Ramping rates:
- Multiple party output issues:

For turn-down (operation at below 100 percent of base output), provide the following:

- Minimum turndown value:
- Maximum hour-to-hour adjustment:
- Cost impact of turndown, if any:
- Multiple party output issues:

Please provide Information about heat rate degradation for plant turn-down:

Other Factors

Identify and describe in detail the following, if applicable:

- ❑ Environmental restrictions.
- ❑ Operational limitations.
- ❑ Other factors relevant to resources supporting a bid that may prevent the resource from meeting its guaranteed monthly quantities of energy (or peak capacity, if applicable).

Environmental

- ❑ Discuss and describe status of project.
- ❑ Discuss known environmental issues related to the development and/or operation of the project.
- ❑ Describe environmental impacts of, and existing environmental constraints on, existing and proposed projects.

Air Quality

Complete the following table, and provide the information requested below (as applicable).

Emission Disclosures

Emission	*Lbs./MWh*
Sulfur Dioxide (SOx)	
Nitrogen Oxide (NOx)	
Carbon Dioxide	
Carbon Monoxide	
Volatile Organic Compounds (VOCs)	
Particulate Matter (PM)	
Hazardous Air Pollutants (HAPs)	
Solid Waste (i.e. ash)	
Other permitted emissions	
Mercury	

Describe the following:

- ❑ Air pollution controls used on the project, *e.g.*, type, emissions controlled and removal efficiency.
- ❑ Whether the proposed project will exceed any criteria of the National Ambient Air Quality Standards (NAAQS) for any pollutant when operating on either primary or backup fuel. Also describe the “Prevention of Significant Deterioration Increment Consumption” due to this project, as applicable.
- ❑ State whether the project requires a federal, state or local air permit. If relevant, Include a copy of this permit, if approved, or a copy of the permit application, if submitted.

19 Appendix H-1 – Technical Specifications for Owned Wind Resources

Template provided in a separate document available for download on PortlandGeneralRFP.accionpower.com.

Portland General Electric Company

WIND RESOURCE TECHNICAL SPECIFICATION**

Renewable Energy Resources

****NOTE: PGE's final issuance of the 2016 Request for Proposals (RFP) for Renewable Energy Resources is subject to Oregon Public Utility Commission approval of both the draft RFP and the Petition for Partial Waiver of the Competitive Bidding Guidelines, including the expedited RFP timeline.**

May 23, 2016

1. DEFINITIONS 3
2. APPLICABLE STANDARDS 6
3. SCOPE OF WORK 9
4. GEOTECHNICAL INVESTIGATION 17
5. WIND TURBINE FOUNDATIONS 20
6. CIVIL WORKS 23
7. ELECTRICAL BALANCE OF PLANT 31
8. HIGH VOLTAGE TRANSMISSION LINE 51
9. PLANT COMMUNICATIONS NETWORK 57
10. TELECOMMUNICATIONS FACILITIES 59
11. PLANT SCADA SYSTEM 63
12. WIND TURBINE EQUIPMENT 79
13. METEOROLOGICAL MASTS 90
14. ON SITE BUILDINGS 95
15. INSTALLATION, COMMISSIONING, AND PERFORMANCE TESTING 98
16. APPROVED SUPPLIERS 103
17. REQUIRED DOCUMENTATION 108

1. DEFINITIONS

As used in this document, the following terms have the meanings set forth below. Other capitalized terms used and not defined herein have the meanings given to them in the form of Engineering, Procurement and Construction Contract included in the RFP.

Agreement	The agreement to be executed by Owner and Contractor, pursuant to which Contractor will construct the Project. To the extent applicable, the Agreement will be based on the form of Engineering, Procurement and Construction Contract included in the RFP.
Applicable Standards	As defined in Section 2
BOP	Balance of Plant - All aspects of the Work, excluding the WTG Works. Includes civil, electrical, SCADA, and other equipment, systems, and buildings which enable all other work.
BOP Civil Works	Those aspects of the BOP Works relating to the civil infrastructure
BOP Electrical Works	Those aspects of the BOP Works relating to the electrical system
BOP Works	All Work required to allow for the WTG Works (from the interface points at the Wind Turbines) and connection to the Point of Interconnection and operation of the Wind Power Plant
Certification Body	An independent organization which is a recognized body to approve the design of a Wind Turbine against a recognized set of design codes.
Contractor	As defined in the Agreement
Contractor's Specifications	The documents to be attached to the Agreement which fully define the equipment being supplied and installed by Contractor.
Design Life	As defined in Section 3.3.1.
Development Met Masts	Met Masts already installed at the Site prior to Site mobilization
Electrical Works	Those aspects of the Work relating to the electrical system
EMS	Energy Management System
Equipment	The machinery or apparatus brought by Contractor onto the Site to perform the Work, and, where applicable, requiring removal afterwards
ERP	Emergency Response Plan
FAT	Factory Acceptance Test
GA	General Arrangement
Grid	As defined in the Agreement
GUI	Graphical User Interface
HMI	Human Machine Interface
HSE	Health, Safety and Environment
HSEMP	Health, Safety and Environment Management Plan
HSMP	Health and Safety Management Plan
HV	High Voltage. Defined within this specification as the nominal grid connection voltage
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
kV	Kilovolt
LV	Low Voltage

MEASNET	International Network for Harmonised and Recognised Measurements in Wind Energy (www.measnet.org)
Meteorological Station	As defined in Section 12
Met Mast	Having the same meaning as Meteorological Station
MTBF	Mean time between failures
MTTR	Mean time to repair
MV	Medium Voltage
MW	Megawatt
NDT	Non-Destructive Testing
O&M	Operation and Maintenance
OEM	Original Equipment Manufacturer
OHL	Overhead Line
OHS	Occupational Health and Safety
OLTC	On Load Tap Changer
Operations and Maintenance Building	The building required to be provided by Contractor for use by the Maintenance Provider and as detailed in this document
OPGW	Optical fiber composite over-head ground wire
Owner	As defined in the Agreement
Owner's Representative	A representative of Owner, appointed by Owner, to serve as an interface with Contractor with respect to the Work
POI	Point of Interconnection as defined in the Interconnection Agreement
Performance Test	The tests defined in the Agreement to verify performance of the Work as described in this document
Permanent Met Mast	Met Masts connected to the SCADA system for operation of the Wind Power Plant and as defined in Section 13
Plant	The Equipment which Contractor is required to provide and hand over to Owner as part of the permanent Work
Project	As defined in the Agreement
Project Schedule	As defined in the Agreement
Reactive Plant	The Work required to meet the requirements of reactive power control and voltage support
Registered Professional Engineer	Licensed as a Professional Engineer in the corresponding engineering discipline of the design work being undertaken. The Registered Professional Engineer shall be in responsible charge of the work, and have competence in the discipline of the work being performed as defined by laws and regulations in the jurisdiction of the project location.
RTU	Remote Terminal Unit
Turbine SCADA	Supervisory Control And Data Acquisition from the Turbine Manufacturer
Substation SCADA	Supervisory Control And Data Acquisition for the Project Substation
Section(s) of Works or Sections	To describe a part, or parts, of the Work as agreed by Owner and Contractor such that the overall objective is to progressively complete the Work and enable groups or sections of Wind Turbines to be brought into operation as early as possible
Site	The immediate area upon which the Wind Power Plant is located including access roads, Substation, O&M and other associated buildings.

Site Access Point	Entrance to the Site
Site Specific Design Assessment	A Site specific statement of compliance for the design assessment from a Certification Body in accordance with the latest edition of IEC 61400-22 which demonstrates that the combined system of Wind Turbine and Wind Turbine tower is designed to withstand the Site Conditions for the full Design Life
SLD	Single Line Diagram
SIEM	Security Incident and Event Manager
Substation	Means the area and equipment included in the following works: HV switchgear, MV/HV transformer, MV swithchgear and associated equipment, reactive plant (if required), the control building, the auxiliary MV/LV transformer/s, diesel generation set and all items associated with it as described in this document.
Temporary Met Mast	Temporary Met Masts as defined in Section 13 for the purpose of site calibration installed in accordance with IEC 61400-12-1
TSP	Transmission Service Provider
Turbine Foundation	The Work required to support the Wind Turbine and Wind Turbine tower
UPS	Uninterruptable Power Supply
VT	Voltage Transformer
Wind Power Plant	The Wind Turbines and all associated BOP infrastructure up to the Point of Interconnection for the Project
Wind Power Plant Communications Network	As defined in Section 9
Wind Power Plant Electrical System	All Electrical Works included in the Work associated with the transmission of power from the Wind Turbines to the POI and the control and monitoring of the transmission of power from the Wind Turbines to the POI as described in this document.
Wind Turbine	Wind turbine generator unit which consists of the rotor, nacelle, yaw system and tower including all associated electrical, safety, access, control equipment and other systems contained within or attached to the nacelle, tower and/or Turbine Foundation (alternatively Wind Turbine Generator or WTG)
WTG Works	All Work related to the Wind Turbines including but not limited to their installation, commissioning, and testing necessary for their operation
Work	As defined in the Agreement

2. APPLICABLE STANDARDS

The "Applicable Standards" are the standards applicable to the Work, as determined by the agencies having jurisdiction in the region of the Project and as contained in the applicable:

- Laws and Regulations (defined in section 2.1 below)
- United States Standards and Codes (defined in section 2.2 below)
- International Standards and Codes (defined in section 2.2 below), and
- Industry Codes (defined in section 2.2 below)

Where a reference to the above is made in this document the latest edition shall apply.

Furthermore in the event of any discrepancy in the Applicable Standards, the most stringent standards and requirements shall apply.

Contractor shall be responsible for ensuring that the Work comply with all Applicable Standards and as these may be amended and revised from time to time.

The Applicable Standards are in addition to the requirements set forth in the Agreement, this document, including any additional standards, the Permits, and the Specifications.

Any the event of any departure from Applicable Standards the referenced codes and standards must be fully explained in writing and submitted for Owner's review and approval prior to implementation.

2.1 Laws and Regulations

2.1.1 As amended from time to time, all laws, rules, regulations and orders having force of law in the state which the Project is located that directly or indirectly apply to the Work. The Work shall comply with all applicable laws and regulations, including, but not limited to:

- Occupational Safety and Health Regulations
- Electricity Regulations
- Environment Regulations
- Civil Aviation Authority
- Road Authority
- Military Authority
- Communications Authority
- Local civil government authorities

2.2 Codes and Standards

2.2.1 The Work shall comply with all applicable local codes and standards, including, but not limited to the relevant standards and codes of practice of the:

- International Building Code, as modified by state and local authorities
- National Electrical Code, as modified by state and local authorities
- National Electric Safety Code, as modified by state and local authorities

2.2.2 or where relevant local standards and codes of practice do not exist the relevant standards and codes of practice of the:

- ANSI
- IEEE
- AIC

- NFPA
- ASTM – American Society for Testing of Materials
- OSHA
- ISO
- IEC 61400-1
- IEC 60287-3-2 Economic Optimisation of Power Cable Size
- IEC 60826 - Design criteria of overhead transmission lines
- IEC 61400-1 Wind Turbines - Part 1: Design requirements
- IEC 61400-11 Acoustic noise measurement techniques
- IEC 61400-12-1 Power performance measurements of electricity producing wind turbines
- IEC 61400-21 Measurement and assessment of power quality characteristics of grid connected wind turbines
- IEC 61400-22 Conformity testing and certification
- IEC 61400-24 Lightning protection

2.2.3 The Work shall comply with all latest applicable industry codes, including, but not limited to the following standards:

- ASCE-AWEA RP 2011, Recommended Practice for Compliance of Large Land-based Wind Turbine Support Structures;
- ACI 318-11: Building Code Requirements for Structural Concrete
- DNV OS C502 (2010):Offshore Concrete Structures (for fatigue requirements of onshore wind turbine foundations)
- FIB Model Code for Concrete Structures, 2010
- ASCE 7: Minimum Design Loads for Buildings and Other Structures
- DNV GL: Guidelines for the Certification of Wind Turbines, 2010
- DNV GL Standard DNV GL-ST-0126: Support Structures for Wind Turbines, Edition April 2016
- ASTM Annual Book of Standards, Volume 4.08 Soil and Rock (I):D420-D5876 and Volume 4.09 Soil and Rock (II) D5877-latest
- US Federal Highway Administration, Gravel Roads Construction and Maintenance Guide, August 2015
- Bulletin 1724E-200, Design Manual for High Voltage Transmission Lines, US Department of Agriculture, Rural Utilities Service, Electric Staff Division, December 2015
- National Electrical Safety Code, 2012 Edition, IEEE
- ASCE 48-11 – Design of Steel Transmission Pole Structures
- ASCE Manual No. 74 - Guidelines for Electrical Transmission Line Structural Loading, 2010, Third Edition
- IEEE-738 - Standard for Calculating the Current-Temperature Relationship of Bare Overhead Conductors
- RUS Bulletin 1724E-200 – Design Manual for High Voltage Transmission lines
- IEEE P1863 - Guide for Overhead AC Transmission Line Design
- IEEE Std. 524, 1992 - IEEE Guide to the Installation of Overhead Transmission Line Conductors,

2.3 Engineer of Record

2.3.1 All engineering shall be performed under the responsible charge of the engineer of record, who shall be a registered professional engineer, registered in the corresponding discipline for the reports or drawings produced, and the state(s) in which the site is located. The registered professional engineer shall have experience and competence in the area of engineering being performed as defined by laws and regulations of the applicable jurisdiction.

2.3.2 Final "Issued for Construction" engineering drawings and reports shall be signed and stamped by the registered professional engineer in responsible charge of the engineering work.

3. SCOPE OF WORK

Contractor is responsible for the engineering, procurement and construction of the Project. It is not the intention of this section or document to specify all details of design and construction of the complete Project. However, the Work shall conform in all respects to high standards of engineering, design and workmanship and be capable of performing in continuous commercial operation meeting all contractual obligations of Contractor including guarantees and warranties in a manner acceptable to Owner.

If there are other or different requirements than are specified in this document or Agreement (including any exhibits thereto) that are necessary in order to provide Owner with a System that: (i) has no Defects, (ii) reflects Prudent Industry Practices; and (iii) is capable of performing on a sustained, fully operational basis to generate the electricity as described in the Agreement, Contractor is to satisfy such requirements as part of the Work.

3.1 General

3.1.1 The Work supplied by Contractor shall achieve the objective of connecting the Wind Power Plant to the POI for the purpose of generating electricity into the network and be of a proven, robust and reliable design incorporating protective systems and devices with adequate factors of safety and operability built-in. Work will include, but not be limited to:

- The engineering, procurement, and construction of the BOP
- The supply, delivery, and installation of the Wind Turbines
- The engineering, procurement, and construction of the O&M Building
- Transmission line between the collection substation and interconnection

3.1.2 The Work shall be carried out in accordance with and meet the requirements of the following:

- The Agreement including but not limited to this document
- Applicable Standards
- Warranty obligations
- Land lease and easement agreements
- Wind Turbine technical specifications
- The Project geotechnical constructability study
- The Project grid interconnection agreement

3.1.3 Contractor shall be responsible for obtaining all relevant permits and authorizations required to undertake the Work.

3.1.4 Contractor shall be responsible for the actions required to enable the engineering, procurement and construction of the Work.

3.1.5 Contractor shall be responsible for all reclamation activities as required for all areas disturbed during the Work.

3.1.6 Contractor shall be responsible for the establishment of appropriate O&M procedures, quality management system documentation and warranties for the Work.

3.1.7 Contractor shall plan and execute its own Work so as to minimize the effect of work by others on its own operations and the effect of its work on the operations of others.

3.1.8 All equipment supplied by Contractor shall be supplied new, complete and operational and shall include all necessary accessories and incorporate all miscellaneous material, minor

parts and other such items, whether or not the items are indicated on the drawings or in this document, where it is clearly the intention that they should be supplied or where they are required and necessary to complete and commission the equipment.

3.2 Project Description

Owner is requesting proposals for a newly constructed wind power project meeting all requirements of the Agreement including but not limited to those listed in this document.

3.3 Site Conditions

Contractor will ensure that all aspects of the Work are fit for purpose and suitable for the current and reasonably predicted conditions at the Site through inspection, examinations, investigations, explorations, surveys, tests, studies and data collection. All inspections, examinations, investigations, explorations, surveys, tests, studies and data collection will be included in Contractor proposal and thus, Contractor will not be entitled to any scope change based on results included in these investigations.

It is Contractor's responsibility to ensure that all aspects of the Work are suitable for the existing and predicted conditions of the Site including but not limited to:

- Climatic (including, but not limited to, both local and regional wind and snow loading)
- Environmental
- Community acceptance and impact
- Geotechnical
- Transmission, and
- Hydrological conditions

3.3.1 If aerial survey techniques are employed, Contractor will validate aerial survey data with ground based data collection.

3.4 Design Life

Contractor will design, engineer, procure, and construct the Project according to the following intended design life:

3.4.1 Civil Works (including Turbine Foundations): 30 years

3.4.2 Electrical Works (including collection system, substation, and communications): 30 years

3.4.3 Wind Turbines: 20 years

3.4.4 O&M Building: 30 years

3.4.5 Transmission Line: 60 years

3.5 Maintainability

3.5.1 The Work shall be provided by Contractor to allow maintenance to be performed safely and efficiently without significant dismantling or disruption to other items or parts of the Work or unduly curtailing power generation.

3.5.2 The Work shall allow maintenance activities that can be performed by a limited crew using mobile plant and operating in remote locations.

3.5.3 Contractor shall provide sufficient access around all of the Work, in accordance with good utility design practice and Applicable Standards, to allow effective maintenance and

removal of items from service or parts thereof, while maintaining operation of the Work unaffected by maintenance tasks.

3.6 Facility Safety

The Work designed and provided by Contractor shall ensure satisfactory operation in which safety of personnel and Work and continuity of service are the first considerations, and equally to facilitate inspection, cleaning, maintenance and repairs.

3.6.1 The design shall incorporate industry best practices for the safety of all those concerned in the operation and maintenance of the Work and of related works supplied under other contracts.

3.6.2 The Work shall be designed and constructed so that they comply with all relevant health and safety requirements.

3.6.3 Contractor shall undertake risk assessments and processes in accordance with the relevant standards to ensure that the design complies with the safety requirements of Applicable Standards and this document.

3.6.4 All items supplied by Contractor shall be designed to ensure satisfactory operation under the environmental conditions prevailing at the Site and under such variations of load as may be met with under working conditions on the system including those due to synchronization and electrical faults including short circuit.

3.6.5 Safe operation shall not rely on the connection of the Wind Turbines to the SCADA system or a remote monitoring center.

3.7 Permits

Contractor will obtain and maintain, at its sole cost, all permits required to design, engineer, procure, and construct the Project.

3.8 Project Management Plan

3.8.1 Contractor shall develop a project management plan for the management and execution of all phases of the Work and shall address as a minimum:

- Construction project manager and key team members
- Communication
- Permits, licenses, certifications and agreements required
- Procurement and sub-contracting
- Project schedule and payment milestones
- Resource loading
- Environment, health and safety
- Management of interfaces

3.9 Project Schedule

Contractor shall develop a Project Schedule which shall be used as the baseline for tracking progress through the design, engineering, procurement, and construction of the Work.

3.10 Project Milestones

3.10.1 Contractor will define milestones with associated completion certificates to include, as a minimum:

- Public road completion
- Access road completion
- Individual Wind Turbine foundation completion
- Collection circuit completion
- Substation completion
- Transmission line completion
- Individual Wind Turbine mechanical completion
- Individual Wind Turbine final completion
- Substantial completion
- Final completion

3.10.2 Contractor will provide a guaranteed Project Substantial Completion date with associated damage provisions. Project Substantial Completion will be achieved after all Wind Turbines comprising the Work have achieved foundation completion and mechanical completion; all public and access roads, collection circuits, the substation and the transmission line have been completed, all Wind Turbines are connected and synchronized with the grid, commercial operation has been achieved according to the Project interconnection agreement, and Contractor and Owner have agreed upon a final punch list.

3.11 Quality Control

3.11.1 Contractor shall operate a quality system equivalent to the ISO 9000 series of standards and as approved by Owner.

3.11.2 Contractor's quality assurance / quality control plan will be adequate to cover all construction operations.

3.11.3 Contractor will submit all quality assurance / quality control documentation to Owner to show compliance with the requirements of this document.

3.12 Reporting

At a minimum, Contractor will provide weekly progress reports throughout the design, engineering, procurement, and construction activities, as well as "plan of the day" reports daily during the construction period.

3.13 Training

3.13.1 Contractor will develop and provide training to Owner personnel in the safe operation of Project equipment including but not limited to the Electrical Works, Substation, and Wind Turbines.

3.13.2 Contractor will involve Owner's personnel during Project start-up activities.

3.13.3 Contractor will provide training materials and manuals for all equipment provided by Contractor, to facilitate a smooth transition of operational responsibility from Contractor to Owner.

3.14 Design & Engineering

3.14.1 Contractor will complete design and engineering services and will provide comprehensive drawings and specifications for a complete and fully operational Project that meets the requirements of the Agreement including those listed in this document (see Section 17).

3.14.2 Contractor will submit 30% (preliminary) design packages for the entirety of the Project for Owner review. Such packages will include, at a minimum, drawings, specifications, and assumptions.

3.14.3 Contractor will submit 75% (issued for review), 90% (issued for procurement), and 100% (issued for construction) design packages for the entirety of the Project for Owner review. Such packages will include, at a minimum, drawings, specifications, design calculations, materials, and assumptions. 100% (issued for construction) design packages shall be issued prior to the commencement of construction.

3.15 Project Documentation

Contractor shall provide documentation, including engineering and design information, as it is developed and issued throughout the Agreement from the beginning of engineering to Project completion, to:

- Enable verification of compliance of the Work with the Agreement and this document
- Provide comprehensive documentation of all aspects of management, engineering, procurement, construction and performance, for Owner's future use in fully and solely operating and maintaining the Work

Required Project documentation is detailed in Section 17. For any documentation that is not available at the time of bid proposal, Contractor will provide justification.

3.16 Design Engineering Submittals

Each submitted drawing shall be unique and shall be clearly marked with the name of the project, facility name, facility designation, specification title, specification number, project equipment or structure nomenclature, component identification numbers and Owner's name.

3.16.1 Engineering Design Document and Drawings Formats

Drawings shall adhere to Owner's CAD Standards. All Contractor and Subcontractor drawings (including shop fabrication drawings) shall be submitted in the following formats:

- Drawings: AutoCAD Drawings (*.dwg) – the latest version as specified by Owner
- 3D Models: Navisworks (*.nwd), AutoCAD (*dwg), AutoDesk Design Web Format (DWF)
- Raster Image Files: Tag Image File (*.tif, *tiff)
- Adobe Portable Document Format (*pdf)

3.16.2 Document Format

Typical project lists shall be submitted in MS Excel format. Examples include, but are not limited to:

- Spare Parts
- Special Tools List
- Electrical Load Lists
- Equipment List

- Instrument List
- Lubrication Schedule
- DCS I/O List
- Cable and Conduit Schedule

All PDF documents shall be unlocked, indexed, word searchable and editable. Project lists shall be submitted in MS Excel format.

3.16.3 Manuals

The electronic versions of the O&M manuals shall be word searchable PDF format, fully indexed and shall not be protected. The index shall link to the pages referenced in the index and the bookmarks shall coincide with the required tabs in the paper form.

Manuals which contain information on multiple manufacturer models shall have the model used at Project highlighted. Manuals shall include as a minimum:

- Maintenance intervals and tasks; including
- Procedures
- Tool
- Inspection criteria
- Troubleshooting guide
- Condition monitoring intervals and tasks, including procedure and criteria

3.16.4 Equipment Numbering

Contractor shall use Owner's equipment numbering scheme for all equipment. Owner's equipment numbering scheme shall also be on all Contractor drawings.

3.16.5 Equipment Information

Contractor shall provide, as a minimum, the information shown in the Project equipment list template for all equipment supplied for the Project.

Contractor shall supply all spare parts and bill of materials for the Project.

3.17 Health, Safety and the Environment

3.17.1 Contractor shall have and maintain documentation detailing its HSE system and if combined, Contractor's policy is expected to have two separate and distinct sections related to: (1) Health and Safety and (2) the Environment.

3.17.2 Contractor shall be responsible that the health and safety requirements extend to all sub-contractor Work associated with or included in the Agreement.

3.17.3 If requested, Contractor will be required to provide documentary evidence to show compliance with the requirements of this document.

3.17.4 Contractor is required to have an operational HSE management system including, at a minimum a method for the identification of hazards during the execution of the Project and subsequently through the Design Life of the Work through risk assessments, hazard reporting, planned inspections, regular maintenance of the Work, and personnel qualification reviews.

3.17.5 Contractor shall have the following management plans submitted and approved by Owner prior to commencing the Work:

- A Health and Safety Management Plan (HSMP);

- An Environment Management Plan (EMP); and
- An Emergency Response Plan (ERP).

3.17.6 Both the HSMP and the EMP shall be specific to the Agreement and Work.

3.17.7 The HSMP and EMP shall be reviewed at regular intervals as agreed between Owner and Contractor to ensure that it remains current and relevant to the Work.

3.17.8 The HSMP and EMP shall establish the process for incident reporting in accordance with the Agreement requirements.

3.17.9 A formal risk register shall be created and used to record the identified hazards, risk assessment and risk control methods to be employed by Contractor throughout the duration of the Work.

3.17.10 Contractor shall provide a description of Contractor's permitting system and safe work procedures for the applicable high risk work associated with the Agreement (e.g. management of hazardous substances, working at height, confined spaces, extremes of temperature and electrical switching, other where relevant).

3.17.11 Contractor shall notify Owner immediately of any incident, involving injury, property or environmental damage or near miss incidents that had the potential to impact HSE, which occurs during the carrying out of the Work.

3.17.12 Contractor shall comply with all relevant Applicable Standards and its obligations under the Agreement including this document for the handling, storage and disposal of hazardous materials and solid waste.

3.17.13 Contractor shall be responsible for the safe disposal of all waste, toxic and hazardous materials during the course of the Work. Such disposals shall be in accordance with the requirements of the relevant Government Authorities.

3.17.14 Contractor shall be responsible for obtaining all approvals, permits or other authorizations required for the disposal of waste.

3.17.15 Contractor shall be responsible for providing adequate fire protection equipment for protection of the Work during the course of the Work including any requirements stipulated in the planning permit such as the supply of fire water tanks.

3.18 Delivery, Storage and Handling

3.18.1 Delivery

Contractor shall bear the responsibility for delivery of equipment, spare parts, special tools, and materials to the site and shall comply with the requirements specified herein and shall provide required information concerning the shipment and delivery of the materials specified in this Agreement. These requirements also apply to any sub-suppliers making direct shipments to the jobsite.

Owner shall, from time to time, at their discretion supply equipment, spare parts, special tools, and materials to the site. Contractor shall coordinate receipt of such items and shall apply all requirements set forth herein to those items.

Contractor shall, either directly or through contractual arrangements with others, accept responsibility for the safe handling and protection of the equipment and materials furnished under this Agreement by Contractor before and after receipt at the port of entry. Acceptance of the equipment shall be made after it is installed, tested, commissioned, placed in operation and found to comply with all the specified requirements.

All items shall be checked against packing lists immediately on delivery to the site for damage and for shortages. Damage and shortages shall be remedied with the minimum of delay, at no additional cost to Owner when it is Contractor supplied.

Delivery of portions of the equipment in several individual shipments shall be subject to review of Engineer before shipment. When permitted, all such partial shipments shall be plainly marked to identify, to permit easy accumulation, and to facilitate eventual installation.

3.18.2 Storage

Upon delivery, all equipment and materials shall immediately be stored and protected by reasonable means until installed in the Work. It is assumed that all materials can be received and stored at the project site. If offsite storage is required, it shall be coordinated and approved by Owner.

Stacked items shall be suitably protected from damage by spacers or load distributing supports that are safely arranged. No metalwork (miscellaneous steel shapes and reinforcing steel) shall be stored directly on the ground. Galvanized steel with architectural purposes shall be stored with appropriate spacers to protect against galvanic discoloring. Galvanic discoloring is not applicable to ground mount array piles for which some discoloring is acceptable. Masonry products shall be handled and stored in a manner to hold breakage, chipping, cracking, and spalling to a minimum. Cement, lime, and similar products shall be stored off the ground on pallets and shall be covered and kept completely dry at all times. Pipe, fittings, and valves may be stored outdoors, but must be placed on wooden blocking. PVC pipe, geomembranes, plastic liner, and other plastic materials shall be stored off the ground on pallets and protected from direct sunlight.

Motors, electrical equipment, and all equipment with antifriction or sleeve bearings shall be stored in weathertight structures maintained at a temperature above 60°F [16°C]. Electrical equipment, controls, and insulation shall be protected against moisture and water damage. Space heaters furnished in equipment shall be connected and operated appropriately to protect equipment from condensation.

Equipment having moving parts, such as gears, bearings, and seals, shall be stored fully lubricated with oil, grease, etc., unless otherwise instructed by the manufacturer. Manufacturer's storage instructions shall be followed by Contractor.

Equipment and materials shall not show any pitting, rust, decay, or other deleterious effects of storage when installed in the Work.

When applicable and reasonable, the packaging of spare units and spare parts shall be suitable for long-term storage in a damp location. Each spare item shall be packed separately and shall be completely identified on the outside of the container.

3.18.3 Handling

Stored items shall be laid out to facilitate their retrieval for use in the Work. Care shall be taken when removing the equipment for use to ensure the precise piece of equipment is removed and that it is handled in a manner that does not damage the equipment.

4. GEOTECHNICAL INVESTIGATION

4.1 General

The Project shall have a site specific design level geotechnical investigation completed to evaluate geotechnical conditions for wind turbine foundations, electrical collection system, electrical transmission, substation foundations, operation and maintenance facilities, and project civil infrastructure including roads and drainage facilities.

4.1.1 Document Review

A document review shall be conducted consisting of available geotechnical and geologic documentation, which at a minimum includes the following:

- Historical and current aerial imagery
- Regional geologic maps
- Soil survey reports
- Groundwater hydrology data and maps
- Landslide hazard maps (as applicable)
- Karst hazard (sinkhole) maps(as applicable)
- Mine subsidence maps (as applicable)
- Seismic hazard maps
- Other applicable geotechnical and geologic mapping

4.1.2 Geotechnical Hazards

All geotechnical hazards that may affect the project shall be included in the geotechnical study and report, with recommendations for mitigation as applicable. Geotechnical hazards shall include, at a minimum:

- Seismic hazard and seismic effects (ground shaking, liquefaction, tsunami, seismic induced slope instability, etc.)
- Landsliding and slope instability
- Flooding and debris flow
- Foundation settlement and land subsidence
- Expansive soils
- Corrosive soils
- Any other geotechnical hazards that may affect the project

4.1.3 Geotechnical Exploration

For all wind turbine locations, geotechnical exploration shall consist of a minimum of one exploration point per turbine foundation, or more as necessary to characterize soil and bedrock conditions within the foundation influence zone. All subsurface exploration shall be located within the turbine foundation footprint, in accordance with and have a minimum depth of 50 feet below the ground surface, and be sufficiently deep to capture all soil and bedrock materials that can influence foundation behavior. The drilling method chosen shall be capable of achieving the minimum exploration depth without encountering refusal. Samples shall be taken at regular intervals to characterize materials within the soil and bedrock profile. Minimum sampling in soil materials shall include standard penetration testing at a maximum spaced interval of 2.5 feet, and 5.0 feet to the total boring depth, or more often as determined by the Geotechnical Engineer. Core borings in bedrock materials shall include a continuous core run, logged to determine sample recovery and assess the character of the bedrock materials. Rock or soil drilling without sampling (percussion, air-track or similar) is not considered suitable for geotechnical

exploration without prior owner approval. A boring log shall be prepared for each exploration point that includes all geologic and geotechnical observations, sampling information (sample type, blow counts, etc.), groundwater observations, and boring completion information. All exploration locations shall also be plotted on a map of the project site.

If groundwater is detected within the foundation influence zone during geotechnical exploration, a standpipe piezometer shall be installed to monitor groundwater fluctuation that could affect foundation stability and bearing capacity.

In-situ testing, including cone penetration testing, dilatometer, pressuremeter, vane shear and other in-situ test methods shall be supplemented with a minimum of 10 percent borings with sampling to correlate soil material properties to the in-situ tests.

4.1.4 Geophysical Testing

Seismic testing, including downhole seismic, seismic CPT, and surface methods should be conducted at minimum of 10 percent of proposed sites in order to determine shear and compression wave velocity of the subsurface materials. The shear and compression wave velocities shall then be used to determine dynamic shear modulus and be input into dynamic analyses of foundation stiffness.

Geophysical testing, including seismic velocity testing, electrical imaging, or other appropriate methods may also be used by the Geotechnical Engineer to assist in determining soil properties for turbine foundation design. Geophysical investigations should be carried out by a licensed professional with specific experience in the geophysical method to be used. Geophysical methods shall only be used to supplement the subsurface exploration program and not be used as the only means of geotechnical exploration.

4.1.5 Groundwater Considerations

Effects of groundwater shall be accounted for in the foundation design and considered in construction of the project. Monitoring of groundwater levels may be necessary over a minimum year period to capture seasonal fluctuation in groundwater levels. The geotechnical engineer should determine the design groundwater level, which shall take into account seasonal fluctuation as well as long term groundwater levels, and shall account for any buoyancy effects resulting from the design groundwater level.

4.1.6 Geotechnical Laboratory Testing

Laboratory testing should be conducted on samples from soil borings gathered during the subsurface exploration program to determine engineering properties for design of the proposed foundations. Laboratory testing should be sufficient to characterize all soil types and layers that may have an impact on the foundation design.

The following laboratory tests should be included in the soils laboratory testing program, as applicable:

- Moisture content and unit weight (all relatively undisturbed samples)
- Plasticity indices (minimum of 10 representative samples)
- Grain size analysis (minimum of 10 representative samples)
- Shear strength (unconfined, triaxial, direct shear, vane shear, etc.) (minimum of 10 representative samples)
- Consolidation/settlement characteristics (minimum of 10 representative soil samples)
- Hydrocollapse (as appropriate, minimum of 10 representative soil samples)
- Compaction characteristics (maximum unit weight, optimum moisture content, etc.) (minimum of 10 representative samples of potential backfill materials)

- Corrosivity characteristics (Sulfate, chloride, pH, resistivity, etc., minimum of 10 representative samples)
- Other geotechnical laboratory testing as appropriate.

4.1.7 Geotechnical Recommendations

Geotechnical engineering recommendations shall be provided in the geotechnical report for the following for incorporation into design of the project:

- Foundation bearing capacity
- Foundation total and differential settlement estimates
- Soil shear modulus (for wind turbine foundation stiffness calculations)
- Shear modulus degradation factor
- Seismic parameters in accordance with ASCE 7 and local standards
- Design groundwater level, and recommendations for construction dewatering
- Foundation subgrade recommendations
- Mitigation measures for expansive soils
- Mitigation measures for soil corrosion of concrete and buried metal
- Recommendations for gravel and paved roads
- Recommendations for site building foundations
- Recommendations for substation foundations
- Recommendations for transmission line foundations, as applicable
- Ground improvement recommendations, as applicable

5. WIND TURBINE FOUNDATIONS

The Wind Turbine foundations shall meet the requirements of this section and Section 6. Where applicable the requirements of this section modify and/or replace the requirements of Section 6.

5.1 General

5.1.1 The Wind Turbine foundations shall be designed, built and constructed in accordance with local and international industry standards of care, best practice and guidelines.

5.2 Design

5.2.1 Wind Turbine foundations shall be designed to support the Wind Turbines for all anticipated loads consistent with the information provided in this document and as determined by Contractor's own geotechnical and site investigations.

5.2.2 The foundation designer shall prepare a design basis document to outline all references, design procedures, and software tools to be utilized for the design and analysis of wind turbine foundations.

5.2.3 The design shall withstand any seismic loading associated with the Site and Contractor shall make its own assessment of the likely ground accelerations based on the greater return period of: 475-year return period as specified in IEC 61400-1, or as specified in the applicable state and local standards.

5.2.4 The Wind Turbine foundations shall be designed to consider all relevant design factors, including but not limited to:

- The above-mentioned ultimate limit state, serviceability limit state, and fatigue limit state loads, as required by the turbine supplier;
- The required degree of rotational stiffness with respect to:
  - The site geotechnical conditions, and
  - The Wind Turbine specification and turbine supplier's foundation requirements
- Allowable stresses for the supporting soils
- The stability of the foundation
- shear modulus degradation of soils
- Flexure and shear in the foundation
- Resistance to tower anchorage pullout
- Seismic loading
- The presence of groundwater (buoyancy effects)
- Load transfer reinforcement to transfer loads into the foundation
- Fatigue in the embedded foundation inset or anchor bolt cage and reinforcement
- Fatigue in rock anchors(if applicable)
- Crack control in the reinforced concrete
- Accommodation of cable ducts as required by the Wind Turbine manufacturer
- Accommodation of the grounding requirements of the Wind Turbine manufacturer
- Accommodation, where applicable, for the installation of Temporary Met Masts as required for the Power Performance Measurements and Site Calibration
- Avoidance of ponding within the foundation influence zone

- The density of the backfill over the top and at the sides of the foundation and its control and achievement on site
- The need to safely access and construct the foundation at all stages of its construction

5.3 Excavation, Ponding and Reinstatement

The excavations shall involve stripping vegetation, topsoil and subsoil, storing each separately and further excavation or piling to a suitable bearing stratum.

5.3.1 Following excavation and prior to a lean concrete slab layer (mud mat) the substrate shall be inspected by a suitably qualified geotechnical engineer to verify the findings of any geotechnical studies and specifically as it relates to the Wind Turbine foundation design.

5.3.2 Following excavation to the design founding level, a lean concrete slab layer (mud mat) layer shall immediately be poured to prevent softening or drying of the foundation.

5.3.3 After construction of the foundation, the top and sides of the foundation shall be backfilled as appropriate to the design with compacted material at a controlled density before reinstatement of topsoil and re-seeding, with due allowance for the crane hardstand pavement and other associated infrastructure.

5.3.4 In the event of ponding, the excavation shall be drained before foundation construction commences. Debris, weak, softened or disturbed material shall also be removed and replaced with suitable material, as appropriate.

5.4 Blasting

5.4.1 Owner shall be notified in advance of any blasting work anticipated for the project Site.

5.4.2 Blasting plans shall be prepared by Contractor for all anticipated blasting work to be conducted for the project.

5.4.3 Contractor shall obtain and provide for all needed permits and licenses required for blasting.

5.4.4 Storage of explosives and blasting materials shall be consistent with applicable federal, state and local laws and regulations.

5.4.5 All blasting shall be conducted in accordance with Owner approved blasting plan, and applicable permits.

5.4.6 Blasting shall only be performed by appropriately licensed and qualified persons experienced in the use of blasting for rock excavation.

5.4.7 The geotechnical engineer shall approve of material resulting from blasted excavations prior to use as general fill material. Recommendations from the geotechnical engineer regarding the use of blasted material shall be followed when using the blasted material as fill or other use on the project site.

5.5 Formwork

5.5.1 Shall meet the requirements of Section 6.2.

5.6 Reinforcement

5.6.1 Shall meet the requirements of Section 6.3, except where the following requirement takes precedence.

5.6.2 No reinforcement in the wind turbine foundation shall be welded.

5.7 Welding

Where welding is necessary for fabrication of any Wind Turbine foundation component other than foundation concrete reinforcement:

5.7.1 All structural or load bearing welds shall meet the AWS D1.1 Structural Welding Code for steel (current edition at time of bid).

5.7.2 All welds shall be identified per the AWS Code and or be clearly marked on a drawing as applicable in accordance with an established procedure. This procedure for identification shall define in detail how Contractor controls the identification and marking of welds and how the weld history, NDT results and material placement are recorded.

5.7.3 Welders shall be certified and welding procedures shall be provided and meet the AWS D1.1 code

5.7.4 Welding inspection shall be conducted by a certified welding inspector per the AWS D1.1 code, and the certification or qualifications shall be furnished by Contractor.

5.7.5 Contractor shall develop and maintain complete, up-to-date records of all inspections, surveys and tests, including failures.

5.7.6 Contractor shall maintain records of weld repair and rejection rates throughout the Work.

5.7.7 Owner reserves the right to conduct regular audits and cross checks on production weld joints to verify the competence of all technicians working to agreed NDT procedures.

5.8 Concrete Works and Batching Plants

5.8.1 Contractor shall meet the requirements of Section 6.4, and

5.8.2 The batching plant(s) shall have a production capacity that is capable of providing concrete to any WTG foundation as to prevent the occurrence of unplanned cold joints and other discontinuities with the WTG foundation concrete.

5.8.3 Contractor shall provide a method statement for forming designed cold joints, as part of Contractors Documentation. However, while supply of this method statement is required prior to construction it does not imply that a cold joint shall be accepted by Owner.

5.9 Concrete and Grout Strength

5.9.1 Shall meet the requirements of Section 6.5

6. CIVIL WORKS

6.1 General

6.1.1 The Design shall suit the requirements for construction access for long loads, heavy plant and cranes as well as ongoing access for O&M of the Wind Power Plant.

6.1.2 Roads and tracks shall be designed to minimize cut and fill and cross drainage requirements consistent with property boundaries, drainage paths and other site constraints.

6.1.3 Roads and tracks shall be designed to minimize native vegetation clearance and be in accordance with Applicable Permits.

6.2 Formwork

6.2.1 Formwork shall be in good condition, capable of supporting all loads applied to it during construction, sufficiently rigid to prevent movement or deflection and provide a standard quality surface finish to the concrete.

6.2.2 Gaps and joints shall be adequately sealed to prevent seepage of concrete.

6.2.3 Prior to pouring concrete, formwork shall be clean with release agents applied as appropriate.

6.2.4 Formwork shall be removed with care and any damage shall be repaired.

6.3 Reinforcement

6.3.1 Reinforcement, including post-tensioning strand, shall comply with all applicable state and local standards including ACI 318, ASTM A615, ASTM A706.

6.3.2 Reinforcement shall be cut and bent in accordance with ACI 318.

6.3.3 Acceptable manufacturers and processors of steel reinforcement shall hold a valid certificate of approval. Evidence of compliance with this Section shall be obtained when contract bids are received. And approval from Owner shall be obtained in writing prior to procurement.

6.3.4 Contractor shall nominate the items in which each individual batch of reinforcing steel is to be used and shall also state the country, mill of origin and the specification to which the steel for that Work item is produced, and clearly demonstrate how it is equivalent to that specified.

6.3.5 Certificates from a laboratory of chemical composition and physical properties of all reinforcing steel shall be required. All testing shall be in compliance with applicable standards, including frequency of sampling and testing. (Refer to Level B Construction Documentation requirement).

6.3.6 Steel shall not be ordered or placed before written approval has been obtained from Owner.

6.3.7 Once such approval has been obtained, the materials shall be cut and bent in accordance with ACI 318.

6.3.8 Reinforcement shall be free from loose rust, dirt, oil and any material that may impair the bond with the concrete.

6.3.9 Spacers and support bars shall be of a type that shall adequately support the reinforcement and resist deflection.

6.3.10 Tying wire shall be annealed wire of adequate size for the purpose required. Sufficient ties shall be used to ensure stability of the reinforcement.

6.3.11 Welding of any grade of steel concrete reinforcement is not permitted.

6.3.12 Reinforcement shall be supported on plastic or concrete bar chairs.

- If concrete bar chairs are adopted, they shall be fabricated from the same grade of concrete as that which they are to be cast into.

6.4 Concrete Works and Batching Plant

6.4.1 Contractor shall provide a detailed method statement for quality control and concrete batching and transport.

6.4.2 Concrete shall be transported, placed, compacted and cured in accordance with Applicable Standards.

6.4.3 Concrete mix design, cement, aggregate, admixtures, and trial batch test result shall be provided for owner approval prior to concrete placement.

6.4.4 If an on-site portable batch plant is used, the following shall apply:

- Contractor shall provide and maintain on-Site storage of cement, aggregates and all other materials required for concrete production.
- Contractor shall provide and maintain a concrete batching plant(s) with all equipment, facilities, approvals and permits that are required for the associated batching plant(s).

6.4.5 If an off-site batch plant is utilized, the following shall apply:

- Travel times to the primary and backup batch plants shall be provided for owner approval
- A transportation plan for off-site concrete batch plants shall include an allowance for potential traffic impact on transportation time, for owner approval

6.4.6 A backup shall be provided for critical items including the batching plant (on site or alternate location), concrete delivery and placement equipment (conveyor belt or pump).

6.4.7 Prior to pouring, Contractor shall install all grounding elements and cable ducts (tapes, electrodes, etc.) exothermic (Cadweld, etc.). Welding of grounding elements to reinforcing steel shall not be permitted.

6.4.8 Unformed concrete finish on the surface of the concrete shall be screeded and finished neatly to be uniform and non-slip when wet.

6.4.9 Adequate precautions shall be implemented in finishing to prevent plastic shrinkage cracking. Methods to be used for plastic shrinkage cracking shall be provided to Owner prior to placement of concrete.

6.4.10 A hot and/or cold weather concreting plan shall be prepared in accordance with ACI 305R and ACI 306R, as applicable to anticipated project site temperatures.

6.5 Concrete and Grout Strength

6.5.1 As a minimum, concrete and grout shall have a minimum compressive strength of 4000 psi, or greater as specified by the Foundation Designer.

6.5.2 Concrete constituents shall meet the requirements listed in Table 1, below:

Table 1 Concrete Material Standards

Material	Requirement
Water	Clean, Potable, free from acid/alkali, oil, petroleum products, organic material or other deleterious substances
Portland Cement	ASTM C150, Type I, II, or V or ASTM C1157, Type GU, MS, or HS
Coarse Aggregate	Gravel, crushed gravel or crushed stone, in accordance with ASTM C33
Fine Aggregate	Washed natural or manufactured sand, in accordance with ASTM C33
Concrete Curing Compound	ASTM C309 and C1315
Admixtures:	
Air Entrainment	ASTM C260
Water-reducing	ASTM C494 Type A
Retarding	ASTM C494 Type B
High Range, water reducing	ASTM C494 Type F
High range water-reducing and retarding	ASTM C494 Type G

6.5.3 Grout materials shall be non-shrink cementitous (ASTM C1107) or epoxy material.

6.5.4 The concrete or grout strength shall be defined by the characteristic compressive strength at age 28 days.

6.5.5 Sampling and testing of concrete shall be in accordance with ACI 318, ASTM C172, ASTM C31, ASTM C39, ASTM C172 and ASTM C231.

6.5.6 Sampling and testing of grout material shall be in accordance with ASTM C579.

6.5.7 Sampling and testing concrete is be carried out by an accredited materials testing laboratory.

6.5.8 Testing shall also conform to Section 15.8 of this specification.

6.6 Off–site Road Improvements

6.6.1 Contractor shall establish any off-Site road or public highway improvements that are required to:

- Comply with agreements between Owner and the local Authorities
- Permit full access for the project
- Permit delivery of all plant and equipment required for the project, and
- Permit delivery and supply of all other plant items, construction materials and equipment required to complete the Wind Power Plant, including, but not limited to:
  - Wind Turbine components, and
  - Cranes for the installation of the Wind Turbines.

6.6.2 Contractor, with respect to the Work, shall be responsible for obtaining any relevant encroachment permits or other permits or authorizations and reaching any relevant agreements required with Government Authorities and third parties.

6.6.3 Contractor shall maintain off-site roads in as good or better than original condition throughout construction.

6.7 Site Entrance and Access Roads

6.7.1 Contractor, with respect to the Work, shall be responsible for obtaining any relevant permits or authorizations and reaching any relevant agreements required with Government Authorities and third parties in relation to access:

- Except where explicitly agreed as being within Owner's scope
- Except in the case of approvals or agreements with landowners which shall be obtained through Owner

6.7.2 Contractor shall be responsible for establishing the extent to which improvements are required to any existing and new site entrance and access roads to facilitate the Project.

6.7.3 Contractor shall be responsible for establishing the site entrance and access roads to facilitate the Work including, but not limited to:

- Delivery and installation of Wind Turbine components in accordance with the turbine manufacturer's requirements.
- Crane access for the installation of the Wind Turbines.
- Two-way traffic for construction access
- All-weather emergency vehicle access to work areas and wind turbine locations

6.7.4 Access road geometry shall conform to the following criteria, the Turbine Supplier requirements, and permit requirements:

- Road width shall be a minimum of 16 feet
- If the design road width is less than 32 feet, passing areas shall be provided every 1500 feet. Passing areas shall be a minimum of 16 feet wide in addition to the road width, and a minimum of 200 feet long.
- Road cross-fall gradient shall be between 1 and 4 percent
- Maximum road longitudinal gradient shall be 10 percent
- Turn radii shall be as specified by the turbine supplier

6.7.5 The Site entrance and access roads shall furthermore be designed to facilitate access including crane access, for the ongoing operation and maintenance of the Wind Power Plant.

6.7.6 Contractor shall repair the Site roads and access roads to the required standard at the end of the construction, but site access for crane access and delivery of large components cannot be diminished.

6.7.7 Particular attention shall be given to cutting, storing and reinstating topsoil and vegetation in order to encourage regeneration of vegetation.

6.7.8 Treatment of cut and fill slopes and installation of drainage shall be in accordance with applicable state and local standards and regulations.

6.7.9 All roads and tracks shall be designed in accordance with the geotechnical engineer's recommendations appropriate to the Site, Climatic Conditions and their period of use including, but not limited to:

- Subgrade strength
- Hydrology
- Flooding
- Frost
- Snow

6.8 Crane Pads / Hardstands

6.8.1 Each wind turbine shall have a crane pad layout designed, constructed and maintained to be suitable for the installation, operation and maintenance of the Wind Turbine, in accordance with the turbine manufacturer's requirements and remain for future operational requirements.

6.8.2 Crane pads are assumed to be left in place at the end of construction, unless specified otherwise by the owner or permit authorities.

6.9 Underground Cable Runs

6.9.1 Underground cable runs, including SCADA communication cables and earth conductors, shall be located at an appropriate depth to meet Applicable Standards, Owner's requirements as set forth in the Agreement and this document, and industry best practices.

6.9.2 Where appropriate, cables or cable conduits shall be laid during access road construction in order to avoid disturbing reinstated ground. Cables shall be suitably protected where they cross roads.

6.9.3 Possible surface reduction from future road maintenance shall be considered when selecting the cable burial depth at road crossings.

6.9.4 To prevent damage, all direct buried cables shall be laid on a bed of not less than 2 inches of sand or friable soil free of sharp stone and covered by not less than 2 inches of the same material.

6.9.5 Cables shall be installed in accordance with Applicable Standards including requirements for mechanical protection, warning tape and depths of burial.

6.9.6 All trenches are to be backfilled and compacted on completion and original levels restored to a minimum level of compaction specified by the Geotechnical Engineer. No surplus soil piles or stockpiles are to be left on the Site.

6.9.7 Native material excavated from the trench shall be used for the bedding/cover material as much as practicable, subject to the requirements listed above, local ordinances, and the need to ensure thermal stability. In areas where topsoil is present, the topsoil shall be preserved during excavation and replaced following installation of the backfill.

6.9.8 Reseeding shall be undertaken by Contractor once trenches are backfilled and topsoil replaced.

6.9.9 Variations in underground cable installation depths, due to road/creek crossings and the typically rigid structure of direct burial machines, shall be considered in the cable sizing calculations and the selection of cable depth derating factors.

6.9.10 Cable runs within the MV/HV substation shall be installed in precast concrete trenches and/or Schedule 40 PVC conduits.

6.9.11 Direct buried cables leaving a trench to pass through ground surface shall be protected by a PVC conduit bend and concrete haunch, or other rigid frame acceptable to Owner.

6.9.12 Contractor shall be responsible for reinstatement of all fences, walls, watercourses, roads and embankments crossed by the cables to the satisfaction of Owner and in accordance with all Applicable Permits.

6.9.13 Suitable cable marker posts shall be installed to indicate the route and depth of all underground power cables at each change of direction and on each side of each corresponding road crossing and fence crossing.

- The markers shall include cable voltage details and telephone numbers of both the asset Owner and the appropriate dig-safe agency.
- Landowners shall also be provided with these phone numbers and the as-built cable route details and drawings.

6.9.14 Electronic cable marking tape shall be installed along the length of all buried power cable.

6.9.15 An appropriate cable locating device shall be provided to enable the location of underground cables and electronic markers.

6.9.16 All trenched fiber cables shall be protected against rodent damage by use of PVC conduit, Pest Duct or armored fiber installation as chosen by the contractor and approved by Owner.

6.10 Fences, Gates, Entrances, Cattle Grids

6.10.1 All fences and entrances shall be in accordance with Applicable Standards and Applicable Permits.

6.10.2 All fences, gates, entrances, and cattle grids shall be of a standard type and similar in all aspects with the type commonly used in the local area unless otherwise specified.

6.10.3 Contractor shall determine and comply with the requirements of all Government Authorities.

6.11 Drainage

6.11.1 Drainage shall be provided by Contractor and Drainage provided shall prevent erosion, consistent with:

- Federal, state and local laws and regulations
- The design assumptions and criteria of the Wind Turbine foundations, and other elements of the Civil Infrastructure
- The absolute requirement to maintain adequate soil cover over the WTG foundation
- Pollutant discharge and other environmental permitting restrictions on construction and the finished Project
- Consideration of the safety of personnel and wildlife through the construction work

6.11.2 Batters and steep slopes that are disturbed in the course of the Project shall have a suitable means of stabilization applied.

6.11.3 Erosion control measures shall be installed in accordance with federal, state and local standards and regulations.

6.11.4 Appropriate means of energy dissipation shall be incorporated into the site drainage.

6.11.5 Additionally, Contractor shall provide drainage that shall accommodate:

- A 25-year return period flood event for the road and drainage infrastructure, and
- A 100-year return period flood with sufficient freeboard for the WTG tower and turbine components, substation and permanent buildings.

6.11.6 The natural drainage patterns of the Site shall be maintained and ponding shall be prevented, other than explicitly where small scale ponding is specifically designed to minimize erosion during drainage. Any pre-existing drains which are damaged in the Work shall be restored.

6.11.7 Access road and crane pad drainage shall be integrated and prevent water flow on the turbine roads.

6.11.8 Water pooling under the WTG step-up transformer pads (if required) shall be prevented. To comply with this requirement, Contractor shall consider raising the ground level prior to installing the transformer kiosks.

6.11.9 Excavations shall be fully drained prior to any construction work within them.

6.12 Disposal of Excess Material

6.12.1 Surplus soil and excavated materials may be disposed of on-Site to the extent this is consistent with Applicable Permits and planning and environmental constraints on the Project.

6.12.2 Other wastes including chemical waste shall be removed from the Site and disposed in an appropriately registered facility in accordance with federal, state and local laws and regulations. If immediate removal is impractical the wastes are to be temporarily stored in accordance with the Laws and applicable standards.

6.12.3 All permits and authorizations required for the temporary storage of waste on site shall be obtained by Contractor.

6.12.4 No litter or construction related waste is to be left on the Site.

6.13 Reclamation

6.13.1 Contractor shall reclaim all areas which have been disturbed during the Work by replanting and indigenous seeding, including conformance with the requirements of any Permits and any Project Agreements.

6.13.2 The seed mix and plant species are to be approved by Owner prior to re-seeding.

6.13.3 Reclamation shall be in accordance with the Permits and planning and environmental constraints on the Project.

7. ELECTRICAL BALANCE OF PLANT

The Electrical Balance of Plant (EBoP) shall keep all Wind Turbines electrically energized (except under fault conditions or for maintenance) and collect the output of the Wind Turbines and transfer it to the Point of Interconnection (POI).

The design of the EBoP by Contractor shall:

- Be for high reliability and efficiency;
- Be compliant with Interconnection Agreement requirements; and
- Allow safe operation and maintenance.

7.1 General

7.1.1 The Wind Power Plant shall integrate seamlessly with and be fully compatible with the TSP interconnection facilities at the POI, including any required communications links.

7.1.2 The POI will be defined in the Interconnection Agreement

7.2 Transmission Service Provider and Interconnection Agreement requirements

7.2.1 Contractor shall ensure that the EBoP and components supplied under the EBoP comply with Interconnection Agreement requirements.

7.2.2 Contractor shall undertake studies, prepare a modelling package, information and technical reports that confirm compliance with Interconnection Agreement requirements.

7.3 Environmental Conditions

7.3.1 The Wind Power Plant electrical system, including equipment selection, design and installation, shall be suitable for all environmental conditions expected at the Site, including those as defined in Section 3.3 and, without limitation:

- Normal and abnormal voltages and currents, and
- Lightning.

7.3.2 It shall remain Contractor's responsibility to satisfy themselves of the appropriate environmental conditions and to supply equipment that is suitable for operation under those conditions.

7.4 Materials and Suppliers

7.4.1 The Wind Power Plant Electrical System shall consist only of new, un-used equipment made from the highest quality materials and components.

7.4.2 All electrical plant shall be sourced from reputable suppliers, consistent with Section 16, that are accredited to recognized manufacturing quality systems.

7.5 Electrical Equipment Ratings

7.5.1 All electrical equipment within the Work shall be adequately rated, including with respect to thermal ratings, fault ratings and insulation ratings.

7.5.2 Thermal Ratings

- Thermal ratings of all electrical equipment shall be adequate for continuous operation at the loading levels expected for that equipment, considering amongst other things, extremes of low voltage and low power factor, 45°C ambient air temperature and additionally temperatures experienced within the immediate installation area of the equipment.
- Thermal ratings of all electrical equipment shall be fully covered by Type Test Certification. Temperature rise shall be specifically addressed and only OEM Type Test certificates shall be accepted to support evidence of compliance in this matter.
- Designs that rely on assumptions of cyclic loading for their adequacy shall not be accepted.

7.5.3 Fault Ratings

- Fault ratings of all electrical equipment shall be such that it shall pass, without damage, the maximum expected fault currents for a period no shorter than the backup protection clearing time and considering the maximum expected future fault level at the POI to the TSP network within the Design Life.

7.5.4 Insulation Ratings

- All electrical equipment shall have adequate insulation ratings for the maximum possible expected voltages – including continuous, temporary, switching, surge and lightning overvoltages.
- Suitable overvoltage protection shall be installed by Contractor to ensure that the insulation ratings of the Work are respected.

7.6 Safety and WTG Isolation

7.6.1 It shall be possible to locally isolate, de-energize, lockout and earth each Wind Turbine without de-energizing others.

7.7 Economic Optimization

7.7.1 All components of the Wind Power Plant Electrical system shall be designed by Contractor to minimize electrical losses, as far as is economically advantageous.

7.7.2 Wherever applicable, cable sizes shall be determined in accordance with IEC 60287-3-2 Economic Optimization of Power Cable Size and within the constraints imposed by other limitations such as voltage drop, fault ratings and thermal ratings.

7.7.3 Notwithstanding the above, the electrical system shall be designed to ensure that electrical losses are minimized as far as economically advantageous and that as a proportion of the total Wind Power Plant generation, over an average year and measured between the Wind Power Plant POI and the sum of the outputs of all the Wind Turbines, shall be less than 2.5%.

7.8 Reliability

7.8.1 The Wind Power Plant electrical system between the Point of Interconnection with the TSP and the Wind Turbine terminals shall be designed to achieve availability in excess of 99.5% on an annual basis, after considering both planned and unplanned outages.

7.8.2 The availability calculation shall take into account the expected mean time between failures (MTBF) and the mean time to repair (MTTR) of the components of the electrical system, and the proportion of the Wind Power Plant (number of Wind Turbines affected by the failure divided by the total number of Wind Turbines) affected by the failure of the component, however Owner acknowledges that such a calculation is a design intent and not a warranty.

7.9 Project Substation

7.9.1 General

- Contractor will design, construct, test and commission a Project Substation that is the primary interface between the Wind Farm and the high voltage (HV) bulk electrical system (BES) of the incumbent utility. The Project Substation will be divided into two main sections;
- A HV voltage section that ties the Project Substation to the BES at the Point of Interconnection (POI), and
- A medium voltage (MV) that ties the Project Substation to the collection system of the Wind Farm.
- The HV section of the Project Substation will be configured based on the nature of the interconnection to the POI. In general, two basic types of interconnection are possible, dictating two different HV configurations. The types of interconnection contemplated for this specification are:
  - A radial interconnection to an existing HV substation, owned and operated by the incumbent utility; and
  - A line tap interconnection to an existing HV transmission line(s), owned and operated by the incumbent utility.
- For a radial interconnection, the HV section configuration, as a minimum, shall consist of:
  - A full tension deadend structure to support the gen-tie line from the Project Substation to the POI (see Section 8);
  - 3 - 1Ø Line Arrestors;
  - Combination metering class, HV, PT and CT devices;
  - A motor operated, SCADA connected, Line Disconnect Switch;
  - A high side generator step up (GSU) transformer SF6 circuit breaker, with 2 sets of 3Ø, gang operated, breaker isolation switches;
  - A GSU transformer rated to support the maximum output of the Wind Farm, equipped with both high and low side station class lightning arrestors;
  - A 34.5 kV low side, SF6 circuit breaker, with 2 sets of 3Ø, gang operated, breaker isolation switches;
  - A protective relaying scheme and attendant equipment appropriate to protect all HV, MV and transmission line equipment;
  - A communications and control system to facilitate both local and remote control of the Project Substation;
  - Interconnecting bus work, jumpers, terminations, cabling, conductors and hardware necessary to interconnect all equipment;

  - Support structures, insulators, foundations and hardware necessary to isolate all energized parts from earth; and
  - A complete, interconnected grounding system sized to limit step and touch potentials during high voltage faults.
  - Note that all HV devices shall be rated commensurately with the nominal operating voltage of the POI.
  - It may be necessary under some circumstances to utilize two or more GSU transformers, based on the size of the proposed Wind Farm. Under such circumstances, the radial configuration will be expanded to accommodate the ultimate size of the Wind Farm.

- For a Line Tap interconnection, the HV section configuration, as a minimum, shall consist of:

  - At least two, full tension deadend structures to support the existing transmission lines;
  - At least two sets of 3 - 1Ø Line Arrestors;
  - At least two motor operated, SCADA connected, Line Disconnect Switches;
  - At least three SF6 circuit breakers connected in a ring bus configuration, with 2 sets of 3Ø, gang operated, breaker isolation switches for each circuit breaker;
  - Combination metering class, HV, PT and CT devices;
  - A GSU transformer rated to support the maximum output of the Wind Farm, equipped with both high and low side station class lightning arrestors;
  - A 34.5 kV low side, SF6 circuit breaker, with 2 sets of 3Ø, gang operated, breaker isolation switches;
  - A protective relaying scheme and attendant equipment appropriate to protect all HV, MV and transmission line equipment;
  - A communications and control system to facilitate both local and remote control of the Project Substation;
  - Interconnecting bus work, jumpers, terminations, conductors and hardware necessary to interconnect all equipment;
  - Support structures, insulators, foundations and hardware necessary to isolate all energized parts from earth; and
  - A complete, interconnected grounding system sized to limit step and touch potentials during high voltage faults.
  - Note that all HV devices shall be rated commensurately with the nominal operating voltage of the POI.
  - It may be necessary under some circumstances to utilize two or more GSU transformers, based on the size of the proposed Wind Farm. Under such circumstances, the ring bus configuration will be expanded to accommodate the ultimate size of the Wind Farm.
  - Contingent upon operating voltage of the HV section of the Project Substation, adequate space will be provided to expand the Project Substation to include up to six breaker positions;
  - For voltages of 345 kV and above, the Line Tap configuration will be modified to support a breaker and a half configuration.

- The MV section shall be comprised of a set of parallel radial feeders to interconnect the collection system to the Project Substation. As a minimum, the MV section shall include;
- 34.5 kV SF6 circuit breakers, equipped with three phase, gang operated breaker isolation switches and a by-pass switch for each collection system feeder;
- 34.5 kV station class arrestors at the termination point of each collection system feeder;
- Interconnecting bus work, jumpers, terminations, conductors and hardware necessary to interconnect all equipment;
- Support structures, insulators, foundations and hardware necessary to isolate all energized parts from earth; and
- A complete, interconnected grounding system sized to limit step and touch potentials during high voltage faults.
- Note that 34.5 kV Indoor Metal Clad Vacuum circuit breakers may be considered at the discretion of Owner.
- The specific characteristics of the required systems and equipment are described in subsequent sections.
- Phase to phase and phase to ground conductor clearance criteria will be in accordance with Owner Substation Design Standards. If required for equipment access, clearances will be increased.
- Studies to be completed as part of Project Substation design will include, at a minimum, in both report and software-specific file format, where applicable:
  - Short circuit analysis (EasyPower file)
  - AC and DC system studies
  - Bus ampacity study
  - Direct stroke protection analysis for lightning
  - Arc flash hazard analysis (EasyPower file)
  - Grounding study (CDEGS file)
  - Relay coordination study
  - Insulation coordination study
  - Electro Magnetic Compatibility (EMC) Study
- All design choices should be based upon results from the above mentioned studies. Contractor is responsible for obtaining all necessary data needed for the studies mentioned above.
- The Substation shall minimize electrical losses as far as is economically advantageous. Contractor shall use the value defined in Section 7.7 in determining the value of any energy gained/lost in the optimization process.
- Specific Owner requirements include:
  - SEL GPS clock for relay time synch
  - All intelligent electronic devices shall be provided with an Ethernet port and DNP 3.0 TCP/IP communication protocol if available or Modbus TCP/IP protocol if DNP is not an available option.
  - Test switches on all trip, close and wetting voltage connections. Slip links or disconnecting terminal blocks on all other connections.

- Redundant relays, including lockouts
- Preference for open air breakers (SF6 insulated) on the 34.5 kV side of the substation
- Non-insulated ring type terminal connectors shall be used on all control circuits as well as current and potential transformer circuits. All other terminal connectors for conductors smaller than 8 AWG shall be non-insulated ring type or pre-insulated spade type. The indent mark form the crimp tool must be clearly visible.

7.9.2 Security

- The Project Substation shall be enclosed by a steel expanded metal perimeter fence, constructed in accordance with the relevant Section(s) of the NESC and Owner Substation Design Standard.
- The Project Substation shall have access control and monitoring provisions to ensure that Owner is able to capture, record and monitor all personnel, authorized or unauthorized that enter the site area. Contractor shall coordinate the preferred access control methodology with Owner along with additional provisions such as video monitoring and motion detection.

7.9.3 Substation Foundations

- All foundations for substation support structures and equipment pads shall be designed in accordance with applicable building codes, the recommendations of the Geotechnical Engineer (including consideration for wind and seismic withstand capability), and Owners Substation Design Standards.
- Blasting to facilitate the Substation foundation is not permitted without authorization from Owner.
- Precast trenches will be free of water and firm throughout and during the life time of the substation.

Transformer pads for main power transformers shall be designed based on Owners Substation Design Standards. The containment pit should be sized accordingly based on oil capacity and estimated volume of rain water with quench rock surrounding the transformer capable of containing the complete volume of transformer oil plus an additional 6” of rain water Oil containment shall include active monitoring for oil detection along with EMS/SCADA alarm points.

7.9.4 Potential Transformers

- All potential transformers used for metering shall be of the wire wound type with shell or core construction. They shall be at least 0.3 class outdoor units with NEMA pads. Contractor shall determine the rating, connection type and turns ratio based on applicable system studies and metering system designs.
- Potential devices shall meet the requirements of IEEE C57.13-2008
- Capacitive Coupled Voltage Transformers (CCVT) may be used for detection or verification of line or bus potential only
- Capacitive Coupled Voltage Transformers shall be of the passive filter type.
- Capacitive Coupled Voltage Transformers shall be of the passive filter type.

7.9.5 Current Transformers

- All MV current transformers shall be connected through an indoor, panel mounted, current test switch, specifically a States Type FMS or ABB equivalent. Each current transformer neutral shall be brought into the control building for single point grounding within the associated protection relay panel.
- Provisions shall be made to enable the secondary leads of all current transformers to be shorted via removable links.
- Current transformers to be used for metering shall be of at least 0.3 accuracy class with a rated overload factor of 2.0.
- Current transformers shall meet the requirements of IEEE C57.13-2008

7.9.6 Generation Step Up (GSU) transformers

- The GSU transformer(s) shall be sufficiently sized to allow the full Project capacity to be delivered to the POI at the maximum of its ONAN / ONAF / ONAF rating.
- The GSU shall be new, outdoor, non PCB mineral oil filled, 3Ø, 60Hz, Cooling class ONAN/ONAF/OFAF, 65°C Rise. The main step-up transformer(s) shall be in accordance with the requirements set forth in Table 3 herein, at a minimum.

Table 2. Substation transformer specifications

Description	Value
Quantity	1
Type	Mineral Oil filled, hermetically sealed, outdoor installation
Voltage ratio	TBD* / 34,500 / 13,200 Volts (HV / MV / TV)
Phases	3
Windings	3 (HV, MV, Tertiary)
Steady state temperature rise	65°C above ambient
Frequency	60 Hz
Impulse levels	TBD kV (HV), 200 kV (MV), 110 kV (Tertiary)
Vector group	Grounded wye
Cooling	ONAN / ONAF / ONAF
Tapping range	±5%, 2.5% steps, manual control DETC Contractor shall determine the need for an OLTC based on the results of applicable system studies. If an OLTC is specified it shall have a ±10% range with 32 0.625% taps. If employed the OLTC shall have provision for remote or local control.
Paint finish	ANSI 70 sky grey color
Guaranteed losses	TBD
Temperature gauge	Required
Pressure level indicator	Required
Pressure relief device	Required
Oil sampling valve	Required
Filling orifice	Required
Tank ground tag	Required
Oil level indicator	Required
Oil Gas Analyzer	Serveron TM
Bushing CTs	Minimum of two sets on both primary and secondary windings. Class to be determined by relaying scheme.
Grounding	Solid (primary and secondary windings) Buried delta (tertiary winding)

7.9.7 High Voltage Circuit Breakers

- HV and MV circuit breakers shall be rated and selected based on the requirements of Owner Substation Design Standards.
- Basic parameters for HV circuit breakers are SF6 insulated, three-pole, single throw, with dead–tank design and dual trip coils.
- Basic parameters for MV circuit breakers are vacuum interrupters, three-pole, single throw, with dead–tank design.
- All circuit breakers shall contain instrument transformers for metering and/or protective relaying applications.

7.9.8 Disconnect Switches

- Disconnect switch placement and selection is based on Owner Substation Design Standards. Disconnect switches are typically placed in the following locations:
  - HV Line Disconnect
  - HV Breaker Disconnect
  - MV Line Disconnect
  - Breaker Disconnect
  - MV Capacitor & Reactor Switch
  - MV Grounding Transformer Switch
  - Disconnect switches are typically manually operated, 3 gang, non-load break, outdoor rated and provide the ability to ground
  - All disconnect switches shall be three phase, gang operated devices
  - Where motor operators are employed, provisions for de-coupling the motor and manual operation shall be provided
  - A DNP 3 compatible SCADA interface shall be provided with all motor controllers

7.9.9 Grounding Transformers

- Grounding transformers shall be sized to effectively ground the portion of the collection system circuit that is disconnected from the main Project Substation 34.5-kV bus when the Project Substation feeder or collector breaker is open. However, at a minimum, grounding transformers shall be capable of carrying 300A per phase for 10-seconda and 900A in the neutral to ground circuit for 10 seconds.
- Grounding transformers shall be 3-phase, and may be configured either Wye-Delta or Zig-Zag.
- Grounding transformers installed inside or near the outside of the substation fence shall be installed with ground-fault detection provisions.

7.9.10 The cable design is not permitted to include splices. Whenever possible all conductors and cables should be a single continuous run.

7.9.11 No splices shall be made in conductors for instrument circuits or control circuits. Shields may be spliced where necessary to permit connection to the station ground. Power cable circuits may be spliced only by methods and at locations acceptable to Owner.

7.9.12 Surge Arrestors

- All surge arresters should be sized according the results of the insulation coordination study.
- HV & MV surge arrestors shall meet the requirements of ANSI C62.11 for Station Class installation in a 60-Hertz outdoor installation.
- Equipment surge arrestors shall be station class, metal-oxide type surge arrestors for outdoor use and polymer housing. Surge arrestors shall be shatterproof.

7.9.13 Rigid Bus

- Design of the bus systems shall be in accordance with IEEE 605 and Owner Substation Design Standard, at a minimum.
- Loading and seismic performance shall be in accordance with the Project design and Project Site location. Such information is subject to verification by Contractor.

- Station post insulators shall be of sufficient strength to support the rigid bus and shall be ANSI 70 gray color.

7.9.14 Connectors and Fittings

- Connectors and fittings shall be of the proper size and design to assure permanent, secure, and low-resistance connections.
- Connectors and fittings shall be in accordance with ANSI C119 & CC 1 along with requirements of Owner Substation Design Standard.
- Rigid bus connections to transformers, breakers, CCVTs, or freestanding current transformers are prohibited.

7.9.15 Grounding System

- The grounding system/grid shall be installed throughout the Project Substation.
- The ground grid shall be designed in accordance with IEEE 80 and Owner Substation Design Standard.
- The system shall be designed such that Project Substation personnel are protected from step and touch hazards that can occur as the substation grounding system provides the earth return electrode during power system phase to ground faults.
- Contractor shall perform ground resistivity testing prior to final design to determine ground analysis parameters. The ground resistivity shall be measured with the methods given in IEEE 81.
- Ground conductors shall be sized for fault duration of 0.5 seconds.
- Equipment grounds shall conform to the following general guidelines:
  - Grounds shall conform to the NESC.
  - All equipment grounding connections shall be connected to the ground grid.
- The ground grid shall extend at least three (3) feet outside the perimeter fence of the Project Substation and shall be bonded to the fence, according to Owner Substation Design Standards, and as required to meet acceptable levels of both touch and step potential and ground potential rise.
- A minimum of six (6) inches of washed crushed aggregate shall cover the entire Project Substation footprint, including those areas reserved for future build-out and five (5) feet outside the Project Substation security fence, in order to help reduce touch and step potentials. A greater level of washed crushed aggregate shall be installed if necessary to meet the Requirements and satisfy the recommendations set forth in the geotechnical engineering report. The minimum resistivity shall be 3,000 ohm-meters. Crushed rock shall conform to ASTM C33, gradation 1.5 to No. 8 particles. Additional design criteria should be considered for vehicular access to the Project Substation.

7.9.16 Lightning Protection

- Lightning protection shall be designed in accordance with IEEE 998, Owner Substation Design Standard, and the results of the lightning protection study.

7.9.17 Lighting

- A lighting system shall be furnished for the Project Substation based on the requirements of Owner Substation Design Standards. The lighting system shall provide personnel with illumination for Project Substation operation and maintenance under normal conditions, and means of egress under emergency conditions.
- Lighting levels shall meet, at a minimum, the requirements of the NESC, including Table 111-1 therein.
- Outdoor lighting shall be LED type.

7.9.18 Equipment Labelling

- All major equipment and devices shall be properly labeled with nameplates that meet Applicable Standards (including those for safety) and other Requirements.
- Equipment labelling conventions shall follow Owner Substation Design Standards, as applicable.

7.9.19 Electrical Equipment Enclosures

- Control cabinets, pull boxes, and junction boxes shall be in accordance with NEMA standards and type number and shall be suitable for the Project location conditions. Minimum design shall be:
  - (1) Indoor: NEMA 1
  - (2) Outdoor: NEMA 3R, stainless or aluminum.
- All enclosures shall be provided with pad-locking provisions.
- Junction boxes shall be located adjacent to roadways, and be surrounded by a minimum of four (4) bollards of a red color.

7.9.20 Battery System

- All battery systems shall conform, at a minimum, to the Applicable Standards of IEEE, ANSI, and NEMA.
- Batteries shall be provided with racks, connection devices, tools, instruction books, protection shield covers, rail protection system, and other standard items. They shall also include redundant fans for the required ventilation.
- Contractor shall supply provide, at a minimum, one complete set of 125 VDC station batteries. For HV sections with a nominal operating voltage of 230 kV or higher, two redundant sets of station batteries will be provided.
  - Contractor will provide one fully rated, self-cooled battery charger for each battery set provided, capable of recharging the batteries within eight hours while serving continuous load. The chargers will be served from the Project Substation AC system.
- For the Project Substation, Contractor shall provide one (1) DC system, including, but not limited to, batteries, two (2) battery chargers, safety fused disconnect switch, a battery disconnecting means and panel boards.
  - Fused disconnect switch shall be a 3-way make-before-break transfer switch between the battery cells and an open ‘alternate’ position, feeding the chargers

and DC load. DC 'transfer' position shall be left unconnected in the switch panel, reserved for future NERC testing.

7.9.21 Raceway

- Raceway shall conform, at a minimum, to the recommendations included in IEEE 525 and Owner Substation Design Standard.
- Individual raceway systems shall be established for the following services:
  - (1) 600-volt control cable.
  - (2) Special electrical noise-sensitive circuits.

7.9.22 Control and Protection

- Contractor will design, procure, construct and test the control and protection system for the Substation. The system will include, but not be limited to, protective relays, indication meters, revenue meters, switches, instruments, devices, and wiring. Relay panels will be installed in the Substation control room.
- Contractor will provide drawings sets, for review, comment, and approval by Owner consistent with requirements set forth in Section 17 and inclusive of one-line drawings, three-line drawings, control panel arrangements, fabrication details, bill of materials, nameplate lists, DC control schematics, AC schematics, circuit schedules, auxiliary equipment schematics, wiring diagrams, index sheets, and legends.

7.9.23 Protective Relaying

- Relaying will provide secure and selective isolation of equipment when necessary. Redundant primary and secondary schemes will be included for all high voltage equipment.
- All relays will be wired to a central communication processor which will integrate all relaying.
- Protection will be included for breakers, bus, transformers, HV & MV lines, capacitors, and inductors.
- Protection specifications include:
  - Transformers
    - (1) set of CTs, 1 high, 1 low – 2 x SEL-787E
    - (2) More than 2 sets of CTs – 2 x SEL-487E
  - Bus
    - (1) 15kV, or lower, switchgear – 1 x SEL-587Z
    - (2) All other bus configurations:

      (a) 6 or fewer positions on ultimate build out – 2 x SEL-487B
      (b) 7 or more positions on ultimate build out – 2 x 3 x SEL-487B
  - Feeder (15kV and below)
    - (1) No remote source (radial circuit) – 2 x SEL-751A
    - (2) Possible remote source (including bus ties) – 2 x SEL-751
  - Collector circuits (34.5kV)

- (1) 2 x SEL-751

– Line – 2 x SEL-411L
– Owner has standard part numbers for each relay type; deviations from those part numbers need to be approved in advance.
– All relays shall communicate to Owner SCADA via DNP 3.0 over Ethernet.
– Redundancy

- (1) Redundant CTs and VT secondaries shall be used in all cases except:

(a) 15kV and lower balance of plant circuits
(b) SEL-587Z applications
(c) Transformer neutral CTs when multiple CTs are not available

– DC Circuity should be fully independent between relays; sourced from separate battery systems.

- (1) Circuits associated with a single close coil may have a single DC circuit connected to each relay.

– Lockout Relays

- (1) Electroswitch per Owner design masters.
- (2) Two per zone

(a) Fully redundant for tripping, common close block circuits.
(b) Tripped by local protection as needed, tripped by adjacent zones for breaker failure.

– Test Switches

- (1) FT type test switches shall be provided for:

(a) Each protective relay shall have sufficient positions to accommodate the following circuits. Name plates shall be provided to identify the purpose of each test switch.
  - Each AC circuit to the relay, one switch position per voltage circuit and two per current circuit.
  - Positive and Negative side of relay power.
  - Both sides of each output used to trip (breaker or lockout) or close.
    - Input wetting voltage.

(b) Each lockout relay shall have sufficient positions to accommodate each trip circuit.

– Wiring

- (1) All schematics shall be per Owner design masters where such exist
- (2) All wires provided with wire labels at each end per Owner design master
- (3) All crimped lugs shall be non-insulated ring lugs.
- (4) Any terminal on the Phoenix blocks on the SEL-7xx relays that requires more than one conductor shall utilize an appropriate crimped ferrule.
- (5) All SIS wiring shall be appropriate for the Phoenix blocks on the SEL-7xx relays, 41 strand #14.
- (6) All CT circuits from field to relay racks shall terminate on shorting terminal blocks. All other circuits shall terminate on slip link terminals.
- (7) All cables provided with cable tags at each end per Owner design master

– Racks

- (1) 36” rack design, one rack per zone of protection. Rack design masters will be provided.

7.9.24 Reactive Power Compensation Equipment

- Reactive plant shall be provided including both static and dynamic reactive power requirements and voltage control; unless it can be shown that the requirements under the Interconnection Agreement can be met without reactive plant that supplements wind turbine capabilities.
- The reactive plant shall include a controller, which allows the choice of either voltage control or power factor control at the connection point as required under the Interconnection Agreement. The controller will incorporate coordinated control between the Wind Power Plant SCADA system and the substation SCADA system and taking into account the main power transformer load tap changer control if applicable.
- The controller shall incorporate voltage regulation within the Wind Power Plant in order to maintain voltages at the wind turbine terminals at their required levels.
- The contractor is responsible for the complete design, implementation, integration, testing, and tuning of the overall reactive power compensation, voltage control systems, including interface, integration with, and coordination with the Wind Power Plant SCADA system, Owner, turbine supplier and other equipment suppliers as required.

7.9.25 Metering

- The Wind Power Plant shall be metered at the Point of Interconnection in accordance with Interconnection Agreement requirements. The meters shall be electronic meters approved by the TSP; and Contractor shall be responsible for obtaining meter approval.
- Check meters
  - In addition to the revenue metering equipment required by the Interconnection Agreement, redundant SEL-735 meters shall be provided to meter net plant output.
  - Check meters shall have full power quality monitoring capability.
  - At a minimum the metering equipment will meet the following specifications:
    - Current Transformers: +/- 0.3% @ B0.1 - 1.8 ohms, 10% - 100% rated current
    - Voltage Transformers: +/- 0.3% through B. ZZ @ 90% through 110% of nominal voltage

7.9.26 LV Supply and Stand-by Diesel Generator

- Contractor shall provide the most cost efficient design for the Substation LV power supplies incorporating the following requirements:
  - Normal supply shall be a metered service from the local utility, if so required by local statues. Else, this service shall be the back-up source.
  - Backup-supply shall be fed via MV through a local transformer at any time the MV system is energized;

  - In the event of loss of voltage on the Normal Supply LV leads, the diesel generator set shall automatically start. Supply shall be manually switched over to a stand-by diesel generator supply.
  - Normal and Stand-by supplies shall never be paralleled.
  - Stand-by supplies and the diesel generator supply may be paralleled.

- The diesel generator shall be enclosed in a kiosk designed to limit the noise of the generator, with the exhaust aimed away from any buildings. The diesel generator shall be fitted with a fuel tank with sufficient capacity to run the generator for at least 48 hours at full load. The fuel tank shall be installed within a bund sufficient to contain at least 110% of the fuel volume. The bund shall be fitted with an oil/water separation system and the bund shall be shielded to prevent the accumulation of rainwater.
- As an alternative to a diesel generator, the backup supply may be obtained from the existing distribution network in the area, provided that reliability is demonstrated and that the supply is not sourced from the same substation/s that the HV supply is derived from.

7.9.27 EMS SCADA System

- EMS SCADA system is to include RTU, HMI, SCADA Input/Output devices and an Ethernet network connecting intelligent electronic devices, designed and constructed according to owner design masters.
- Contractor shall provide a complete EMS SCADA drawing set, including network block diagrams, schematics and wiring diagrams created according to owner design masters.

7.10 Collection System

7.10.1 General

- The Project electrical collection system shall be buried. Overhead circuits may be permitted with Owner approval.
- The electrical collection system will include power and communications cabling in the same trench. See Section 9 for fiber optic specifications.
- The layout of the electrical collection system will follow existing or new roads wherever possible, but not in contradiction to economic optimization as described in Section 7.7. Civil Works Requirements
- Trenches will be free of water, firm throughout, and of a minimum dimension to facilitate cable installation
- Backfill will be compacted to 85 percent (85%) of standard proctor density, unless alternatively specified.
- Blasting for the collection system trenching is not permitted without authorization from Owner.
- Studies to be completed as part of Project electrical collection system design will include, at a minimum:

  - Grounding studies
  - Short circuit analysis

  - Load flow study
  - Reactive compensation study
  - Annual electrical loss calculation
  - Arc flash analysis
  - Harmonic analysis
  - Transient overvoltage and cable withstand
  - Voltage drop study
  - Thermal design analysis of cable ampacity considering the following assumptions:

- Trefoil cable installation
- 25ºC Ambient soil
- 200 rho (used for cost estimate only)
- 48 inches burial depth to top of cable
- 90ºC rating
- 100% load factor
- 90% compaction (95% compaction results required in construction to provide margin)
- Studies shall be completed and submitted in document form, with files native to the software utilized for any simulation, modeling, or studying.

7.10.2 Power Cabling

- Collection system 34.5 kV cable shall be rated 35 kV, direct buried aluminum conductor with copper concentric neutral. Insulation shall be tree retardant, water blocked, cross-linked polyethylene insulation (TRXPL) or ethylene-propylene rubber insulation (EPR) 345 mils thick, 100% insulation level (provide cost alternative for 133%), that meets or exceeds all requirements of applicable AEIC, IEEE, ICEA, NEMA, and UL standards.
- Cable sizes to be utilized are (as required):
  - 1/0 AWG AL (full neutral)
  - 3/0 AWG AL (full neutral)
  - 4/0 AWG AL (full neutral)
  - 500 kcmil AL (1/3 neutral)
  - 750 kcmil AL (1/3 neutral)
  - 1000 kcmil AL (1/6 neutral)
  - 1250 kcmil AL (1/6 neutral)

  Other cable sizes shall not be used per Owner direction.
- All central conductors shall be Class B stranded. No more than one (1) conductor per cable shall be allowed. Conductor material shall be aluminum or copper.

7.10.3 Cable Installation

- Use of plow type installation equipment is not allowed unless confirmed appropriate for soil type and approved by Owner.
- Mechanized, all-in-one wheel or chain trenching-laying equipment is allowed, and open trench method is allowed.

- Cable trefoil configuration shall be maintained by use of zip ties or suitable tape in accordance with manufacturer recommendations and Owner approval, placed at 10 foot maximum intervals.
- Burial depth: 48 inches below final grade to top of cable
- Bedding: Approximately 6 inches of < ¼ inch native bedding (or thermal backfill if required), and twelve (12) inches of < ¼ inch native (or thermal backfill if required) soils shall cover the collector fiber optic and cable bundle and shall be screened/visually inspected for materials in excess of two (2) inches. Bedding material shall be free of debris, roots, or other deleterious material unsuitable for use within the cable trench. A continuous metallic marking tape shall be laid in the trench a minimum of thirty (30) inches below grade, and at least twelve (12) inches above cable bundle in all cultivated areas.
- Electrical marker balls shall be installed in the trench every 300 feet, at all crossings and at every turn. The markers shall be programmed with the feeder number as per the substation breaker identification number.
- Compaction: Backfill above the first lift shall be placed in maximum 6-inch lifts and tamped or compacted between lifts. Minimum compaction shall be 95% testing every 500 feet at start of job, increasing to 1000 feet upon approval by engineer (assume 90% compaction in ampacity studies to provide margin).
- Ditch dams, consisting of sand bags or soil cement berms placed over the conductors at a 30 degree angle, shall be placed at intervals in all cable runs which traverse slopes greater than 3 per cent. Spacing shall vary, depending on the steepness of the grade, at from 100 ft to 300 ft.
- All collector trenches shall be laid out and pre-graded to assure correct burial during final grading. Changes of grade between trenching and final profiles shall be accounted for in confirming burial depth.
- Final depth of collectors shall be verified following final grading and adjusted to meet the specified minimum requirements.
- Parallel collector circuit bundles shall maintain a minimum separation of 8-feet, in order to provide physical and thermal separation. Closer spacing where necessary shall be evaluated for thermal effects or shall require de-rating of the buried conductors.
- Sufficient slack shall be provided at termination points to allow two future terminations. Establishing slack via coil under the padmount transformer or junction box, in a plenum or vault, is preferred.
- A sufficient amount of cable slack shall be provided to allow installation of elbows and termination of the cables to the appropriate junction box and/or Turbine switchgear terminal and permit ready disconnection of the elbows and mounting on the parking stands. For the avoidance of doubt, such slack shall allow for the installation/service disconnection of connectors, dead breaks, and other similar devices.
- Cable bending radius shall not be less than NEC and cable manufacturer requirements.
- Directional drilling bores are allowed for crossings.
- Cable markers shall be placed at all road, utility and waterway crossings.
- Directional fault current indicators (DFCI) at all key feed through points, branch points, load-break Circuit Switches, and junction boxes. Each DFCI shall include a

fiber optic indicator-extension, with lenses mounted through the enclosure. All DFCIs shall be installed and phase orientations displayed uniformly.

- Collection system conductor shall be rated for a maximum temperature of 250°C (short-circuit current rating).
- Collection system components shall be rated for a basic impulse level (BIL) of 200 kV.
- Cable Splices/Terminations/Connections
  - Direct burial splices are not allowed.
  - Splices shall be made in above ground metal or fiberglass splice vaults. Splice-points shall include a capacitive test point and allow means of establishing a ground point with hot-stick applicable accessories. Splices and terminations at junctions, pad mount transformers are to be made by experienced personnel, with manufacturer refresher training on site at beginning of job, with training certificates made part of QA/QC job books.

7.10.4 Load Break Circuit Switches

- Load-break circuit switches shall be provided at each sub-circuit or major branch to isolate major sections of the collector system in the event of a cable fault or turbine issue, and should be located at every "major" cable system intersection. All load-break circuit switches shall provide means of visibly observing the open/closed state.

7.10.5 Pad Mount Transformers

- Pad mount transformers shall be installed on vaults; fiberglass box pads will not be used.
- Spare pad-mount and ground reference transformers will be supplied at a ratio of 1:40 (one spare per 40 installed)
- Transformers shall be K-factor rated
- Transformer tanks shall be rated to withstand 10psi internal pressure.
- Each padmount transformer shall be equipped with an exterior fill value, drain valve, oil sample port, oil level gauge, temperature gauge, and nitrogen bleed valve, under lockable covers.
- Each pad mount shall be equipped with an operating handle.
- Each pad mount will have infrared viewing port installed on secondary side.
- For each Wind Turbine type, each transformer in the Wind Farm shall be of the same type and shall, with the exception of the MV switchgear configuration, be directly interchangeable with any other.
- It shall be possible to completely replace any transformer without removing any Wind Turbine or Wind Turbine tower.
- Any switching, protection or isolation functionality provided as part of the Wind Turbine transformers shall facilitate safe switching and operation to the maximum extent afforded by modern electrical equipment in accordance with the Applicable Standards.
- Fuses under oil are not permitted.
- Any pad mount transformer enclosure will afford appropriate environmental protection, including ice fall from the wind turbine. In particular all enclosures shall provide ingress protection required by the Wind Turbine transformer and any other

equipment housed therein is respected. The enclosure will be constructed for its environment including corrosion and erosion conditions and shall be suitably designed for the prevention of damage caused by livestock and other animals commonly present in the environment.

- Oil-filled transformers will be supplied with a bund adequate for the purpose of containing oil. A vault, in which the transformer is mounted upon, may be configured to serve this purpose.
- A minimum bund capacity of 110% of the transformer's maximum oil volume is required and the bund shall be shielded to prevent the accumulation of rainwater.
- Ball studs shall be installed on the LV side of the transformer for ease of grounding.

7.10.6 WTG Tower Foundation Electrical Work

- MV Cable
  - Sufficient slack will be provided at termination points to allow two future terminations. Establishing slack via coil under the padmount transformer or junction box, in a plenum or vault, is preferred.
- LV Cable
  - Conduit - two spare power conduits are required.
- Grounding
  - Driven ground rods shall be installed for each WTG transformer, and bonded to the turbine foundation ground grid and rebar cage
  - Pad mount transformers shall be ground bonded to the WTG foundation ground ring via Eufer ground.
  - Ground rings shall be bonded to the WTG foundation large diameter, full length reinforcing bar by suitable mechanical clamps.
  - Ground resistance shall comply with turbine supplier maximum resistance requirements.
  - Ground grid resistance shall be tested at each WTG foundation prior to connection to (isolated from) trench ground.
  - Underground ground connections are to be exothermic weld.
  - Ten (10) feet wide "beauty ring" crushed, high impedance rock shall be placed around the tower foundation pedestal and transformer pad if required, in accordance with ground study step and touch analysis results.

7.10.7 Overhead Installation

- The following general specifications apply to the Project overhead collection system if applicable:
  - Overhead collection system shall be designed and installed in accordance with Owner T & D Standards.
  - Collection system shall be in full compliance with the applicable requirements of the Oregon Avian Power Line Interaction Committee.
  - Double circuit construction is allowed.

  - Portions of the 34.5 kV overhead collection system may be installed as underbuild on 230 kV transmission line only where terrain or other construction factors absolutely dictate.
  - Conductor type shall be 1590AAC, with an OPGW shield required per Owner direction.

7.10.8 Surge Arrestors

- Surge arrestors shall be fully shielded, submersible, dead-front devices rated at 35-kV class, 600A, 30kV/24.4MCOV and meeting the requirements of ANSI C62.11 for Station Class installation in a 60-Hertz outdoor installation.

7.10.9 Grounding

- Turbine foundation ground system ground rods shall be copper-clad, 5/8-inch diameter, 8-foot-long rods at a minimum.
- All turbine manufacturers, local requirements, NESC and IEEE shall be adhered to in the grounding design and construction. Grounding design shall consider recommendations of the geotechnical report, grounding study (personnel safety for step-and-touch potentials), and lightning and surge protection.

7.10.10 Conduit

- Conduit size shall be in accordance with ANSI / NFPA 70, at a minimum. Conduit material shall be Schedule 40 PVC, with smooth interior surface and suitable pulling lubricant used to prevent cable damage while pulling cable into duct.
- The location of all conduits shall be surveyed and recorded within the as-built drawings.
- All above-ground power and communications cabling shall be installed in conduit.
- All below grade crossings, including road, utility, and wetland crossings (if required), shall be installed in conduit.
- LV cable from turbine to pad-mount transformer (if any) shall be installed in conduit.

7.10.11 Connectors and Fittings

- Connectors and fittings shall be of the proper size and design to assure permanent, secure, and low-resistance connections.
- Suitable connectors and fittings to be used where appropriate include:
- Belleville washers for pad connections
- Stainless steel bolts for copper to aluminum connections
- Stud-to-pad and cable-to-pad connectors for stranded aluminum conductors
- Tubular compression fittings for stranded aluminum conductors
- Four bolts or two “U” bolts for copper bus work joints
- Shield wire dead ends, splices, and taps shall incorporate fittings that are compression type with bolted jumper connections, with compressions sleeves of at least 90% shield wire strength.
- Disconnect switch terminal pad connectors will be NEMA four (4) bolt terminal pad connectors.

8. HIGH VOLTAGE TRANSMISSION LINE

8.1 General

8.1.1 The HV Transmission Line shall be designed, assembled, constructed and tested consistent with all Applicable Standards including:

- ANSI / IEEE C2 – National Electric Safety Code
- ASCE 48-11 - Design of Steel Transmission Pole Structures
- ASCE Manual No. 74 - Guidelines for Electrical Transmission Line Structural Loading, 2010, Third Edition
- IEC 60826 - Design criteria of overhead transmission lines
- IEEE-738 - Standard for Calculating the Current-Temperature Relationship of Bare Overhead Conductors

8.1.2 Furthermore the HV Transmission Line shall be designed, assembled, constructed and tested in accordance with local and international industry best practice and guidelines and achieve compliance with the requirements of:

- RUS Bulletin 1724E-200 – Design Manual for High Voltage Transmission lines
- IEEE P1863 - Guide for Overhead AC Transmission Line Design
- IEEE Std. 524, 1992 - IEEE Guide to the Installation of Overhead Transmission Line Conductors
- Applicable Permits
- Owner Standards
- Any other relevant requirements of local, state and national authorities

8.2 Line Route and Access

8.2.1 The line route and pole locations shall be in accordance with the Applicable Permits.

8.2.2 Transmission Pole Spotting Criteria:

- Minimize contact with environmentally sensitive areas, streams, forested areas, or other valuable natural habitats.
- Minimize contact with property parcels that have incompatible zoning or land use planning classifications.
- Minimize contact with areas where terrain or drainage would interfere with transmission line construction and maintenance.
- To the extent practical, if any existing structures require replacement, the structure should be replaced on a structure-for-structure basis. All new structures will be placed as close as possible (either ahead or back along the center-line) to the existing structures.
- The structures at line angle points (P.I.s) will be placed in the same location as the existing structures. Temporary structures will be used during construction to support the existing circuit in order to remove the existing P.I. structure and replace with a new structure.
- Where the rights-of-way are sufficiently wide, new structures will be placed along side of the existing structures to facilitate a 10-hour return to service time of existing transmission lines during construction.

- Some structure locations may be shifted significantly for more optimal design or as dictated by environmental factors.

8.2.3 Perform any field surveys to acquire topography and other field data, as necessary, for transmission line design. Provide all electronic copies of the associated AISC survey files to Owner. Contractor shall be responsible for the staking of all proposed locations for core borings, Right of Way acquisition and any other associated engineering activity such as wetland delineation.

8.2.4 Perform subsurface utility analysis to address construction access and external loading limits for all foreign utility crossings.

8.2.5 Design solutions and obtain crossing approvals for all foreign utility crossings from other owner utilities (e.g. power lines, state or county roads, communications cables, railway lines, gas pipelines, etc.).

8.2.6 Review to determine whether any Federal Aviation Administration regulations apply, provide written notification to those agencies for their review and acceptance, incorporate any requirements in the design and note any specific construction details on the new drawing set. Aviation marker spheres shall be used as part of the construction requirements on all prominent crossings, such as limited access highways, river or major ravines. Any aviation marker lights that are required must have an automatic monitoring system installed with each light.

8.2.7 Acquire transmission line right-of-way covering the line from the collector substation to the POI.

8.2.8 Minimize disturbance areas, damage to cultivated crops or pastureland and avoid native vegetation sensitive areas as far as possible.

8.2.9 Drainage and erosion control shall meet the requirements of Section 6.11.

8.2.10 Reinstate and re-vegetate all disturbed areas.

8.3 Foundations for Poles or Towers

8.3.1 Pole or tower foundations shall be designed in accordance with the Applicable Standards, and meet requirements of the geotechnical report, as well as requirements for concrete in this specification.

8.3.2 All transmission line custom steel pole structures and any guy anchors shall be supported by drilled reinforced concrete caissons. The foundations shall be designed per current industry standards and the designer shall use Ensoft, Inc's LPILE or PLS-CADD-foundation design computer program.

8.3.3 Program inputs (pole loading, soil conditions data from core borings and Geo – Tech report output) and output results shall be provided to Owner. Contractor must perform a geotechnical and subsurface investigation at each foundation structure location that will include a boring to determine the soil parameters to be used in the design.

8.3.4 If shallow bedrock is encountered in the soil borings, the caisson foundations shall be designed to be embedded into solid rock a length equal to at least one caisson diameter.

8.3.5 The ultimate strength of overturning moment and uplift of the foundation shall not be less than 1.25 times the design factored load reactions of the structure. The ultimate strength of foundations subjected primarily to compression load shall be not less than 1.10 times the design factored load reaction of the structure. Overturning moment foundations

designed by rotation or pier deflection performance criteria shall use factored structure reactions for determination of the foundation performance.

8.3.6 The minimum caisson diameter for each structure shall be the custom designed steel pole manufacturer's anchor bolt circle diameter plus a 6 inch minimum clearance to surrounding competent soil or bedrock materials around the anchor bolt cage.

8.3.7 Alternate transmission tower foundation designs shall be submitted to Owner prior to executing the foundation design effort.

8.3.8 The pedestal height above ground line shall be designed with a minimum of 12 inches of reveal above final grade unless prior approval is given by Owner.

8.4 Design

8.4.1 Owner requires preparing the line design utilizing PLS-CADD. A copy of the final PLS--CADD design file shall be provided electronically to Owner.

8.4.2 All final drawings shall be approved and sealed by a Registered Professional Engineer certified within the state of proposed construction.

8.4.3 Contractor will stake and acquire a core boring and a geotechnical report for each structure site and perform a customized foundation design for each structure.

8.4.4 Contractor shall determine and specify all of the associated hardware that will be required for the OPGW installation along with splice locations determined. The hardware specified must meet the wire manufacturer's specifications and utilize their recommended supplier.

8.4.5 Contractor shall locate all proposed OPGW splice locations at easily accessible structures. Slice points shall also be located near other telecom utility crossings or a point nearest to a telecommunication provider's infrastructure if a crossing does not exist.

8.4.6 Contractor shall comply with the manufacturer's recommendations and Applicable Standards for all assemblies and installation of poles, conductors and other components.

8.4.7 All new Transmission structures should be direct embedded Round Wood Pole (Monopole, H-Frame style, or 3-Pole style) or Tapered Tubular Steel supported by a drilled reinforced concrete foundation. Tapered Tubular steel pole structures and associated attachments shall be weathering steel or galvanized steel.

8.4.8 Conductor installed should be one of Owner's standard conductors. Conductor shall be single bundled. The use of multiple bundled conductor shall be approved by Owner.

8.4.9 All insulators, style and manufacturer, shall be pre-approved by Owner. Non-Ceramic insulators are not permitted to be used for voltages above 138kV. For 230kV lines, insulators must be toughened glass (Seves) or Porcelain (NGK).

8.4.10 Contractor shall hire an Engineer to complete a grounding study, incorporating the mutual coupling and induced voltage of the phase conductors and shield wire(s). This study shall inform the grounding scheme for the Transmission Line and OPGW system to ensure public and worker safety. This study is required to be presented to the owner prior to completion of the Transmission Line Design.

8.5 Assembly and Installation

8.5.1 Contractor will provide off-loading and secure storage facilities and shall be held responsible for the proper protection and safekeeping of all material until the completion

date. Contractor shall be held responsible for any loss or damage to material after delivery.

8.5.2 Contractor will verify and confirm the quantities of material supplied by vendors. Conductor used is to be optimized to obviate excessive waste. A nominal amount (dependent on the terrain - max. 5%) of phase and earth conductor will be allowed for sags and jumpers.

8.5.3 The applicable type of tower shall be erected on the completed foundation. In the case of self-supporting tower concrete foundations, towers shall not be erected until the concrete has had at least 14 days in which to cure, or test breaks have proved the Design strength of concrete has been achieved, whichever is later. In the case of guyed tower concrete foundations and/or anchors, towers shall not be erected until the concrete has had as least 21 days in which to cure, or test breaks have proved the Design strength of concrete has been achieved, whichever is later. Guyed steel structures are discouraged and require approval from Owner.

8.5.4 All design tolerances shall be documented and provided to Owner and achieved.

8.5.5 Substantial temporary conductor supports shall be used, or equally effective measures taken, to prevent encroachment of statutory clearances, or other clearance requirements stated in the permits, between the conductor being strung and other power or communication lines, roads or railways being crossed.

8.5.6 Suitable structures under each phase will be erected to protect all fences from conductor damage during stringing.

8.5.7 Temporary changes in poles, fixtures or conductors of lines being crossed will only be carried out if accepted by Owner. Contractor shall indicate any changes considered necessary and will co-ordinate any changes with the owner of the service.

8.5.8 Contractor will endeavor to arrange that all crossings be made with the crossed line de-energized. The time of line outages shall be kept to the absolute minimum. All preparatory work shall be done prior to the work permit coming into effect. Upon completion of the work, Contractor shall immediately notify the applicable utility that lines are clear and release the working permit.

8.5.9 All phase and earth conductors shall be tension strung. Stringing shall be done in daylight hours only.

8.5.10 The equipment and methods used for stringing the conductors shall be such that the conductors will not be damaged. Particular care shall be taken at all times to ensure that the conductors do not become kinked, twisted, bird-caged or abraded in any manner.

8.5.11 Contractor shall make suitable arrangements for temporary staying of towers, and anchoring of conductors when necessary. Conductors may not be anchored to any portion of any tower, except strain towers, and then only at the points designed for conductor attachment. Temporary anchoring to footings and guy anchors will not be permitted. Where temporary anchoring is required, suitable temporary anchors shall be provided. Installation and removal of temporary anchors will be Contractor's responsibility

8.5.12 All conductors shall be strung by the controlled-tension method by means of rubber faced, double bullwheel-type tension stringing equipment. This equipment must be so designed that there shall be no conduction of the heat generated by the braking action, to the bullwheels. There shall be appropriate mechanical braking on the reels to prevent loose conductor between the reels and the bullwheels, but sufficient tension to pull the conductor in between layers remaining on the reel. Brake controls shall be positive and fail-safe in order to minimize the danger of brake failure.

8.5.13 The tension shall be controlled individually on each conductor, and when the desired tension is obtained, the same constant tension shall be held so long as the brakes are left at this setting. Tensions, while pulling, must be sufficient to clear all obstacles safely without damage to the conductor. At no time shall the pulling tension exceed the tension shown on the sag charts.

8.5.14 Adequate protection shall be provided where there is danger of conductors being damaged by vehicles or other equipment and objects. Conductors shall not be left in contact with the ground, vegetation or any conducting or semi-conducting material. Wood lagging or similar material shall be used to protect the conductor when working at ground level.

8.5.15 Before stringing commences, Contractor will be required to compress sample phase and earth conductor mid span joints, as well as phase conductor dead/end assemblies on site using the matched and numbered dies and compressors intended to be used on the line during stringing. The length of conductor between any two fittings on the sample shall be not less than 100 times the overall diameter of the conductor. At an acceptable testing authority a tensile load of about 50% of the breaking load of the conductor shall be applied and the conductor shall be marked in such a way that movement relative to the fitting can easily be detected. Without any subsequent adjustment of the fitting, the load shall be steadily increased to 95% of the breaking load and then reduced to 90% of the breaking load and maintained for 1 min. There shall be no movement of the conductor relative to the fitting due to slip during this period of 1 minute and no failure of the fitting. The conductor shall then be loaded to failure, and shall again withstand a minimum load of 95% of the minimum breaking strength of the conductor for it to be deemed acceptable. If the sample fails this test, a further three (3) samples shall be tested and will all be required to pass the above. A copy of the test report shall be provided to Owner prior to stringing.

8.5.16 Records of temperature, sag and tension for each section regulated shall be kept by Contractor, and a copy supplied to Owner.

8.5.17 OPGW shall be installed for the dual purpose of providing a lightning shield for the conductors and fiber-optic communications. A minimum of 48 individual fibers shall be provided in the OPGW conductor.

8.5.18 All conductor shall be Sagged using the T-t Transit method and by installing a dyno at the far end of the deadend section. The Transit targets and dyno shall confirm adequate sag has been reached. Identical processes shall be followed when installing additional phases in the same deadend section.

8.5.19 Structures requiring guy wires will have fencing to protect them from wildlife and vehicles.

8.5.20 Fire preventative coating will be applied up to 8 ft on structures if wooden products used.

8.6 Earthing

8.6.1 The earthing system shall clearly and demonstrably ensure the safety of personnel, the public and equipment under all normal and abnormal operating conditions and all fault conditions.

8.6.2 The earthing system shall ensure that there is no risk to personnel, the public or livestock of electric shock (e.g. transferred potential, step voltages and touch voltages).

8.6.3 Pole structures shall have a maximum footing resistance of 10Ω, unless a requirement for lower resistances is determined by the earthing study.

8.7 Commissioning

8.7.1 Contractor to provide owner with as-built LiDAR survey of complete Transmission Line. The Survey of existing facilities shall be commissioned and completed within 1 month of conductor installation.

8.7.2 Contractor to provide owner with IR survey of entire transmission line after the line has been energized and is delivering not less than 80% of anticipated nominal load.

8.7.3 Contractor to provide owner with Corona survey of the entire Transmission Line after the line has been energized and is delivering not less than 80% of anticipated nominal load.

9. PLANT COMMUNICATIONS NETWORK

The Wind Power Plant Communications Network shall connect to all Wind Turbines and Meteorological Stations on the Wind Power Plant site and shall connect to the terminal points as specified in this document, including but not limited to the TSP communication network.

Contractor shall be responsible for achieving a fully functional communications link between the Wind Power Plant SCADA server(s), each of the Wind Turbines and the Meteorological Stations.

9.1 General

9.1.1 The Wind Farm communications network will connect to the terminal points as specified, be compliant with Applicable Standards, and meet any additional requirements of the TSP Interconnection Agreement.

9.1.2 Fiber optic cables shall be used for the Wind Farm communication network.

9.1.3 The Wind Farm communications network shall be suitable for the Site, including:

- Immunity from the effects of fault and lightning currents
- The expected ambient temperature range
- Geotechnical conditions
- Protection from pests and rodents

9.1.4 No joints in the fiber-optic cable are permitted.

- Prior to fiber-optic cable installation, all cable will be inspected and tested with optical domain reflectometer.

9.1.5 Communications network requirements

- Underground fiber optic cable shall be as follows:
  - Conduit EPDM SDR 11 minimum
  - 12 fiber for individual collector circuits
  - For rodent protection a combination of the following methods shall be used:
    - Non-armored fiber-optic cable in Pest Duct
    - Non-armored fiber-optic cable installed in a minimum of 4” schedule 40 PVC or HDPE innerduct
    - Armored fiber optic cable
    - Any concreted encased duct bank or metallic conduit
    - Any owner approved substitution that achieves equal protection from rodent damage
  - Collapsed fiber-optic ring system layout design, installation and testing.
- The communication network will be designed for a minimum of one (1) GB bandwidth
- The fiber-optic cabling will be either 12 strand multimode or 12 strand single mode, as applicable and consistent with standard industry practice
- Fusion splicing will be used if required, and completed in above-ground pedestals.
- Splice vaults shall be composed of reinforced concrete or fiberglass and equivalent in size to 4’x4’x4’ with interior racking to mount splice case off the bottom of vault. Vault shall have an open bottom with gravel base.

- Extra fiber-optic cabling (slack) will be included at each end of all cable runs consistent with standard industry practices
- The communication system will have a maximum attenuation of 0.35 dB/km at 1310 nm or 0.25 dB/km at 1550 nm and will include a minimum system margin of between four (4) and six (6) dB
- In the event fiber-optic cables are placed in trenches with wiring associated with other parts of the Work, underground rated subduct that also provides the ability to eliminate or decrease damage due to wildlife infestation. will be used to protect and separate the cable

  – Redundancy

    - The Wind Power Plant Communications Network shall have redundancy, so that the failure of a single component or communications link in the Communications Network shall not result in the loss of communication to more than one Wind Turbine, Meteorological Station, Terminal Point or Interface.
    - Redundancy may be achieved by using ring topology for the fiber-optic network such that communications can be maintained to all Wind Turbines in the event of a break in one of the cores of the fiber-optic cable. Re-routing of data shall take place automatically and not require manual intervention.

10. TELECOMMUNICATIONS FACILITIES

10.1 SUMMARY

10.1.1 This Section summarizes the communications systems Contractor shall provide as part of its proposal. The proposal shall address three aspects of the telecommunications design.

- Intra-site Communications - the Network shall primarily be an Ethernet Fiber network to support intra-site data and voice communications needs.
- Substation Interconnect - Contractor shall incorporate plans for the communications needs required to interconnect the facility to the bulk electric power system. This may include transfer trip and any of special or remedial protection schemes needed for the interconnection of the facility to the bulk electric power system. This design shall meet any requirements from the interconnecting utility, the Public Utility Commission, and/or the Independent System Operator for SCADA or Metering.
- Owner Connectivity - to support remote monitoring and operation of the facility. This will include one or more data links back to Owner operations center. This shall include connectivity for both the Primary SCADA link as well as the plant operational data link serving plant operations such as sending operational and maintenance data to a historian, allowing remote access and control, and voice communications to the facility.

10.2 TELECOMUNICATIONS APPROACH

10.2.1 Contractor shall provide a bid that both meets these specifications and allocates a budget for the design, procurement, and construction of these telecommunications facilities. The site network and the interconnection requirements should be known and the design and costs of these facilities should be accounted for and well understood. The communications link to Owner will depend greatly on the location, size, and type of facility proposed, and therefore Contractor shall propose a solution that meets these functional specifications. During negotiations this aspect of the design may be revised based on site specific conditions. An allowance for each of these three sections (Intra-site Communications, Substation Interconnect, and Owner Connectivity) shall be provided. The proposal price will not be revised if the ultimate solutions remains within these allowances.

10.3 TELECOMUNCATIONS FACILITES

10.3.1 The following shall be provided both during and after construction:

- Communications during construction: Contractor shall provide a communications network to be used during construction, and specifically communications services to the on-site trailers used during construction. A minimum of 5 Mbps Ethernet link shall be provided to each Owner trailer, along with (2) phone lines per trailer, which may be either VOIP or POTS. The Ethernet link shall only be dedicated to Owner and no other users. Contractor shall further provide any communications circuits needed for their own use. In addition each trailer shall be equipped with one 7’ tall 19” wide communications rack and 20 A of AC power for Owner to install routers/switches used to distribute data connections.
- Intra-Site Network: Contractor shall provide a data network that extends from a central substation or maintenance office to all equipment enclosures throughout the facility that house microcontroller equipment.

- This network shall be constructed such that it supports the following applications:
  - Shall support the Real-time control for the operation of the plant.
  - Shall support remote monitoring for Owner to gather operational data from microprocessor-controlled equipment.
  - Shall support monitoring of weather information.
  - Shall allow Owner to remotely access remotely configurable equipment to make settings changes and firmware upgrades.
  - Shall support the use of Voice at each enclosure, desk, conference room, or security control point.
  - Shall support the use of Video where required for security and operations of the plant.
  - Shall include Wireless Access Points in Office locations
- The network shall be capable of meeting the following specifications:
  - Use IP/Ethernet communications over a fiber and copper network.
    1. At least 60 Strands of single mode (SM) fiber shall be installed between all buildings as part of the project. Fiber shall be configured in a logical ring and where possible into a diverse optical ring.
    2. Category 6 copper shall be used for all connections between switches and equipment within a building.
  - Use gigabit Ethernet connections
  - Use VLANS for segmentation of traffic
  - Use Quality of Service to Prioritize traffic flows
  - Use Rapid Spanning Tree or other advanced ring convergence protocols.
  - Support POE where phones or wireless access points are installed.
  - Use managed equipment that support the following:
    1. Centralized authentication via RADIUS or TACACS
    2. Centralized logging via Syslog
  - Use hardened network equipment rated for the environment in which it will be installed.

- Interconnection to Bulk Electric Power System:
  - Build any fiber, microwave, or leased facilities needed in order to tie facility into bulk electric power system.
  - Follow Western Electricity Coordinating Council (WECC) teleprotection standards.
  - Meet utility interconnection standards.
- Owner Communications Circuits :
  - Contractor shall provide the following communication circuits, each with the respective parameters given. These communications circuits can be delivered over the one or more aggregate leased circuits if possible. These circuits may make use of a private data network or a leased facility from a common carrier. Contractor's proposal shall include the capital cost for construction, as well as the estimated monthly recurring cost if applicable. Owner shall not be responsible for any communication links required by manufacturers, such as for remote access by the turbine or generator manufacturer. Contractor shall make use of Owner equipment listed below in Section 10.4, where such equipment is required:

Circuit Name	LOC A	LOC Z	Type	Capacity	Latency	Avail.	Circuit Description

O&M POTS LINE	O&M	PGE WHQ	FXS	64 kbps	100 msec	99.99%	PHONE LINE
O&M CORPORATE NETWORK	O&M	PGE WHQ	ETH	20 Mbps	100 msec	99.99%	CORPORATE NETWORK SERVICE
O&M SECURITY ETHERNET	O&M	PGE WHQ	ETH	1.5 Mbps	0.5 sec	99.99%	CORP SECURITY LAN
SUB SECURITY ETHERNET	SUBSTATION	O&M	ETH	1.5 Mbps	0.5 sec	99.99%	CORP SECURITY LAN
SUB REMOTE ACCESS LAN	SUBSTATION	PGE WHQ	ETH	1.5 Mbps	0.5 sec	99.99%	REMOTE ACCESS FOR PROTECTION & AUTOMATION GROUP
SUB COMM TECH LAN	SUBSTATION	PGE WHQ	ETH	1.5 Mbps	0.5 sec	99.99%	REMOTE ACCESS FOR COMM TECHS
SUB SCADA	SUBSTATION	PGE WHQ	RS-232	64 kbps	1 sec	99.99%	SERIAL DNP 3.0 SCADA
SUB AGC SCADA	SUBSTATION	PGE WHQ	RS-232	64 kbps	1 sec	99.99%	SERIAL DNP 3.0 AUTOMATIC GENERATION CONTROL
SUB PHONE	SUBSTATION	PGE WHQ	VoIP	64 kbps	100 msec	99.99%	PHONE LINE FOR CONTROL HOUSE
SUB ACCESS CONTROL POTS	SUBSTATION	PGE WHQ	FXS	64 kbps	100 msec	99.99%	PHONE LINE FOR SECURITY ACCESS CONTROL
SUB SECURITY POTS	SUBSTATION	PGE WHQ	FXS	64 kbps	100 msec	99.99%	PHONE LINE FOR SECURITY
INTERCONNECT METER POTS	SUBSTATION	PGE WHQ	FXS	64 kbps	100 msec	99.99%	PHONE LINE FOR INTERCONNECTING UTILITY METER
INTERCONNECT PHONE POTS	SUBSTATION	PGE WHQ	FXS	64 kbps	100 msec	99.99%	PHONE LINE FOR INTERCONNECTING UTILITY PHONE

10.4 TELECOMUNCATIONS EQUIPMENT & INSTALLATION

10.4.1 In each major facility provide space for (4) adjacent Communications racks. For the Plant and Switchyard/Substation facilities, locate the Communications racks in the same room or adjacent to the relay equipment racks. For the O&M Building or Administration Building, in addition to the Communications racks, provide (4) racks for IT Operations and (2) racks for Corporate Security Operations. Locate the Communications racks in the same room or adjacent to racks dedicated for IT Operations and Corporate Security. Each room to include 4'x8' fire-rate plywood backboard (white).

10.4.2 In the O&M or Administration Building, provide a Communications room of at least 240 sq. ft., with dimensions of 12' x 20'. For the Switchyard/Substation, the Control House shall be of adequate size to accommodate the telecommunications equipment, -48 VDC charger, and -48 VDC battery, as well as any additional equipment required in preceding or proceeding sections.

10.4.3 Provide a -48VDC power system capable of supplying the load with an 8 hour reserve time at each major facility.

10.4.4 Provide a SATRAD-G2 satellite phone system with exterior antenna, rack mount equipment, and a dedicated desk phone (PSTN Interface).

10.4.5 Communications equipment shall be grounded per Motorola R56 standards in O&M and Administration Buildings. Grounding in the Switchyard/Substation shall follow standard industry practices, and single point grounding methodology.

10.4.6 Installation of fiber optic cable shall meet TIA-568C or later, in addition to any other relevant industry standards. Intra-site fiber optic cable shall be installed in innerduct, within appropriate PVC conduit, cable trench or ducting.

10.4.7 OPGW fiber optic cable shall be installed in the shield wire position for any new transmission line installations.

10.4.8 Contractor shall provide diagrams or drawings matching existing Owner documentation standards for all building/room plans, cable routing, equipment racks, equipment wiring, and circuit schematic diagrams for all installed telecommunication facilities.

10.4.9 All equipment and systems shall be tested to ensure desired performance, and the results shall be submitted to Owner in writing. Communications systems shall not be considered approved for operation until the testing results are reviewed and approved by Owner or a designated Owner's representative.

10.4.10 All installed cabling shall be labeled to allow Owner or an independent third party to locate and document individual cables at each termination point.

10.4.11 Equipment specified for this project shall be of the same manufacturer and model as Owner uses in their existing communications systems:

- Dual-post Rack – Chatsworth "Clear", 19" x 84"
- Ethernet Switch – Cisco
- VoIP Phone - Cisco
- Wireless Access Point – Cisco
- SONET Fiber Node – Fujitsu 4100 ES shelf and support cards
- T1 Multiplexer – RAD MP4100 shelf and support cards
- DSX-1 Cross-connect panel – Telect 28-port; 010-0128-0101
- Fiber Patch Panel – Clearfield FxDS, with SC/UPC Connectors
- ADSS Fiber Cable – OFS AT-3BE17NT-060-CMEA (60-CNT)
- OPGW Fiber Cable – AFL DNO-8234 (48-CNT)
- -48 VDC Fuse Panel – Telect GMT Dual Feed 20/20-position
- -48 VDC Charger Panel – Valere; CK4D-ANL-VC shelf, min 24 hours battery recharging capability while under load
- -48 VDC Battery (Plant or Switchyard/Substation) – C&D (flooded), min 8 hours carry time
- -48 VDC Battery (O&M or Admin Building) – C&D (flooded) or East Penn Deka Unigy II (VRLA) with one-piece base and interlocking cells, min 8 hours carry time

11. PLANT SCADA SYSTEM

The SCADA system shall be a proven system, suitable for performing the operation, maintenance and monitoring functions associated with the Wind Power Plant.

Other features that include modules for managing O&M may be offered as an option. These may include maintenance scheduling, spare part records, service records and maintenance records.

11.1 General

11.1.1 The central SCADA computer shall be installed in the substation and shall be suitably protected against all reasonably foreseeable environmental conditions.

11.1.1 The SCADA system shall record and report all necessary operational details and allow central and remote, automatic and manual control. The software provided shall also be capable of undertaking the warranty calculations and providing daily/monthly/yearly operations and management reports to an agreed format. SCADA system will be able to generate nonstandard reports, points and Owner will have the ability to create new reports/points without vendor assistance. Owner will be given access to all points via a standard communication protocol.

11.1.2 The SCADA system shall be capable of meeting the TSP Interconnection Agreement requirements, for monitoring and control of the Wind Power Plant. This shall include the provision of real time data required by the Interconnection Agreement via the TSP RTU.

11.1.3 The SCADA system shall be equipped with a database back-up facility, together with a facility for online access to the database, that shall allow Owner to obtain and process data and to customize and configure reports for the purpose of undertaking the warranty calculations and providing daily/monthly/yearly operations and management data, by employing suitable industry standard database software (e.g. MS SQL Server).

11.1.4 The SCADA system shall be capable of routine interrogation from a remote site at an acceptable speed.

11.1.5 The SCADA system shall be connected to all the Wind Turbines and the central SCADA control via industry standard data communication hardware and software. It shall also be possible to connect other signals including utility meters and other Wind Turbine signals as required by the design and supply of the Wind Power Plant. It shall be possible to access the SCADA system from any of the Wind Turbines using a portable PC, giving full access to the system. The SCADA system will also support the addition of nonstandard instrumentation to include, but not be limited to, SODAR, LIDAR, cameras, and other meteorological instrumentation.

11.1.6 Should the central SCADA control or communication connection fail the individual Wind Turbines and electrical systems shall continue in operation and shall be operated safely by the individual Wind Turbine control system.

11.1.7 It shall be possible to store at least one (1) year of data from the Wind Power Plant without archiving it from the system. It shall be possible to remotely download raw 10-minute average SCADA data by means of an online database facility for further analysis.

11.1.8 Upgrades to the SCADA software and any necessary hardware keys shall be provided free from charge throughout the warranty period. Contractor shall provide additional upgrades, additional hardware keys and support on reasonable terms over the Design Life.

11.1.9 The SCADA system shall be traceable and transparent in operation. It shall be structured in such a way as to provide maximum data integrity. Data sampling rates shall be

sufficient to meet the requirements of the warranty and testing contracts and external parties as specified in this document.

11.1.10 It shall be possible to download configuration and parameter settings from the Wind Turbine controllers and record them on the SCADA system.

11.1.11 SCADA system will be accessible and independent of the Wind Turbine providers supplied SCADA system. SCADA system will be scalable and able to integrate with other variable energy assets.

11.2 Main SCADA Components

11.2.1 The SCADA system shall comprise as a minimum:

- Main SCADA server(s), viewing and operation station (may be combined with server) in the Wind Power Plant Control Building
- Communications links connecting all Wind Turbines, Met Masts, buildings and electrical equipment within the Wind Power Plant
- Interface to Wind Turbine controllers
- Interface to external systems including the TSP's RTU
- Interfacing and connections between components as required
- SCADA system will have a local user interface at the physical SCADA system. System will be accessible to Owner employees 24/7. Owner employees will be able to control the plant in the event of communication failure externally.

11.3 Main SCADA Server(s), Viewing and Operation Station

11.3.1 The SCADA viewing and operation station shall allow full viewing, analysis, reporting, fault diagnosis, resetting of faults and control of Wind Turbines consistent with its deployment as the primary SCADA terminal located on the Site.

11.3.2 The SCADA viewing and operation station shall be equipped with a printer suitable for printing reports from the SCADA system.

11.3.3 The SCADA system will be fully accessible to Owner engineering and compliance group. Owner will be able to designate which SCADA points will be archived in Owner's PI system through the OPC server.

11.4 Interfaces

11.4.1 The main SCADA server(s) shall interface with an RTU provided by the TSP. The communication protocol and medium for this interface shall be agreed with the TSP.

11.4.2 The main SCADA server(s) shall interface with an RTU provided by Owner. The communication protocol and medium for this interface shall be agreed with Owner. This interface shall provide AGC control of the entire plant.

11.4.3 The main SCADA server(s) shall interface with any substation capacitors, SVC or other reactive plant comprising part of the Work as necessary for their control and monitoring. This interface shall be suitable for the purpose of:

- Voltage, VAR or power factor control as necessary to achieve compliance with the Interconnection Agreement and TSP requirements, Wind Turbine requirements and plant insulation ratings

- Controlling voltage at the Wind Turbines' terminals to maximize uptime and energy production and minimizing electrical losses as reasonable
- Viewing the status and monitoring the condition of any reactive plant as necessary
  - The main SCADA server(s) shall interface with the substation equipment. This interface shall be suitable for the purpose of:
    - Viewing status of circuit breakers and switches at the substation
    - Obtaining voltage, current, active and reactive power, and relay data at feeders and the point of interconnection with the TSP
    - Receiving equipment alarms
    - Tripping feeder circuit breakers

11.4.4 The main SCADA server(s) shall interface with Owner's PI data collection and historical system via Owner's standard interface.

11.5 Availability and Reliability

11.5.1 The SCADA system, inclusive of all elements including and between the Wind Turbine controllers and the main SCADA server shall be designed and implemented for an availability of 8760 hours per year minus hours for planned outages and 100% reliability. Redundancy shall be designed into the system to meet the required availability and reliability.

11.5.2 Redundancy shall be provided for all critical elements that are prone to failure, including electromechanical hard drives and computer power supplies.

11.5.3 In case of a grid failure or other loss of power, an uninterrupted power supply (UPS) shall prevent data stored on the main SCADA server(s) from being lost after loss of supply. When normal conditions are resumed, the main SCADA server(s) shall re-start automatically.

11.6 Cyber Security

Contractor shall furnish and configure the following security features as part of the SCADA system to be compliant with NERC Critical Infrastructure Protection (CIP) and Owner's internal standards.

11.6.1 Security Center

- Contractor shall provide a security center to accompany the SCADA system.
- Contractor will supply all necessary servers, one local view station, and any necessary networking devices to connect the security center to the SCADA system
- Each security appliance (with the exception of the vulnerability scanner) must reside on its own virtual machine operating in separate subnets, with strict access rules governing which communications are allowed into and out of the networks.
- Security appliances:
  - Patch Management:
    - Contractor shall supply an on-site patch management server capable of deploying patches for all software, hardware, and integrated third-party applications within the SCADA system, security center, and all other sub systems

- SCADA vendor shall evaluate, test, and provide appropriate patches to all devices and software within the SCADA system, security center, and all other sub-systems
- Patches will be provided on a monthly basis
- The patch management server will compile a comprehensive, centralized view of the patch status of each computer through agent-based scans, which will be capable of being displayed on a graphical dashboard. This information will also be integrated into the SIEM.
- Patch Management functions will operate in a virtualized environment, utilizing agents installed on SCADA system, security center, and other subsystem devices.

– Malware prevention

- All Windows endpoints within the SCADA system, security center, and any other sub-system will have host-based whitelisting
- Malware prevention will provide centralized configuration and control of malware prevention agents that reside on each client.
- Malware prevention agents will restrict which executables can run on the client by creating a whitelist of programs that are allowed to run.
- Malware detection will be reported to the SIEM, and standard reports must be capable of running on an automated schedule
- Malware prevention functions will operate in a virtualized environment, utilizing agents installed on SCADA system, security center, and other subsystem devices.

– Backup and Restoration

- Contractor shall provide an on-site backup server to schedule and preform automatic backups
- Contractor shall provide a network attached storage (NAS) to store backups
- Contractor shall provide specific recovery instructions for all devices
- All capable devices within the SCADA system, security center, and any other sub-system shall be backed up
- Other devices within the SCADA system, security center, and any other sub-system, such as networking devices, shall have their configurations, firmware, and any other applicable configuration files pulled automatically on a scheduled basis
- All backup files shall be encrypted
- Backup and restoration functions will operate in a virtualized environment, utilizing agents installed on SCADA system, security center, and other subsystem devices.

– Anti-Virus

- SCADA vendor shall integrate approved anti-virus software for all Windows systems within the SCADA system, security center, and all other sub systems.
- SCADA vendor shall provide an on-site anti-virus management server to apply updates to end point software
- All Windows endpoints will have host-based anti-virus software running at all times
- SCADA vendor shall provide updated anti-virus definitions on a weekly basis
- The anti-virus software will automatically detect, repair, and quarantine any spyware, adware, viruses, and other malicious intruders
- The anti-virus software will be installed on a dedicated anti-virus management station and will be used to:

    1. Integrate client software
    2. Configure and manage SCADA clients

3. Distribute anti-virus signatures
4. Generate anti-virus status reports

- Anti-virus software will continually monitor client's machine for known viruses, the client must be installed and configured such that it does not adversely affect the operation of the SCADA system or delay operator actions
- The anti-virus software will provide a standard set of reports that can be run on an automated schedule and will be incorporated into the SIEM. The reports that will be included with the anti-virus software will be, at a minimum:

1. Viruses report
2. Protection status report
3. Protection coverage report
4. License usage report
5. Anti-virus software version report
6. Users of infected computers report
7. Most infected users report
8. Anti-virus database usage report
9. Incompatible applications report
10. Errors report

- Anti-virus software must also have the ability to create custom reports
- Anti-virus functions will operate in a virtualized environment, utilizing agents installed on SCADA system, security center, and other subsystem devices.

– Vulnerability Scanner

- Vulnerability scanner will perform scheduled scans to identify missing patches, viruses, identify vulnerabilities, detect out-of-date anti-virus signatures, etc. so they are remediated before they can are exploited
- The vulnerability scanner will be capable of running detailed configuration checks that enumerate ports, users, shares, groups, agents, and services. Scans will be user-scheduled to collect information that is integrated with the SIEM.
- Vulnerability scanner can reside on the same device virtualized environment as another security appliance.

– Security Incident and Event Manager (SIEM)

- The SIEM will provide centralized collection and correlations mechanisms to monitor and report on the SCADA system security posture.
- The SIEM functions will consolidate and normalize all event logs generated by a variety of firewalls, NID devices, anti-virus products, anti-malware products, Netflow, vulnerability scanners, SCADA servers, etc.
- The SIEM shall simplify large amounts of disparate types of data in order to provide an indication that a security event may be happening.
- The SIEM shall be capable of running customizable reports on an automated schedule
- Contractor must supply a NAS for all log storage
- The SIEM appliance shall be compatible with existing Owner centralized SIEM
- The SIEM device can be standalone or virtualized, but must be approved by Owner.

• Security Center Computer requirements

– Server:

- General
    1. Each server shall be an independent Microsoft Windows based computer capable of stand-alone operation.
    2. Servers shall connect to SCADA system through an Ethernet NIC
    3. Rack mountable
    4. Servers shall be configured for redundancy complete functionality shall be available with the loss of any server

- Operating System: Microsoft Windows Server 2012 R2 or as recommended by Contractor
- Storage
    1. Raid 5 with minimum of 5 drives
    2. Hard drives:
        a. 1 terabyte per virtual machine
        b. SATA Interface
    3. Hot-plug hard drives

- Memory: Minimum 32 Gigabyte RAM per virtual machine
- CPU Cores: Minimum 4, Intel Xenon or greater, minimum speed 3.0 GHz
- Network Interface: Minimum 5 NICs, 1Gbps
- Power: hot pluggable redundant power supplies
- Virtualization: Up to 4 virtual machines per physical host
- Manufacturer: VMWare or Microsoft Hyper-V
- Manufacturer: Dell PowerEdge R730 or greater

– View Node:

- General
    1. Each server shall be an independent Microsoft Windows based computer capable of stand-alone operation.
    2. Servers shall connect to SCADA system through an Ethernet NIC
    3. Rack mountable

- Operating System: Microsoft Windows 2010, 64 bit.
- Storage: 500 Gigabyte solid state drive
- Memory: Minimum 32 Gigabyte RAM
- CPU Cores: Minimum 2, Intel Xenon or greater, minimum speed 3.0 GHz
- Network Interface: Minimum 1 NICs, 1Gbps
- Video Interface: Support up to 2 HDMI video outputs
- Monitors:
    1. Quantity: 2 monitors per view Node minimum
    2. Resolution: 1920 x 1080
    3. 24 inch diagonal

- Manufacturer:
    1. Dell Precision Rack 7000 Series or greater

– Network Attached Storage (NAS)

- General
    1. NAS shall be connect to SCADA system through an Ethernet NIC
    2. Rack mountable

- CPU architecture: 64 bit
- CPU Cores: Minimum 4, 3.0 GHz
- Memory: Minimum 4 Gigabyte RAM
- Drive bays:
    3. Minimum 12 drives
    4. Hot-swappable
    5. 1TB per drive
- Network Interface: Minimum 2 NIC, 1Gbps
- Power supply: Redundant failover
- Manufacturer: Synology

– Networking Devices

- Cisco iOS
- Netflow capable
- Rack mounted
- FirePOWER services (for firewalls)

11.6.2 Device Management

• Networking Devices

– All networking devices shall receive validated patches from the vendor via the patch management server
– By default, all networking devices will be managed by Owner, with the option of dual management (Owner and vendor) as required
– All networking devices shall have all un-used ports disabled
– post-contract award, the vendor shall provide documentation on all network devices installed with security settings
– All network devices provided by Contractor shall be capable of generating Netflow data
– If critical devices needed to operate SCADA system effectively do not inherently generate Netflow data, Contractor shall provide Netflow generators to simulate Netflow.
– Firewalls

- Firewalls will be implicit deny with exceptions
- Firewalls will be designed with both ingress and egress rulesets
- Post-contract award, vendor all provide information on all communications through the firewalls
- Firewalls will be Cisco iOS based with FirePOWER services
- Firewalls provided must meet all VPN Requirements

– Network Intrusion Detection (NID)

- All communications between different subnets or networks shall be monitored using Network Intrusion Detection System (NID)
- All external access points shall be monitored at the firewall level, capable of blocking unauthorized traffic
- Contractor shall provide any additional NID appliances
- NID devices shall be Sourcefire appliances
- All NID/NIP devices (including firewalls) must be capable of talking up to, and receiving updates from, an Owner owned Sourcefire management server

- End Devices
  - Examples of end devices include, but are not limited to, servers, HMIs, RTUs, controllers, sensors, actuators, meters, and inverters
  - Post-contract award Contractor shall provide documentation detailing all applications, utilities, system services, scripts, configuration files, databases, and all other system requirements for all end devices
  - Contractor shall provide documentation of all services required and justification for why they are necessary
  - Contractor will remove and/or disable all software components not required for operation prior to the FAT
  - Contractor shall configure devices with least privilege file and account access and provide documentation of the configuration
  - Contractor shall disable (through software or physical disconnection) all unneeded communication ports and removable media drives. Contractor will provide documentation that this has been completed prior to the SAT
  - Contractor shall incorporate a patch management process for all devices (in accordance with patch management section)
  - Contractor shall incorporate host-based appliances for all endpoints required by the security center
  - Pre-contract award Contractor will provide information on the patch management process
  - Contractor shall verify that the additional of security features does not adversely affect connections, latency, response times, and throughout, including during the SAT
  - Contractor is responsible for providing hardware capable of performing its normal functions in addition to all required the security functions

11.6.3 Account Management

- All default and guest accounts will be removed prior to the FAT
- Contractor will supply a list of accounts which need to be active and which can be disabled. Owner will approve these accounts in writing.
- Contractor will supply a domain controller to manage all windows-based machines and accounts
- Contractor will supply an Authentication, Authorization, and Accounting (AAA) server for authenticating VPNs and all networking accounts, and device accounts
- Contractor will hand over management of domain controllers and AAA server post-SAT
- All account activity, as well as failed login attempts, will be logged and sent to the SIEM
- All accounts within the SCADA system, security system, and DMZs will adhere to least privilege permission schemes
- Pre-Contract award, Contractor shall provide a separation agreement to determine how Contractor employees who have sensitive knowledge of purchaser's control system and who leave their position or have responsibilities changed will be

prohibited from disclosing that knowledge, where disclosure could lead to a reduction in security

- Contractor shall notify Owner within 12 hours of a Contractor employee, who has access to the SCADA system or any sub-system, quits or is terminated with cause
- Contractor shall notify purchaser within 3 days when a Contractor employee, who has access to the SCADA system or any sub-system, retires or changes position to where they no longer need access to the system
- All accounts will be role based with restricted permissions
- No local accounts shall be enabled within the SCADA system, where technically feasible

11.6.4 Network Design

- Contractor will provide a mechanism for alerting Owner in the event of a vulnerability or exploit that affects the SCADA system within a pre-agreed upon time frame
- Contractor shall disclose the existence and reasons for any identified backdoor codes
- FTP, telnet, and HTTP shall be disabled on all SCADA devices and replaced with SFTP, SSH, and HTTPS or encrypted alternatives where needed
- SSH, HTTPS, and RDP will be the only methods to remotely log into the site devices, authenticated by the AAA server, and may only originate from inside the SCADA system or
- Network Segmentation
  - In addition to all existing DMZs, the SCADA system shall be segmented in a logical manner, to be agreed upon by Contractor and Owner.
  - Contractor shall provide ACLs, port security address lists for all communications between subnets
  - Contractor shall provide and document secure network architecture where higher security zones originate communications to less secure zones
  - Contractor shall provide and document all communication paths between networks of different security zones
  - Contractor shall provide a mechanism for isolating specific subnets if they are known to be causing harm to the SCADA system
- Wireless Communications
  - Wireless technologies such as microwave, cell, Bluetooth, Wi-Fi (802.11x), ZigBee, WirelessHART, or other wireless technologies shall not be used within the SCADA system or any sub-system
- Management Tools
  - Contractor shall provide management tools specific to the hardware and software included in the SCADA system, security system, test environment, or any other sub-system
  - All tools will be licensed to incorporate all devices provided
  - Any licensing must be transferable if any device is replace for any reason
  - Additional licenses shall be available for purchases

11.6.5 Remote Access

- All remote access traffic will be fully encrypted
- All remote access will require 2 factors of authentication
- All access points including routable connections, serial links, or other communication methods will be documented and supplied by Contractor
- All remote access will be managed by Owner, in cooperation with Contractor
- No Contractor (including SCADA Contractor) shall have access to SCADA network or equipment remotely without Owner authorization
- Web Access
  - Under no circumstances will the SCADA system have direct access to the internet
  - All web (HTTP/HTTPS) access will be performed through a web-proxy
  - Contractor shall provide documentation of input sanitation for all web form inputs including, but not limited to, prevention of command injection, SQL injection, directory Traversal, RFI, XSS, and buffer overflow
  - Contractor shall provide an independent, third party assessment of all web-based interface software
- VPN Access
  - All remote access to the control system network must be performed through a VPN
  - VPN terminal server shall be located in a DMZ
  - VPN terminal server shall have monitoring software installed to record and forward pre-encrypted traffic to the NID device
  - VPNs must utilize multifactor authentication (e.g., security token, known key, and/or certificate)
  - VPN connections shall have communication logging, alarming, and monitoring to protect SCADA system from unauthorized modification or use
- Dialup and dedicated phone lines
  - Dial-up and dedicated phone lines will not be used within the SCADA network, security network, or any other sub-system

11.6.6 Physical Security

- Contractor shall provide a lockable or locking enclosure for all control system components
  - Core equipment, such as any backbone switches, SCADA servers, Remote access terminals, Firewalls, Routers, etc. must be locked, at minimum, by a non-reproducible keycard. Access to these cards and equipment must be logged, and this system must electronically record and timestamp who enters the room (e.g. AMAG)
  - Remote equipment, such as remote switches, controllers, media converters, PLCs, RTUs, and other end devices must be secured, at a minimum, by a non-reproducible key or keycard. Access to these keys and equipment must be logged
- Contractor shall verify and provide documentation that unauthorized logging devices are not installed (e.g. key loggers, cameras, and microphones)

- All physical security networks must be separate from SCADA networks

11.6.7 Incident Response/Disaster Recovery

- Pre-Contract award, Contractor shall provide Incident Response and Disaster Recovery (IR/DR) plans
- Contractor must incorporate purchaser's specific IR/DR plans if there are any deficiencies

11.6.8 Test environment

- Contractor shall provide equipment for a test environment to simulate standard operating conditions. The purpose of this system is not to completely reproduce the SCADA system, rather it should mimic key features of the system for testing purposes.
- Contractor shall include all hardware necessary to generate this environment including, but not limited to, SCADA servers, HMIs, Firewalls, Routers, Switches, Controllers, Protocol Converters, etc.
- Contractor shall include all software licenses and patches for all equipment in the test lab
- This network must be capable of testing patches, backups, and preforming penetration tests
- Test environment will be solely managed by Owner

11.6.9 Awareness Training

- Before any user is granted access to the SCADA system, they must undergo an Owner approved security training
- This training must be renewed on an annual basis for all personnel that interact with the SCADA system
- Contractor may provide their own training; however purchaser must verify that this training meets purchaser's requirements
- Contractor is responsible for insuring their personal complete cyber security training in the required time if they elect to train their own personnel
- If Contractor does not wish to have their own training, Owner will provide training to Contractor personal
- All records of this training must be provided to Owner before a Contractor employee is granted access to the SCADA system

11.6.10 Acceptance Tests

- Factory Acceptance Test (FAT)
  - Contractor shall provide current configuration files for all devices
  - Firewall rules, as well as all other access control mechanisms, will be enabled throughout the duration of the FAT
  - Devices will have logging enabled and logs will be provided to Owner at the end of the FAT
  - All Firewall rules will be reviewed during the FAT

- Site Acceptance Test (SAT)
  - Contractor shall ensure all devices are patched to their most current level
  - Contractor shall provide current configuration files for all devices
  - Firewall rules, as well as all other access control mechanisms, will be enabled throughout the duration of the SAT
  - Devices will have logging enabled and logs will be provided to Owner at the end of the SAT
  - All Firewall rules will be verified at the SAT
  - Vulnerability scans must be performed on critical system components as part of the SAT
  - Remote access and remote access restrictions must be tested as part of the SAT
  - Contractor will disable, remove, or modify all Contractor-owned accounts or negotiate account ownership of these accounts as part of the SAT
  - Contractor will create a baseline of system communication and configurations at the time of the SAT to be provided to the purchaser.
  - Contractor shall document the results of any NID tuning signatures and adjusting thresholds to reduce false positives and minimize false negatives.

11.7 Viewing and Display

11.7.1 The SCADA system shall display an "easy-to-read" summary of the Wind Power Plant status and performance at any time and shall also be able to display more detailed information about individual machines. The monitoring system shall be able to process the data and to sort the data necessary for the presentation.

11.7.2 The user shall be able to monitor the Wind Power Plant current status through either a GUI showing a map based representation of the Wind Power Plant or a series of tables summarizing Wind Turbine, meteorological station and grid station status.

11.7.3 The GUI shall provide a top-level view of the Wind Power Plant with facilities to link to particular groups or units. Units shall be represented by icons identifying the unit type and name and conveying the equipment status as the user scans the Wind Power Plant.

11.7.4 Commands shall be instantly available on selecting a unit or group of units from the map.

11.7.5 Direct links shall be available from the GUI icons to the corresponding tabular summary screens.

11.7.6 A single top level tabular screen shall show the complete site status at a glance. Clearly defined areas of the screen shall show Wind Turbines, meteorological stations, grid stations and current events. The Wind Turbine status shall show Wind Turbines on line, faulted, stopped, power and energy outputs. The meteorological status shall show the site mean wind speed, direction, temperature, and pressure. The grid status shall show the grid active and reactive power, voltage and current at the interconnection point with the TSP.

11.7.7 Current Site events shall be clearly shown with event code, event description, response status and times.

11.7.8 There shall be easy access to detailed information screens on individual Wind Turbines, meteorological stations and grid stations.

11.7.9 The Wind Power Plant SCADA system shall display at least:

- Single Wind Turbine data, e.g. status, power, voltages, currents, temperatures, energy, faults and wind speed
- Actual power for the whole Wind Power Plant calculated as a sum of the Wind Turbine outputs
- Actual line conditions at the substation including, voltage, current, active power, reactive power, power factor and average values for each Wind Power Plant and Reactive plant feeder
- Actual status of major substation equipment
- Clock time synchronized to an external source

  - Data collection and storage
  - Data shall be recorded from the Wind Turbines and Met Masts. Provision shall be made for additional sensory data from transformers, meters, noise monitoring stations, cameras, condition monitoring systems, safety and access control equipment as required.
  - Data recorded shall be both regular time series data (e.g. wind speed, power, temperature etc.) and event data (faults, warnings, errors, changes of state, operator initiated changes, etc.).
  - Time series data shall be recorded with an averaging period of 10 minutes. Mean, min, max and standard deviation are required for wind speed and Wind Turbine active power. Other time series data may be recorded as mean only.
  - Data sampling rates for time series data shall be independent of the Site communications network and depend only on the speed of communication with the Wind Turbine controller. Sampling rates shall be 0.5 Hz or higher for time series data at the Wind Turbines and Meteorological Stations.
  - Processed data shall be stored locally in a queue so that no data are lost if the Site communications network is temporarily unavailable. When the network is available, the queue shall be downloaded to the SCADA computer.
  - If any Wind Turbine is switched off, the data processing shall continue and communication with any other Wind Turbines shall not be interrupted.
  - Ten-minute averaged performance data and all event data shall be stored in an industry standard relational database. The data shall be time stamped. The database shall be capable of being searched with a range of data access query functions provided. Ideally these shall be implemented as SQL commands. It shall also be possible to store specific query functions for later use.
  - The returned data shall be capable of graphical or tabular presentation. It shall also be capable of being exported to external analysis programs in appropriate formats, e.g. CSV, Excel etc.
  - It shall also be possible to store at least 50,000 events on the system and to download data to third party software (e.g. Excel) for further analysis.
  - The Wind Power Plant SCADA system shall be equipped with full facilities to back up all critical operating data; all operational data from the Wind Turbines, Meteorological Stations, and other monitored signals; and all other non-regenerable data.

- Backups shall be written to standard media using an open, non-proprietary file format. The backup facilities shall allow all backups to be verified once they are written.

11.8 Control Requirements

11.8.1 The Wind Power Plant SCADA system shall include local and remote control of the individual Wind Turbines, groups of Wind Turbines and substation switchgear.

11.8.2 The Wind Power Plant SCADA system shall include the capability to apply a wind sector management program if necessary.

11.8.3 Remote control shall be capable from a remote computer connected to the Wind Power Plant SCADA system via the Internet or direct modem connection. System configuration shall allow for any number of user-defined groups of Wind Turbines. The following commands shall be included as a minimum:

- Reset Wind Turbine
- Stop Wind Turbine
- Start Wind Turbine
- Stop group of Wind Turbines
- Start group of Wind Turbines
- Selection of fixed voltage / reactive power / power factor mode
- Limit Wind Power Plant output to a configurable value

11.8.4 Remote control function shall be protected by appropriate passwords or hardware key (dongle) in the Wind Power Plant SCADA system.

11.8.5 Adequate provision shall be made for interlocks to prevent unsafe operation of the Wind Turbines while Site personnel are working on them and a switch shall be provided at the Wind Turbines to allow maintenance staff to disable remote access.

11.8.6 Any SCADA system commands shall be ignored if there is a crew at the Wind Turbine. Any commands issued locally at a Wind Turbine shall override the Wind Power Plant SCADA system if there is a crew present. If there is no crew present, commands from the Wind Power Plant SCADA system shall override the current Wind Turbine setting.

11.8.7 The Wind Power Plant SCADA system shall implement auto control of the Wind Turbines. This shall allow automatic implementation of any constraints on Wind Power Plant operation (e.g. network restrictions, noise restrictions, time of day restrictions).

11.8.8 The Wind Power Plant SCADA system shall provide remote access to the Wind Turbines to aid in the remote analysis and repair of Wind Turbine faults. The Wind Power Plant SCADA system shall be optimized to allow remote interrogation and resetting of as many errors as possible consistent with industry standards for safety and machine integrity.

11.9 Reporting

11.9.1 The user shall be able to view and interrogate the 10-minute data and events database and show the events for any unit for any time period. The more common selections shall be catered for in drop down menus such as:

- View Wind Turbine and Wind Power Plant event data with options to, select Wind Turbine or group of Wind Turbines, include events from grid station, meteorological stations and servers, select time range and list all events or filter on type of event
- Scroll through 10-minute data records for a selected Wind Turbine, meteorological station or grid station
- Compare time series data for up to 10 selected Wind Turbine signals
- Trend any selected signal from Wind Turbines, metering stations and meteorological masts

11.9.2 Summary analysis reports for daily/monthly/yearly or other defined time periods shall be produced to an agreed format. They shall be produced on demand by the system. They shall provide extensive analysis and viewing functions for statistical and event data. Reporting based on data that has been archived from the system is not required.

11.9.3 Power curves shall be created for any user-selectable date range and choice of binned or scatter data.

11.9.4 Meteorological data shall be able to be analyzed according to wind speeds, wind direction, turbulence, temperature, pressure, and other data from any installed sensors. This includes frequency distributions, and analysis of mean, maximum and minimum data. Wind speed and wind direction distributions shall be created over any user selectable date range. It shall be possible to generate them from any meteorological station.

11.9.5 The energy production for individual Wind Turbines, groups of Wind Turbines or the whole Wind Power Plant for any time period to date shall be available.

11.9.6 Additional information that shall be available shall include, but not be limited to:

- Faults on a per Wind Turbine and whole Wind Power Plant basis
- Availability reports
- A record of software updates downloaded to the main SCADA server(s) and other machines comprising the Wind Power Plant SCADA system
- Control system control variables and calculated points for:
- Nacelle yaw
- Rotor blade pitch
- Tower Cut in/Cut Out
- Operation mode

11.10 Support for Warranty Calculations

11.10.1 The Wind Power Plant SCADA system shall be capable of producing reports for evaluation of availability and performance as required for warranty and other agreements.

11.11 Remote Alerts

11.11.1 It shall be possible to configure the Wind Power Plant SCADA system to alert operations staff via mobile phone (SMS) or email if any part of the Wind Power Plant requires attention. There shall be a choice to configure this function to operate continuously for unmanned sites or only during certain times of day as required.

11.12 Time Base and Date Formats

11.12.1 A GPS satellite receiver shall be installed to provide time synchronization signals. This device shall provide time synchronization signals for the Wind Power Plant SCADA system main SCADA server(s). All other clocks shall automatically be synchronized to the central computer clock.

11.12.2 Time and date formats shall be chosen to eliminate confusion arising from different time zones, summer/winter changes and different country display formats.

11.12.3 All time stamps on time series data shall apply to the end of the averaging period.

11.12.4 All time stamps shall be stored as UTC, regardless of local time setting used.

12. WIND TURBINE EQUIPMENT

12.1 General

The Wind Turbines shall be fully described within Contractor's Specifications, including specific hub height, tip height and any specific packages offered as optional equipment.

12.1.1 The Wind Turbines shall meet the following minimum requirements:

- The Wind Turbines shall be three bladed, horizontal axis, upwind type
- The Wind Turbines shall be mounted on a tubular tower
- The Wind Turbines shall provide suitable marking and lighting (i.e. aviation related obstacle marking) in accordance with the Applicable Standards and Applicable Permits
- The Wind Turbines shall be identical and their components shall be fully interchangeable between different units
- The Wind Turbines shall be designed to operate and perform acceptably without manual intervention

12.1.2 The Wind Turbine shall be part of a well-developed product range.

12.1.3 The Wind Turbines shall be commercial units of the same model with substantial fault-free operational experience, such that the model meets "Qualified Status," at minimum, or "Proven Status," per the following definitions:

A turbine model achieves Proven Status when:

- The manufacturer is capable of performing all contractual and commercial obligations in North America.
- The manufacturer can demonstrate the ability to support warranty, O&M, and supply chain obligations in North America.
- The version of the turbine that will be supplied to North America carries a valid Design Statement of Compliance (SoC) to IEC 61400-1 standards issued by an accredited certification agency.
- The turbine model has at least 100 turbine-years of experience in the North American market, operating at 95% fleet turbine availability or greater.

A turbine model achieves Qualified Status when:

- The manufacturer is capable of performing all contractual and commercial obligations in North America.
- The manufacturer can demonstrate the ability to support warranty, O&M, and supply chain obligations in North America.
- The version of the turbine that will be supplied to North America *is in the process* of obtaining a Design SoC to IEC 61400-1 standards issued through an accredited certification agency.
- The turbine model is an evolutionary variant of turbines already considered Proven in North America. Examples include rotor diameter changes for new wind classes, cold weather packages, or other modifications sufficient to require a new IEC certification but not a fundamental re-design.

- The turbine model is considered Proven in its home market but is new to North America.
- The turbine model has been performing well in North America for some time but is still without sufficient track record to be designated as Proven.

12.2 Site Suitability

12.2.1 Contractor shall warrant that the Wind Turbine is fit for the purpose of generating electricity in line with Owner's requirements as set forth in the Agreement and this document, Contractors Specifications and within the range of climatic conditions expected at the project site and based upon the final site layout for the Wind Power Plant, therefore including, but not limited to, consideration of Wind Turbine spacing, obstructions (e.g. forestry) and site topography.

12.2.2 In the case a cold-weather package is required, the site-specific loads analysis must state that it explicitly considers the planned operating temperature range. Regardless of cold-weather package, turbines operating outside of the standard IEC temperature range must undergo loads analysis specific to site conditions.

12.2.3 Contractor shall provide a definitive statement confirming that the Wind Turbines are fit for purpose at the site in the final locations for a minimum of 20 years. Any operational modifications required to assure the Wind Turbines are fit for purpose shall be clearly stated in Contractor's Specification.

12.2.4 Contractor shall provide a summary of the applicable site conditions and the output of Contractor's assessment shall be provided with Contractor's Specification.

12.3 Certification and Standards

All Wind Turbine components shall be capable of withstanding all mechanical, aerodynamic and electrical induced loads during a 20-year operating life.

12.3.1 The Wind Turbine design shall be in compliance with the latest edition of IEC 61400-1 Ed. 3.0 Wind Turbines - Part 1: Design requirements.

12.3.2 Contractor shall provide a Wind Turbine with a valid Type Certificate for the climatic conditions expected at the Site. The Type Certificate shall be in accordance with latest edition of IEC 61400-22. In the absence of a Type Certificate, a Design Evaluation Conformity statement according to "-22" section 8.3 plus completion of associated testing is acceptable Associated testing shall include at minimum:

- Safety and Function testing per "-22", section 8.4.2
- Blade testing in accordance with "-22", section 8.4.5
- Power performance testing per "-22" section 8.4.3
- Loads measurement per "-22", section 8.4.4.
- Test reports for the above shall conform to the requirement of "-22" section 8.4.7

12.3.3 The Wind Turbines and Wind Turbine towers shall carry a current and valid Design Evaluation Conformity Statement from a recognized Certification Body or other accredited party acceptable to Owner.

12.3.4 The Certification shall be provided within Contractor's Specifications and shall state:

- Standards to which the design was certified against
- Climatic assumptions

- Cold weather package specifications if applicable
- Description of the scope of the assessment
- Description of the Wind Turbine and Wind Turbine tower design assessed

12.3.5 Contractor shall make the Certification reports available in electronic format.

12.3.6 Contractor shall provide additional documentary evidence of the suitability of the Wind Turbine for the Site if:

- Any of the equivalent climatic conditions at the Site are more onerous that the assumptions in the Design SoC
- Additional characteristics of the Site prevent the Design SoC serving as evidence of the suitability of the Wind Turbine and Wind Turbine tower
- There are deviations in the design of the Wind Turbine or Wind Turbine tower from that assessed in the Design SoC

12.4 Power Performance

12.4.1 An independently performed power curve measurement test of the Wind Turbine model shall be performed in accordance with the IEC 61400-12-1 Ed. 1.0 Wind Turbines - Part 12-1: Power performance measurements of electricity producing Wind Turbines. The report on such shall be provided within Contractor's Specifications.

12.5 Noise

12.5.1 The Wind Turbine shall not have a sound power level in excess of that defined within this document and as required in all Applicable Permits, including planning and environmental and local noise ordinance.

12.5.2 The Wind Turbine shall have had its acoustic noise emission assessed at the Wind Power Plant site according to IEC 61400-11 Ed. 3.0.

12.5.3 The Wind Turbine shall produce no audible tones under any normal operating conditions, when assessed at the Wind Power Plant site according to IEC 61400-11 Ed. 3.0. Acoustic measurements shall include instances of the turbine yawing during power production and yawing below cut-in wind speeds to assure tone prominence meets stated requirements for all operating and non-operating conditions.

12.5.4 Contractor shall specify the maximum warranted A-weighted (LwA) sound power level emissions for the Wind Turbine.

12.6 Electrical Characteristics

12.6.1 Contractor is responsible for ensuring the requirements as defined in IEC 61400-21 are met, including power quality issues.

12.6.2 This shall include carrying out all tests, and production of all documentation, simulations, test results and other information required.

12.6.3 The Agreement shall provide documentation of power quality measurements to IEC 61400-21 within Contractor's Specifications.

12.7 Visual Appearance

12.7.1 The visual appearance of the Wind Turbines shall be in accordance with Applicable Permits.

12.7.2 Unless otherwise instructed by Owner or required by Applicable Permits, the Wind Turbine color shall be of a dull light grey color or similar and all external visible components shall be of an identical color and finish, where not otherwise required.

12.8 Health and Safety

12.8.1 The Wind Turbine shall comply with all relevant health and safety regulations including OSHA standards and as detailed in the Applicable Permits.

12.8.2 The Wind Turbine shall be designed to include provisions that respect the health and safety of the general public, operators, maintainers, land owners and any other personnel who may have an interest in the Wind Power Plant throughout the Wind Turbine's lifetime. These provisions shall include for:

- Fire prevention and fire fighting
- Emergency stop
- Emergency evacuation
- Evacuation of injured personnel including from the nacelle and hub
- Rotating machinery guards, where required by applicable standards
- Electrical isolation of systems and components
- Mechanical protection against hazards
- Mechanical isolation of systems and components including, but not limited to the rotor lockout system
- Lightning protection
- Protection against electric shock and arc flash hazards
- Lighting of tower and nacelle for normal operation and maintenance
- Emergency lighting upon loss of external power
- Unauthorized access and climb prevention

12.8.3 Working at Height Features

- A fall arrest system shall be incorporated on the tower ladder, Lad-Safe or Owner approved equivalent.
- Secure attachment points and safety rails for lanyards shall be provided at all locations inside or outside the Wind Turbine where maintenance personnel may require access and Working at Height hazards apply as per all Applicable Standards.
- Appropriate markings and signs shall indicate hazards, attachment points, include brief instructions, load ratings and maintenance requirements and as required by Applicable Standards.

12.8.4 Confined Spaces

- If any part of the Wind Turbine can be classified as a confined space in accordance with Applicable Standards, appropriate safety and risk control measures shall be in implemented to conform to the relevant Applicable Standards..
- Safety measures shall include but not be limited to the implementation and use of relevant safety processes, procedures, personnel training, signage and equipment.

12.8.5 Rotating Equipment

- Robust guards shall be fitted around rotating machinery in line with Applicable Standards to prevent any part of an operator or their clothing coming into contact with moving parts. Signs warning of rotating machinery shall be clearly displayed.

12.9 Wind Turbine Protection

12.9.1 General

- The Wind Turbine shall have a safety and control system that conforms to all requirements of IEC 61400-1 Wind Turbines - Part 1: Design requirements.
- In addition to this Section further Wind Turbine earthing requirements are identified in Section 7.

12.9.2 Lightning Protection

- The Wind Turbine shall have sufficient lightning protection to protect the Wind Turbine components and its support structure, and shall meet the requirements of IEC 61400-24.
- Details of the lightning protection system shall be given within Contractor's Specifications.

12.9.3 Electrical Protection

- The electrical protection scheme shall disconnect faulted electrical plant within the Wind Turbine and be designed to adequately protect the electrical components of the Wind Turbine for the maximum design fault currents at the Site and any other electrical conditions passed through to the Wind Turbines from the utility system or created by the Wind Power Plant electrical system.

12.10 Markings and Lighting

12.10.1 External Wind Turbine marking and lighting, including but not limited to aviation related obstacle marking and lighting shall be in accordance with any requirements identified or implied by the Agreement and the relevant Permits.

12.10.2 Safety signs shall be displayed in the English language at suitable locations of the Wind Turbine.

12.10.3 Nameplates shall be fixed to the tower base and major components showing; manufacturer name, serial number, part number, manufacturing batch number.

12.10.4 Each Wind Turbine shall have a unique identification number, which shall be clearly and indelibly displayed inside and outside the lower tower access door.

12.11 Wind Turbine Systems and Components

12.11.1 Rotor and Blades

- The blades shall be fitted with an adequate lightning protection system with sufficient receptors and down conductors to protect the complete length of the blade in accordance with IEC 61400-24.

- Blade bearings shall be fitted with automatic lubrication and grease catchers to prevent egress of excess grease.

12.11.2 Nacelle

- The nacelle shall be designed to allow personnel safe and easy access to and from the tower ladder, and a safe working environment within the nacelle.

12.11.3 Gearbox

- Gearbox shall be certified to the IEC 61400-4 standard.
- Replacement gearboxes and components shall be made available by the turbine manufacturer for procurement through the design life of the gearbox.
- A failure modes and effects analysis shall be provided by the gearbox manufacturer to demonstrate that failure modes have been identified and that the design mitigates or eliminates the identified failure modes.
- A summary of the test plan, workshop testing, field testing, loads verification, robustness testing, design reviews, and reliability test results summary from the gearbox manufacturer which validate the long term drive train assembly reliability shall be provided by Contractor. These results should account for system assembly dynamics, grid events, non-torque loading, and other unique operational characteristics specific to the wind industry.
- The gearbox shall be designed to operate without major intervention requiring an offsite crane for a minimum of 20 years.
- All pressurized lubrication lines shall be filtered.
- Gearbox shall be fitted with an off-line oil filtration (3 µm or as approved by the lubricant supplier), in addition to the in-line filter, and a desiccating breather.
- Gearbox shall be fitted with a Gram and Juhl, turbine condition monitoring (TCM), or Owner approved equivalent, online and continuous vibration monitoring system capable of detecting all low and high speed faults. The data shall be property of Owner and integrated into the turbines' SCADA system and Owner's PI historian system. Accelerometers will be threaded into the gearbox housing using integral, threaded holes.
- A list of gearbox faults which are being monitored for and the associated alarm conditions and fault thresholds should be provided by Contractor to permit Owner auditing and continuous improvement.
- Kinematic data for each gearbox model supplied shall be provided by Contractor.
- A bill of material defining the type, make, model, and serial number (if available) of the bearings shall be provided for each gearbox. The BOM shall be provided in MS Excel format.
- The gearbox full load acceptance test report with evidence of run-in, water content in the oil < 500 ppm, and final oil cleanliness of 17/15/12 (or less), and a manufacturing non-conformance summary for each gearbox shall be provided by Contractor.
- The gearbox dimensional outline, lubrication, cooling and heating, and section drawings from the gearbox manufacturer shall be provided by Contractor. Third-party component manuals for cooling fans, lubrication pumps, etc. shall also be provided by Contractor.

- The gearbox specification, transportation, installation, operation, and maintenance manual from the gearbox manufacturer, in addition to the wind turbine installation and maintenance manual, shall be provided by Contractor.
- Routine and planned overhaul or major maintenance, including oil and filter changes, shall be identified in Contractor's maintenance schedule. The maintenance schedule shall be provided in MS Excel or MS Word format.
- The design may be subject to third-party expert review if required by Owner and Contractor's gearbox manufacturer shall co-operate with such reviews.
- Gearbox manufacturer storage, handling, and assembly requirements shall be followed and documented by Contractor whose associated quality assurance records can be made available to Owner upon request.
- Final fill oil to be added during turbine erection shall be tested and verified to be the correct lubricant, cleaner than 16/14/11, and water content <300 ppm before installation. Oil outside of these parameters shall be filtered and dried prior to installation.

12.11.4 Main bearing

- The main bearing(s) shall be designed to operate without major intervention requiring a crane for a minimum of 20 years.
- Main bearing(s) manufacturer storage, handling, and assembly requirements shall be followed and documented by Contractor whose associated quality assurance records can be made available to Owner upon request.
- The main bearing(s) shall be fitted with an automatic centralized lubrication system. Lubrication operation shall be able to be initiated by both SCADA and an integral meter (time).
- Main bearing(s) shall be fitted with borescope access plugs to permit in-situ visual inspection.
- Main bearing(s) shall be fitted with online continuous temperature monitoring.
- The main bearing shall be fitted with a Gram & Juhl turbine condition monitoring (TCM), or equivalent, online and continuous vibration monitoring system capable of detecting all low and high speed faults. The data shall be property of Owner and integrated into the turbines' SCADA system and Owner's PI historian system. Accelerometers will be threaded into the bearing housing using integral, threaded holes.
- A list of the main bearing(s) and housing make, model, and serial number shall be provided.
- The main bearing shaft assembly drawing, lubrication, and component drawings and manuals shall be provided.
- Grease analysis sampling procedure and test limits (such as ICP iron, wear debris concentration, etc.) shall be provided by Contractor.
- Test plan and test result summary should be provided.
- Test results and/or design calculation summary which verify that a 20-year operational life without major intervention is achievable given certain design limitations (namely, a low axial/radial load ratio) in three point-mounted drive train configurations with a spherical roller main bearing.

12.11.5 Generator

- The generator shall be suitable for operation in the full range of climatic conditions which it is expected to experience.
- The generator shall be designed to operate without major intervention requiring a crane for at least 20 years.
- The generator shall be supplied from a reputable manufacturer and be within a standard product range. The passage of lightning through the generator shall be protected against in accordance with IEC 61400-24.
- The generator bearings shall be fitted with automatic centralized lubrication. Lubrication operation shall be capable of initiation by both SCADA and an integral meter (time).
- The generator bearings shall be fitted with a Gram & Juhl turbine condition monitoring (TCM), or equivalent, online and continuous vibration monitoring system capable of detecting all low and high speed faults. The data shall be property of Owner and integrated into the turbines' SCADA system and Owner's PI historian system. Accelerometers will be threaded into the bearing housing using integral, threaded holes.
- The generator cooling system, if air-cooled, shall utilize a closed loop heat rejection system to ensure airborne particulate are not entrained in the generator.
- There shall be a 10 degrees C temperature margin between the generator insulation class temperature rating and the maximum measured generator "hot spot" temperature under all operating and climatic conditions to ensure that any degradation of the generator insulation over 20 years of operation does not lead to failure. A minimum of class F insulation shall be required in any instance.

12.11.6 Hydraulic power unit

- Third-party supplier installation, O&M manuals, process and instrumentation diagram shall be provided.
- On-line filter alarms and temperature monitoring shall be provided.
- Sump shall be equipped with a desiccating breather.
- Oil analysis sampling procedure and limits shall be supplied.
- Hydraulic oil to be filled during turbine erection shall be tested and verified to be the correct lubricant, cleaner than 15/13/10, and water content <100 ppm before installation. Oil outside of these parameters shall be filtered and dried prior to installation.

12.11.7 Yaw System

- The yaw bearing shall be fitted with automatic centralized lubrication. Lubrication operation shall be capable of initiation through an integral meter (time).
- The yaw system of each wind turbine shall be programed and normalized to the same 0-degree (true north) reference.

12.11.8 Service Crane

- The nacelle shall be fitted with a service crane capable of lifting tools and consumables required for scheduled maintenance directly into the nacelle from the ground level.
- The crane shall comply with relevant Permits and Applicable Standards.
- Contractor shall provide details of the service crane, including largest component able to lifted, as part of Contractor's Specifications.

12.11.9 Wind Turbine Tower

- The tower shall be of tubular steel construction.
- The tower shall be fitted with an internal ladder, Lad-Saf (or Owner approved equivalent) fall arrest systems, rest platforms and lighting (including safety lighting which shall work during grid and internal power failure).
- The tower paint system shall at minimum conform to a "C3" environmental protection classification for the tower interior and "C4" for the tower exterior according to ISO 12944. The tower exterior paint color shall be approved by Owner prior to tower fabrication.
- The tower access door shall be of sufficient size to allow removal of the largest sub-assemblies of major components housed within the tower enclosure.
- The tower access door shall be fitted with a mechanism to lock the access door in an open position and include features to ensure safe personnel egress should the tower door be inadvertently locked from the outside.

12.11.10 Cabling

- All cables shall be mechanically protected against effects of bending, abrasions, impact, abnormal heating, rubbing, movement and vibration and supported at suitable locations.
- Terminations and joints shall be installed in a manner consistent with this document

12.11.11 Service Ladder

- The service ladder in the tower shall comply with the relevant Applicable Standards including where applicable, requirements of the current IBC, State and Local standards.
- The clearance between the ladder and tower wall shall comply with the OSHA CFR 1910.27 Standard.
- All turbine ladders shall be equipped with a deflector plate at tower section junctions.
- Turbines not fitted with a Service Lift shall be fitted with an Ibex Power Climber, or Owner approved equivalent installed on the climbing ladder to assist climbers. Owner shall pre-approve the climb assist make and model.

12.11.12 Transformer

- Contractor shall provide a single, suitably rated power transformer for each Wind Turbine to step up from the generation voltage to the Collector System voltage for connection to the Wind Power Plant Electrical System.

12.11.13 Remote control and monitoring capabilities of the Wind Turbines shall be sufficient to fulfill the requirements of:

- Authorized and unauthorized access monitoring
- Applicable Standards and Applicable Permits including but not limited to the Connection Agreement between Owner and the TSP

12.11.14 Low Voltage Supplies

- All low voltage equipment installations shall comply with Applicable Standards and the requirements of this document.

12.11.15 Medium-Voltage Switchgear

- All medium voltage equipment installations shall comply with Applicable Standards and the requirements of this document.

12.11.16 Control System and Converter

- Control System and converter bill of material defining the type, make, model, and serial number.
- One hand held terminal or laptop per 10 turbines for tower troubleshooting, control and software downloading. Software updates per the period of warranty coverage.
- High speed wind extended cut-out options

12.12 Foundation Loads

12.12.1 Contractor shall supply Owner, and as required the foundation designer and certifier, with foundation loads, performance criteria and interface details prepared by the Turbine Manufacturer in accordance with the relevant certification.

12.12.2 The foundation loads shall be compatible with the relevant Certification and Site Suitability Assessment.

12.12.3 Foundation loads are to be calculated in accordance with the all Applicable Standards including, but not limited to:

- International Building Code and applicable state and local amendments
- ASCE 7 (current edition) Minimum Design Loads for Buildings and other structures
- IEC 61400-1 Wind Turbines - Part 1: Design requirements
- DNV GL Standard DNV GL-ST-0126: Support Structures for Wind Turbines, Edition April 2016 (supersedes DNV/Riso Guidelines for Design of Wind Turbines, Second Edition)

12.12.4 Fatigue loads shall be provided in a Markov Matrix format for the specified Design Life.

12.13 Options and Other Features

12.13.1 Contractor shall advise of any special packages that may be supplied as 'Options', including but not limited to:

- Advance grid control
- Special SCADA features
- Vibration and Condition monitoring
- Cold Weather Package
- Meteorological Instrumentation

12.13.2 Should any options be selected by Owner, they shall be included in the definition of the Wind Turbine.

13. METEOROLOGICAL MASTS

13.1 General

13.1.1 Met Mast structures shall be designed and installed to Revision G of the ANSI/TIA 222 standard.

13.1.2 A geotechnical investigation shall be performed at the final Met Mast locations prior to the design phase.

13.1.3 Design and construction shall take into account and not interfere with the requirements for construction access for long loads, heavy plant and cranes for the construction of the entire Wind Power Plant as well as ongoing access for operation and maintenance of the Wind Power Plant.

13.1.4 All meteorological stations shall include a free-standing lattice mast of height such that wind speed measurements may be made at the hub height of the Wind Turbines.

13.1.5 The Met Mast(s) shall be suitable for support of the specified instruments, data logging equipment, communications equipment, any autonomous power supply systems and any marking or aviation lighting as required by relevant Permits. Details regarding the Met Mast instrumentation and mounting hardware shall be reviewed by the manufacturer and incorporated into the design with a minimum of 3kW service for all equipment, plus auxiliary 120VAC provisions and a 20A/120VAC GFCI outlet for service work.

13.1.6 When installed, safe access shall be possible for maintenance to the mast itself and to all instrumentation.

13.1.7 Each Met Mast shall be safely climbable and shall support two persons at any one time. Each Met Mast shall include a suitable wire or rail free fall-arrest system in accordance with ANSI A14.3 Safety Requirements for Fixed Ladders.

13.1.8 The design of the mast(s), while suitable for use in the Site climate, shall be so as to minimize interference to the air flow at the anemometers and wind vanes. The mast arrangements shall comply with the relevant IEC and MEASNET standards, including:

- IEC 61400-12-1 Ed. 1.0 Wind Turbines - Part 12-1: Power performance measurements of electricity producing Wind Turbines.

13.1.9 Contractor shall be responsible for ensuring and demonstrating that the meteorological stations are fit for purpose and that the design and construction are in accordance with all Applicable Standards.

13.2 Power Performance Testing Met Masts

The Permanent and Temporary Met Masts for the purpose of power performance testing and site calibration respectively shall be designed and constructed in accordance with the requirements of:

- The power performance warranty of the Wind Turbines
- IEC 61400-12-1 Ed. 1.0 Wind Turbines - Part 12-1: Power performance measurements of electricity producing Wind Turbines, and
- MEASNET standards.

13.3 Permanent Met Masts

13.3.1 The number and locations of Permanent Met Masts shall be such that at all times there shall be at least one (1) Met Mast within free-stream, non-wake-affected wind, effectively covering wind speed and direction measurement at hub height for all wind directions (360°).

13.3.2 The Permanent Met Masts shall be at least two (2) rotor diameters from the nearest Wind Turbine.

13.3.3 Met Masts shall be sited in accordance with IEC 61400-12-1.

13.3.4 Annex A of the standard IEC 61400-12-1, shall be used to determine non-wake-affected sectors for each Permanent Met Mast.

13.3.5 Security and Fencing

- The Permanent Met Mast installations shall include suitable security/anti-climb fencing to prevent unauthorized access to the Met Mast.
- The fencing shall be 6’ tall chain link. The compound size shall be 40’x40’ with 3” of gravel with weed barrier and include a lockable gate.

13.3.6 Lighting and Marking

- The Met Masts shall be marked in compliance with FAA recommendations found in Advisory Circular 70/7460-1L.
- Temporary or guyed Met Masts may be required to have marker balls installed. The marker balls shall be placed such that they do not interfere with the air flow at the anemometers and wind vanes.

13.3.7 Power Supply

- The Permanent Met Masts shall be permanently connected to a 120VAC power supply.
- Power supply is to be firm against interruption by all environmental and electrical grid conditions for a period of twenty-four (24) hours.

13.3.8 SCADA Connection and Monitoring

- The instrumentation installed shall be connected to the SCADA system such that it can record, with an averaging period of the more stringent requirement of ten (10) minutes or the data sampling rate requirements below:
  - Mean, standard deviation and three-second gust wind speed from each anemometer
  - Mean and standard deviation of direction from each wind vane
  - Mean temperature from each temperature sensor
  - Mean barometric pressure
- Data sampling and sampling rates shall be sufficient to meet, where applicable, the requirements of:
  - The Network Service Provider
  - Warranty and testing arrangements

- Calibrations shall be undertaken prior to installation in accordance with in IEC 61400-12-1 Ed 1.0 and provided to Owner

13.3.9 Anemometers

- All anemometers shall be high quality calibrated, Class 1, cup anemometers meeting all the requirements specified by IEC 61400-12-1
- All calibrations shall be carried out in a MEASNET accredited wind tunnel.
- All mounting of anemometers shall comply with IEC 61400-12-1 recommendations for minimization of mast and boom interference to air flow.
- The primary anemometer shall be placed at hub height as recommended in Section G.2 of IEC 61400-12-1.
- A secondary (control) anemometer shall be installed as recommended in Section G.5 of IEC 61400-12-1.
- A tertiary anemometer shall be installed at the lowest blade tip height.
- Additional anemometers maybe required for testing purposes.

13.3.10 Wind Vanes and Direction Measurement

- All direction measurements shall be made by high quality wind vanes meeting all requirements specified by in IEC 61400-12-1.
- All mounting of wind vanes shall comply with IEC 61400-12-1 recommendations for minimization of mast and boom interference to air flow.
- The primary wind vane shall be installed as recommended in IEC 61400-12-1.
- A secondary wind vane shall be installed as recommended in IEC 61400-12-1.

13.3.11 Other climatic measurement sensors shall be installed to make accurate measurements of:

- Air temperature
- Barometric pressure
- Humidity
- Rainfall

13.3.12 Sensor specifications and mounting arrangements shall meet requirements of IEC 61400-12 -1 Ed 1.0.

13.4 Temporary Met Masts

13.4.1 Temporary Met Masts shall be installed in number and at locations as required by IEC 61400-12-1

13.4.2 Anemometers

- All anemometers shall be high quality calibrated, Class 1, cup anemometers meeting all the requirements specified by IEC 61400-12-1.
- All calibrations shall be carried out in a MEASNET accredited wind tunnel.
- All mounting of anemometers shall comply with IEC 61400-12-1 recommendations for minimization of mast and boom interference to air flow.
- The primary anemometer shall be placed at hub height as recommended in Section G.2 of IEC 61400-12-1.

- A secondary (control) anemometer shall be installed as recommended in Section G.5 of IEC 61400-12-1.

13.4.3 Wind Vanes and Direction Measurement

- All direction measurements shall be made by high quality wind vanes meeting all requirements specified by in IEC 61400-12-1.
- All mounting of wind vanes shall comply with IEC 61400-12-1 recommendations for minimization of mast and boom interference to air flow.
- The primary wind vane shall be installed underneath the secondary (control) anemometer as recommended in IEC 61400-12-1

13.5 Foundations

13.5.1 The foundation shall be capable of accepting all loads to be imposed upon it during its temporary installation period or the Design Life, where applicable. Each foundation shall be designed and installed to Revision G of the ANSI/TIA 222 standard.

13.5.2 Particular care shall be taken with respect to the height of the ground on which Temporary Met Masts are installed.

- Ideally Temporary Masts shall be installed on the Wind Turbine foundation, or if not, another suitable foundation at the Turbine location shall be installed, such that all requirements of IEC 61400-12-1 are adhered to. Meaning, it shall be ensured that the relationship between the Temporary Masts sensors and the final installed height of the Wind Turbine is in line with the requirements of the Power Performance measurements standard.
- Any excavation and/or build up at the site that shall be required for the final Wind Turbine foundation should be taken into account to ensure the Temporary Met Mast measurements are applicable for the final installed Test Wind Turbine.

13.6 Instrument Calibrations

13.6.1 MEASNET calibrations shall be undertaken prior to the installation of instrumentation.

13.7 Enclosures and Cabling

13.7.1 Other than the sensors, all local Met Mast system equipment shall be installed at or above the base of the Met Mast in an enclosure that meets or exceeds an IP 66 rating.

13.7.2 All cables between enclosures on the equipment rack shall be in protective conduit.

13.7.3 All cables running up the Met Mast shall be armored, or travel within flexible conduit. The protected cables shall run into a junction box of minimum IP 66 rating for all seals and plugs.

13.7.4 The location of the junction box shall not affect the measurements of the Met Mast sensors.

13.7.5 Sensor cable tails shall have suitable plugs at each end, and shall pass within the booms and risers as recommended in IEC61400-12-1 Ed 1.0.

13.8 Grounding and Lightning Protection

13.8.1 The Met Masts shall be grounded and protected from lightning strikes in accordance with Revision G of the ANSI/TIA 222 standard.

13.8.2 All instrumentation on the Temporary and Permanent Met Masts shall be protected from lightning and grounded in accordance with industry best practice.

13.8.3 Where the instrumentation on a Met Mast is connected to an LV supply from a Wind Turbine or from another fixed source, the connection shall be equipped with overvoltage protection designed to limit the effects of a lightning strike to the Met Mast on the LV supply to which it is connected.

13.8.4 Lightning protection shall be installed in accordance with the recommendations of IEC 61400-12-1.

13.8.5 A separate, multi-stranded copper cable shall connect the mast top lightning finial to the buried grounding system. The tower structure itself can be used as a conductor.

13.8.6 All copper connections shall be used to join the lightning protection components.

13.8.7 The final placement of the mast top lightning finial shall not interfere with the instrumentation, operation and correct functioning of the instrumentation in the dominant wind directions sectors.

13.9 Uninterruptible Power Supply

13.9.1 Meteorological Stations shall have local UPS or equivalent supply.

13.10 Development Met Masts Decommissioning

13.10.1 All Development Met Masts at the Site shall be decommissioned by Contractor in line with directions by Owner.

13.10.2 No Development Masts shall be decommissioned without Owner’s consent, which shall follow satisfactory correlation of site measurements between the Development Masts and the new Permanent Met Masts. Such data correlation shall occur prior to energization of any Wind Turbines at the Site.

14. ON SITE BUILDINGS

14.1 General

14.2 Temporary Construction Compound

14.2.1 Contractor shall be responsible for the design, construction, security, operation, maintenance, dismantling, removal and reclamation of the construction compound or compounds.

14.2.2 The construction compound shall house the temporary site offices, health and safety facilities, storage/laydown area and all office, toilet and washing accommodation required to execute the Project. A construction trailer, suitable for Owner's site management, environmental compliance, and safety personnel, shall be provided for Owner for the duration of the Project construction.

14.2.3 Toilets shall be of a type to ensure that all discharges are contained and removed from Site.

14.2.4 24-hour security for the Project and temporary construction compound shall also be provided by Contractor.

14.3 Permanent Buildings

14.3.1 All site buildings shall be suitable for the Site and Climatic Conditions (including applicable reactive soil movements), of a high standard and permanent in nature to achieve the required Design Life.

14.3.2 Buildings shall be designed in full compliance with the Applicable Standards, including the building code regulations in force within the local jurisdiction.

14.3.3 Contractor shall provide all necessary auxiliary supplies, including heating, internal and external lighting, water supply and similar for the site buildings. Contractor shall be responsible for the connection of the permanent buildings to local utilities infrastructure.

14.3.4 The auxiliary power supply shall be derived from an auxiliary transformer or transformers located in or adjacent to the Control Building and/or Substation. Critical Auxiliary power supply shall not be interrupted by the loss of connection to the POI.

14.3.5 Exit Signage and Emergency escape lighting shall be provided in accordance with the local building code regulations.

14.3.6 The final design(s) of all buildings is to be approved by Owner.

14.4 MV Substation Building

14.4.1 If not part of a combined MV Substation / Control Building the building shall be sized to provide the MV Switchroom.

14.5 Control Building

14.5.1 The Control Building shall be sized to provide the following facilities:

- Housing of SCADA equipment;

- General office area/Control room;
- Any additional control room/facility requirements of the TSP.

14.5.2 The power shall be supplied from the MV Switchroom's LV power supply.

14.5.3 The location and minimum accommodation and size requirements of the Control Building shall meet the requirements of all applicable planning Permits and all other Applicable Permits.

14.6 Operations and Maintenance Building

14.6.1 The O&M building and surrounding area shall also incorporate sufficient road infrastructure, parking lot and outdoor facilities suitable for the operation and maintenance of the Wind Power Plant and the operational staff requirements during its Design Life during all anticipated weather conditions.

14.6.2 The O&M building shall consist of the minimum indoor and outdoor storage and working areas corresponding to the Wind Turbine Supplier and/or Maintenance Provider's requirements, in addition to office and meeting space for Owner's staff, bathroom and kitchen facilities as well as network and SCADA control facilities to support wind power plant operations. At a minimum, the building should be 10,000 sq. ft. including the warehouse area (approximately 65 sq. ft. per turbine and a minimum of 7,000 sq. ft.) and the office space (approximately 3,000 sq. ft. including 2nd story/mezzanine office space) minimum. The building shall be of steel construction, site specific design, and shall be at least 20 ft. high with a roof having at least a 5 degrees slope. Building and surrounding plot must be elevated by one foot above the surrounding ground level.

14.6.3 The indoor storage area shall be smooth hardened concrete, while the outdoor storage area shall be covered with compacted gravel.

14.6.4 The O&M Building shall include at a minimum:

- One male restroom and one female restroom
- Heating/air conditioning, fire containment, etc.
- Locker areas including lockers and benches
- A storage room for office supplies and consumables
- A utility room
- A workshop area
- A kitchen which includes refrigerator, oven, dishwasher, microwave and cabinets.
- A conference room with built in projector, screen and seating
- Card reader access to O&M building, warehouse and Server room.
- Area for a Work Control Center that is capable of being qualified CIP compliant

14.6.5 The office area should be able to accommodate working stations for four technicians as well as the site manager in a separate office of about 250 sq. ft., and a project manager office of 150 sq. ft. The server room shall be approximately 240 sq. ft. and climate controlled for temperature and humidity, with a separate air-conditioning system.

14.6.6 The workshop shall be shall be equipped with 480V weld receptacles, 120V outlets, equipment hoist.

14.6.7 The power shall be supplied from the MV Switchroom's LV power supply. Contractor shall provide a backup generator (i.e. 30 kW gas generator, maximum load current at 240 V, 125 A) for critical functions of the facility, such as the servers and emergency lighting. In

a power outage, a dual 200 Amp/Split 400 Amp automatic transfer switch shall automatically transfer power to the backup generator.

14.6.8 Contractor shall specify and supply suitable waste water disposal via on-site means or connection to a public sanitary sewer system, in accordance with codes and regulations in place in the local jurisdiction.

14.6.9 The O&M building and yard shall have a 8 foot high with 3 barbed wire lines fenced perimeter. Access shall be through a sliding gate, of a width large enough to provide easy ingress to the yard for a full size delivery truck.

14.6.10 A parking area shall be provided with sufficient space to accommodate 2 vehicles per 10 turbines with a minimum of 20, including parking for Contractor and Owner, and handicap parking spaces to comply with applicable laws and regulations. The parking area shall be paved with either Portland cement concrete or asphaltic concrete in accordance with local standards.

14.6.11 Structural design for the building shall be conducted in accordance with building code standard regulations for the local jurisdiction. The structural design shall utilize the parameters obtained from the Geotechnical Investigation Report (Section 3).

14.7 Security System

Contractor shall provide a security system that meets the following requirements

- Fiber Sensys perimeter fence protection - single zone around the entire perimeter all fences.
- Bosch Intrusion Alarm system - Bosch Panel, Bosch Keypad, Bosch output relays and position switches for all gates and building doors.
- Access Control on all personnel gates, vehicle gates and building entry doors, arm/disarm reader.
- Vicon CCTV System, consisting of eight exterior perimeter PTZ cameras and one camera at the control house entry door.
- Provision of the required low voltage power supplies for the systems listed above.
- Program and commission this system into Owner Security System with an Owner representative.
- All wiring shall be installed in raceways provided by Contractor.
- Contractor will provide the wire from the control house to the gates, cameras and security fence.

15. INSTALLATION, COMMISSIONING, AND PERFORMANCE TESTING

15.1 General

15.1.1 Contractor shall provide all necessary labor, equipment and tools for erection, installation, commissioning, and testing activities, and shall be entirely responsible for efficient and correct procedures and operations associated with transportation of all components associated with the Wind Power Plant.

15.1.2 Contractor shall adhere to the requirements of this document and the installation, commissioning, and testing requirements set forth in the specifications for the item of work as obtained from the item's original manufacturer.

15.1.3 Contractor will maintain comprehensive records of the installation, commissioning, and testing work and provide Owner with a copy of these records and the as-built drawings at the completion of the work.

15.1.4 The tests on the Work are categorized as follows:

- Factory acceptance tests
- Equipment receiving and inspection checks
- Mechanical completion
- Commissioning tests
- Performance tests for the purpose of achieving Project substantial completion
- Performance tests for the purpose of confirming performance levels during initial operation (such as power performance test)

15.2 Installation Records

15.2.1 The installation records shall include as a minimum:

- Final location of each structure
- Serial numbers of equipment in each structure
- Electrical test records
- Bolt tightening records or certificates (where critical)
- Foundation excavation records
- Concrete and steel records
- Records of remedial works required to foundation excavations
- Quality records throughout the foundation construction
- Photographs of the works at relevant hold points
- Wind Turbine erection records

15.3 Commissioning activities

15.3.1 Contractor shall carry out all testing and commissioning activities, which shall be monitored by Owner.

15.3.2 Contractor shall draw up a general commissioning procedure, which shall cover all activities from mechanical completion of the facilities to Project substantial completion, including all commissioning tests and acceptance tests.

15.3.3 The testing and commissioning phase shall be planned as part of the overall project planning.

15.3.4 Daily and weekly meetings shall be held during the testing and commissioning period to coordinate activities.

15.3.5 Contractor shall be responsible for liaison with third parties, including the grid interconnection provider, to ensure the efficient and timely commissioning of the Work, and provision of all test results and data required by the grid interconnection provider.

15.4 Owner's right to witness tests

Owner reserves the right to attend and witness all tests in relation to the Work. Owner shall be offered an invitation three weeks prior to all testing for right to attend.

15.5 Factory Acceptance Tests

15.5.1 Contractor is responsible for the provision of FAT documentation for all components, including any components manufactured by a third party.

15.5.2 FATs shall be performed in accordance with the relevant manufacturer's established procedures, its approved quality assurance scheme and as identified in Contractors quality plan.

15.6 Commissioning Tests, General

15.6.1 Contractor shall demonstrate by suitable tests that the BOP and Wind Turbines will operate satisfactorily and safely.

15.6.2 Commissioning tests shall be based on Contractor's standard commissioning procedures and shall include, but not be limited to, the tests included in this Section.

15.6.3 No tests shall threaten the safety of the Project or personnel. Contractor will report any such test to Owner should this be the case, along with details on measures to be implemented to mitigate any such risk.

15.6.4 Following satisfactory completion of each commissioning test Contractor will issue a certificate to that effect, supported by Contractor's test report.

15.6.5 Owner may reject the commissioning certificate, providing written reasons for this rejection within 5 business days of submission of the commissioning certificate.

15.7 Commissioning Tests, Wind Turbines

15.7.1 Commissioning of individual Wind Turbines is completed upon issue of turbine completion certificates and the punchlist, demonstrating the Wind Turbines can be operated satisfactorily and safely.

15.7.2 Commissioning tests for each Wind Turbine will follow the technical specifications provided by the turbine supplier in accordance with industry practices and will include, at a minimum, a run test of 168 hours error free duration with operational data recorded by the SCADA.

15.8 Commissioning Tests, Wind Turbine Foundations

Commissioning tests shall include but not be limited to the following:

15.8.1 Certificate from a qualified geotechnical engineer confirming conditions in the base of the excavation were in-line with expectations prior to pouring the foundation.

15.8.2 Third-party Registered Professional Engineer's Report (or certificate) confirming the suitability of the WTG foundation(s) design.

15.8.3 Pre-pour inspection approval from the Foundation Design Engineer.

15.8.4 Concrete production tested in accordance with ACI 301 Specification and supply of concrete and ACI 318, ASTM C172, ASTM C31, ASTM C39, ASTM C172 and ASTM C231:

- Slump tests
- Four (4) concrete test cylinders to be taken every batch, for compressive strength testing at 7 days and 28 days as follows:
  - One (1) specimen tested at 7 days cure
  - Two (2) specimens tested at 28 days cure
  - One (1) specimen to be kept as a permanent record and/or for additional testing
- Drying shrinkage shall be tested at each foundation on the basis of three (3) specimens for each foundation

15.8.5 Grout production tests (for WTG foundation-to-tower base flange connection and/or rock anchors) in accordance with ASTM C579, including:

- A minimum of three (3) specimens (1 set) to be taken for each turbine foundation site for compressive strength testing as follows:
  - One (1) specimen tested from each set at 3-7 days cure
  - Two (2) specimens tested from each set at 28 days cure
- Specimens shall be taken at commencement, during and near completion of grouting.
- If grout production is not continuous then additional sample sets and testing shall be required.

15.8.6 Testing of concrete and grout samples shall be carried out by an accredited laboratory

15.9 Commissioning Tests, Substation and Electrical Works

Commissioning tests related to the Project electrical systems will include the following, as applicable, as a minimum:

15.9.1 Check mechanical state and earth connections.

15.9.2 Check satisfactory equipment labelling and warning signs.

15.9.3 Check substation tap selector switch in correct position.

15.9.4 Ratio and vector group checks on all substation tap settings (unless already checked in the FAT).

15.9.5 Check oil levels.

15.9.6 Winding resistance measurement on highest, lowest and nominal tap settings.

15.9.7 Insulation resistance between all windings, and each winding to earth.

15.9.8 Insulation resistance tests.

15.9.9 Oil sample tests prior to HV applied tests and energization, including breakdown strength, moisture content, and dissolved-gas content.

15.9.10 Check all earth connections.

15.9.11 Check all control, alarms, fans and pumps for correct operation.

15.9.12 Routine tests and dielectric withstand tests prior to energization.

15.9.13 Visual check for damage to insulation, and satisfactory identification of cores.

15.9.14 Perform AC/DC voltage withstand tests ("pressure test") or otherwise as recommended by cable manufacturer.

15.9.15 Test all cables during and after installation in accordance with the manufacturer's recommendations.

15.9.16 Perform functional test (trip/close) of switchgear, including remote operation and indications if applicable.

15.9.17 Perform voltage withstand tests ("pressure test") (to earth, between phases, and across open switch contacts).

15.9.18 Perform conductivity tests across switch contacts (including earth switches) and across busbar joints (if applicable)

15.9.19 Tests on the Wind Power Plant earthing system shall be of sufficient type and number as necessary to fully verify the safety of the Site and to justify any assumptions made in respect of the Wind Power Plant earthing system.

15.9.20 Contractor will measure resistance to earth of each Wind Turbine earthing system (isolated from balance of earth system). The results are required to satisfy statutory requirements and requirements of Wind Turbine manufacturer.

15.9.21 After the installation of all joints and terminations and before energization of the circuit, Contractor shall conduct an insulation resistance (IR) test between each phase and earth/neutral, between the cable screen and earth, and between phases.

15.9.22 Commissioning tests shall be undertaken to confirm compliance with the requirements of the network service provider and grid interconnection agreements.

15.10 Commissioning Tests, Communications Network and SCADA System

Commissioning tests shall include the following as a minimum:

15.10.1 Attenuation measurements on all optical fibers.

15.10.2 Redundant loops tested and operational on all optical fiber loops.

15.10.3 Contractor's standard commissioning tests for the SCADA System.

15.10.4 Tests to demonstrate that the system is able to send and receive all the data required by the grid interconnection provider.

15.10.5 Commissioning tests shall also demonstrate that the system is able to record:

- Ten-minute average values for wind speed, direction, and power operational status from all Wind Turbines
- Occurrence and correction of Wind Turbine events
- Ten-minute average values of power, reactive power, frequency, and power factor from the grid monitoring station(s)

15.11 Performance tests for achieving substantial completion

Performance tests, including a 72-hour Project-wide performance run test, will demonstrate to Owner that the Work operate satisfactorily and safely, comply with the requirements of this document and are suitable for operational handover and for the purpose of achieving Project substantial completion.

15.11.1 If the 72-hour Project-wide performance run test is interrupted due to a fault of Contractor supplied equipment, the 72-hour performance run test shall be restarted.

15.11.2 Contractor shall be responsible for liaising with third parties, including the network service provider, to ensure the efficient and timely acceptance testing of the Work.

15.11.3 All performance data, faults, errors, trips etc. that occur during performance tests shall be recorded by the SCADA until such time that the test has been successfully completed.

15.11.4 If any significant defects occur during the course of any performance test, they shall be remedied immediately by Contractor and the performance test for the affected item shall start again.

15.11.5 Contractor shall provide Owner with the appropriate documentation for the test period in order to verify the tests have taken place and were successfully completed.

15.12 Performance test during initial operations

15.12.1 Contractor will include power performance testing of the Wind Turbines for compliance with the Wind Turbine’s guaranteed power curve.

16. APPROVED SUPPLIERS

Below is a list of preferred and approved equipment suppliers and subcontractors for the Work. Should Contractor's proposal include equipment suppliers and subcontractors which deviate from the parties below, Contractor will request approval for the use of such parties from Owner. Owner may request information related to the equipment suppliers experience in the industry, technical specifications of equipment or materials proposed, CVs, and/or other similar background and informational documentation.

16.1 Approved major equipment vendors

16.1.1 Wind Turbine Generators

- General Electric
- Siemens
- Vestas

16.1.2 Collector System Cable

- Southwire
- Prysmian Power Cables and Systems
- General Cable
- Okonite

16.1.3 Substation Transformers

- Pauwels (Winnipeg, Manitoba, Canada shop)
- Smit (The Netherlands shop)
- ABB (St Louis, MO shop)
- Fortune Electric
- Siemens (Mexico shop)
- HICO
- Hyundai (Montgomery, AL shop)
- Delta Star
- Waukesha Electric

16.1.4 Capacitors

- Cooper Power Systems
- General Electric

16.1.5 Protective Relays

- Schweitzer Engineering Laboratories (SEL)

16.1.6 GSU Padmount Transformers

- ABB
- CG Power Systems USA
- General Electric
- Cooper Power Systems
- Siemens

16.1.7 High Voltage Circuit Breakers

- Siemens
- ABB
- Mitsubishi
- Alstom

16.1.8 Instrument Transformers

- ABB
- Trench Ltd
- Alstom

16.1.9 Ground Reference Transformers

- ABB
- Cooper
- GE
- Virginia Transformer
- Pacific Crest Transformers

16.1.10 Transmission Tubular Steel Towers

- Valmont
- Sabre
- Trinity Meyer
- Dis-Tran

16.1.11 Substation Remote Terminal Unit

- Eaton Cooper Power System

16.1.12 Substation Human/Machine Interface

- Schneider Electric

16.1.13 Substation Ethernet Switches and Routers

- RuggedCom

16.1.14 SCADA Input/Output Devices

- Eaton Cooper Power Systems

16.2 Approved subcontractors

16.2.1 Survey and Civil Engineering

- Pioneer Surveying and Engineering, Inc.
- Tenneson Engineering Corp.
- Encompass Energy Services
- David Evans and Associates
- Pacific Community Design
- Westwood Professional Services, Inc.

16.2.2 Geotechnical Engineering

- Barr Engineering
- Renewable Resource Consultants, LLC
- GeoEngineers
- GN Northern
- Cornforth Consultants

16.2.3 Structural Engineering Design (wind turbine foundations)

- Barr Engineering
- Renewable Resource Consultants, LLC
- HDR, Inc.

16.2.4 Cranes and Rigging

- Wilhelm Trucking and Rigging Co.
- Bigge Crane and Rigging
- Barnhart Crane and Rigging
- KR Wind
- Bragg Crane and Rigging

16.2.5 Transportation

- Wilhelm Trucking and Rigging Co.
- ATS Wind Energy Service
- Omega Morgan
- Contractors Cargo Co.

16.2.6 Electrical Contractors

- Rosendin Electric
- Tice Electric
- Mountain Power Construction Company
- Michels
- Christenson Electric
- Henkels & McCoy
- Par Electrical Contractors
- EC Electrical Construction
- NAES
- Blattner Energy

16.2.7 Substation Design

- Black and Veatch
- Power Engineers
- Sebesta Blomberg
- Burns & McDonnell

16.2.8 Collection System Design

- Power Engineers
- Burns & McDonnell

- TBD

16.2.9 Collector System Installation

- RES Earth and Cable
- Robinson Brothers Construction
- PLC
- Blattner Energy

16.2.10 Met Towers

- World Tower
- Magnum Tower
- CER
- Aerial Erectors
- Anetech
- Sabre
- Tower Systems
- Nello
- Sioux Falls Towers
- Vertical Technologies

16.2.11 Earthwork and Roads

- RES Earth & Cable
- Nelson Engineering
- Tower Foundations (TFS Wind)
- Builders Construction Services
- Narum Construction
- Goodfellow Brothers
- Lydig Construction
- Royce Hydroseeding
- Wildlands Inc.
- Geotech Foundation Company West
- Barker Inc.

16.2.12 O&M Building

- Thomas L Wood Heath Construction
- Apollo Sheet Metal Inc.
- Adran
- Shamrock Construction
- Opp & Seibold
- Metal Structures LLC
- SM Andersen Company

16.2.13 Overhead Transmission Line

- Wilson Construction
- International Line Builders

- Michaels
- Potelco

16.2.14 Transmission Line Foundations

- Crux
- DMI Drilling Construction
- Brent Woodward Inc.
- Malcolm Drilling
- Tri-State Drilling

16.2.15 Transmission Engineering Design

- POWER Engineers
- Black & Veatch
- HDR
- Burns & McDonnell

17. REQUIRED DOCUMENTATION

Documentation is grouped and shall be supplied by Contractor in the following categories:

- Level A, Bid Documentation: Documentation submitted prior to execution of the Agreement.
- Level B, Construction Documentation: Documentation to be submitted prior to the commencement of Work on Site or issuing of any completion certificate.
- Level C, As-Built Documentation: As-Built drawings and other record documentation to be submitted after the issuing of any completion certificate.

The documentation requirements listed herein are not intended to be exhaustive and all the requirements of this document relevant to the document submission item shall be considered by Contractor when preparing a submission.

Level A Documents	Description / Comment
Contractor's Specification(s), Site Layout	Proposed aggregation and layout of the: • Wind Turbines (including padmount transformers) • MV Cable routes • Substation • Transmission line • Access roads • Public Roads • Landowner Boundaries • Laydown areas • Foundations • Meteorological stations • Crane pads/hardstands • Borrow pits • Batch plant(s) • Construction compound, and • Permanent and temporary buildings
Contractor's Specification(s)	The documents that shall be attached to the Agreement to fully define the equipment being supplied. As part of this documentation Contractor shall provide a list of: • Standards as identified by Contractor as being relevant to the Work • Equipment suppliers detailing locations, and where major components of the Work shall be manufactured
O&M Building	Functional description and conceptual design specification including details on: • Layout • Elevation drawings • Structural
Control Building	Functional description and conceptual design specification including details on: • Layout • Elevation drawings • Structural
Wind Turbine, Noise Assessment	Noise assessment detailing the predicted Wind Power Plant noise at stakeholder and non-stakeholder receiver locations.
Wind Turbine, Site Suitability Statement	Provision of evidence and a statement of site suitability if conditions are outside type certified conditions

Level A Documents	Description / Comment
Wind Turbine, Specification	Specification(s) of Wind Turbines proposed for the Site including (for each proposed turbine type and operating mode): • Technical description of main components • General arrangement drawings • Description of operational envelope and control system • Details that show compliance with this document • Failure Modes and Effects Analyses • Maintenance schedule, included routine and major overhaul activity • Operational track record and performance including up-to-date installation figures for the proposed wind turbine model • Warranted power and thrust coefficient curves for the purpose of warranty calculations • Independently certified power curve measurement report • Warranted sound power levels and tonality for the purpose of warranty calculations • Independently certified noise measurement report • Electrical specification and single line diagram for the wind turbine, showing protection and earthing systems; interface to Wind Power Plant electrical system, acceptable variations in grid conditions • Independent Power quality measurement report • Confirm wind turbine meets the requirements of the applicable grid code
Wind Turbine, Certification Documentation	Type Certification or Design Assessment of the Wind Turbine applicable to the proposed Wind Turbine configuration
WTG Foundations	Design basis document prepared by the foundation designer, outlining standards, methods and approach to be used in the foundation design.
WTG Foundations, Concrete and Grout Specifications	Including minimum strength required for any concrete or grout forming part of the wind turbine foundation design
WTG Foundations, Preliminary study	Preliminary design information including: • Wind turbine standard foundation design • Proposed foundation design types used for costing estimate based on Preliminary assessment of Wind Power Plant • Foundation design, construct & test philosophy • General arrangement drawings
Civil Works, Specifications	Where not covered by the site layout an outline of proposed BOP Civil Works, including but not limited to: • Overview, specifications • Details of reinforcement • Site testing proposal
Electrical System, Grid Connection, Loss of grid power method statements and procedures	Provide method statements and procedures to achieve the aim of ensuring the Work are able to withstand periods without grid electrical power.

Level A Documents	Description / Comment
Electrical System, Specifications	Outline of proposed electrical systems (balance of electrical plant up to and including the Point of Interconnection) including: • Single line diagram of substation, including reactive plant; protection SLD to be incorporated or provided separately • Wind Power Plant Collector System SLD, showing connection to MV/LV transformers and Wind Turbines; protection SLD to be incorporated or provided separately • Cable route layout for collector system, including approximate in-line joint locations (if applicable) • Reactive power support and voltage control philosophy • Protection philosophy • Substation GA drawing • Primary and Secondary system key equipment specifications, including WTG Step-up Transformer and MV/HV Transformer, Reactive Plant (if applicable), HV and MV switchgear, neutral earthing resistors or neutral earthing transformers (if applicable) • Optimization of power cable and overhead conductor size
Transmission Line Specifications	An outline of proposed Transmission Works, including but not limited to: • Transmission line route including proposed pole/tower locations • Transmission line typical span and pole/tower drawings • Proposed transmission line structures and foundations • Power Line Systems PLS-CADD model
Communications Network, Specifications	Information on the communications system, including specifications and drawings
SCADA System, Specifications	Information on the SCADA system, including specifications and drawings
Meteorological Station, Specifications	Information on the Met Masts installations including number of Permanent Met Masts
Shipping and access routes and plan	Proposed shipping and access routes and major onsite plant required
Installation & Commissioning Plan	Proposed installation and commissioning plan
Grid Connection Documentation	All required information to assist Owner in its application for Grid Connection.
Project Management, Project Plan	Proposed Project Plan including: • List of key personnel with CVs • Project organisation diagram
Project Management, Project Schedule	Proposed Project Schedule including all milestone dates and for completion of Sections of Works (if applicable)
Sub-contractors	A list of all sub-contractors to be included as approved sub-contractors.
Quality Management	Proposed Quality Management Plans applicable to: • Design of the Work • Manufacture of the Work • Transportation and storage of the Work • Installation and erection of the Work • Testing, commissioning, and Substantial Completion of the Work • Shall include, where appropriate, references for FATs of major components
Quality Management, System Description	Description of the Tenderer's quality management system and associated certificates

Level A Documents	Description / Comment
HSE Policy	Description of the Tenderer's HSE System and associated certificates; and proposed Health, Safety, and Environment management plans
Performance Test	Draft of the Project equipment performance test

Level B Documents	Description/Comment
Topographic Survey	Detailed topographic survey, covering all areas where construction is proposed and supplied in both hard copy and electronic copy.
Grid Connection Data and Settings	Contractor shall provide, and update as required, data and settings as required by TSP including but not limited to: • Generating System Design Data Sheets, and • Generating System Setting Data Sheets
Grid Connection Documentation	All required information to assist Owner in its application for Grid Connection
Grid Connection Performance Standard Template	Contractor shall supply a completed performance standard template stating the proposed level of compliance to each access standard in accordance with the TSP's GPS
Work Method Statements	For all parts of the Work
Detailed Specifications	Full specification of the Wind Turbines including specifications of all main components
Wind Turbine, General Arrangement Drawings	Includes the general arrangement drawings of the following: • Nacelle • Hub (including electrical and hydraulic systems as applicable) • Blades • Tower sections including internals (platforms, ladders, hatches, control cabinets and safety equipment) • Service lift • Gearbox (where applicable) • Generator • Mechanical braking system • Hydraulic systems • WTG electrical cabinets • Safety equipment
Wind Turbine, Instrumentation Specifications	• Specification and calibration certificates where applicable of the following Wind Turbine instruments: - Nacelle anemometers - Nacelle wind vanes - Thermometers and other temperature measurement devices such as thermostats - Yaw and pitch sensors or transducers - Accelerometers, and - Condition monitoring sensors
Wind Turbine, Site Specific Modifications	Specifications and general arrangement drawings of any Site-specific modification made to the WTG.
Wind Turbine, Site Specific Statement of Compliance	Site specific statement of compliance for the design assessment from a Certification Body which demonstrates that the combined system of Wind Turbine and Wind Turbine towers is designed to withstand the Site conditions for the full Design Life.
Wind Turbine, Site Specific Statement of Compliance Associated Documentation	All reports associated with the site specific statement of compliance for the design assessment.
WTG Foundations, Geotechnical Certification	Certification from a qualified geotechnical engineer confirming design founding conditions in the base of the excavation prior to pouring the foundation or blinding.

Level B Documents	Description/Comment
WTG Foundations, Civil / Structural Design Report	Including but not limited to the following: • Design loads • Design calculations including all assumptions • Demonstration of suitability of all structural components in extreme wind conditions and over the design life • Detailed foundation specifications • Detailed foundation design drawings • Concrete and Grout Design and the mix proposed as described in this document • Borehole logs and relevant geotechnical test results for each WTG site • All partial safety factors • Decision trees • Reinforcement specifications and testing, and • Conclusions
Civil Works, 3rd Party Structural Design Report	Third-party Registered Professional Engineer's Report confirming the suitability of: • The permanent buildings • Any other structures as required to be certified under the local building and/or structural codes
Civil Works, Civil / Structural Design Report	The design report shall contain, as a minimum, all method statements, design inputs, design calculations, specifications, design drawings, cross sections, layouts and studies regarding: • Borehole logs and relevant geotechnical test results for the HV/MV Substation • HV/MV Substation foundations/footings; • Met Mast foundations/footings • Crane hardstands • Access roads • Permanent Buildings (including structural, architectural, fire rating and hold down details) • Site drainage • Site landscaping • Site reinstatement
Civil Works, Concrete and Grout Design Supporting Information	Contractor shall provide evidence from field, production or trial tests to justify the design of the concrete or grout mix proposed.
Civil Works, Concrete, Work Method Statements	A detailed method statement for on-Site concrete batching, including as a minimum: • Source of materials • Transport plan • Quality control If Contractor proposes to utilize a pre-existing off-Site batch plant, details shall be provided on the concrete supplier including: • Quarry materials suppliers and any additives required • How the delivery of concrete to site is to be managed Contractor shall additionally provide a method statement for forming cold joints should concrete supply be disrupted.
Civil Works, Geotechnical Investigation Report	Geotechnical investigation of HV/MV Substation, Access Roads, Hardstands, Underground Cabling, Wind Turbine & Met Mast foundation/footing sites.

Level B Documents	Description/Comment
Electrical System, Detailed Specifications and Design Drawings	Full specification and design drawings of all elements of the Wind Power Plant Electrical System including, but not limited to documentation for the following items as indicated: • MV/HV Transformer specifications and drawings, including MVA rating, nominal voltage rating, OLTC configuration, AVR, insulating medium, vector group, thermal ratings, temperature rise, fault ratings, insulation ratings, IP level, fire protection, corrosion protection, load and no-load loss guarantees, oil/water separator and bund details, manufacturer and standards compliance. Also required is the Type test certificate (considering environmental conditions, corrosion, cyclic loading, peak voltages and fire risk) and a fitness for purpose statement. • Manufacturer specifications for all Reactive Plant equipment (if applicable) and associated transformers • Cable specifications and schedules for all HV, MV, LV, earthing and fiber-optic cabling in the Wind Power Plant (including MV/HV Substation and Collector System) • Full technical specifications for all termination kits, jointing kits, lugs and connectors to be used in the primary power circuits of the Wind Power Plant and in the earth network • Protection equipment and switchgear specifications (including MV/HV Substation, WTG located MV switchgear, NER/NET if applicable), including insulating medium, description of interlocking and protection, thermal, fault and insulation ratings, IP level, manufacturer and standards compliance, relevant type test certificates • LV systems, diesel generator and associated equipment specifications, including battery and UPS capacities/back-up time • Revenue and power quality meter specifications • In-line cable jointing kits •
Transmission Line Civil/Structural Design Report and Drawings	Foundation and structure design for every pole location, including but not limited to the following: • Design loads • Design calculations including all assumptions • Demonstration of suitability of all structural components in extreme wind conditions and over the design life • Detailed foundation specifications • Detailed foundation design drawings • Concrete and grout mix design proposed • Borehole logs and relevant geotechnical test results • All partial safety factors • Decision trees • Reinforcement specifications and testing • Transmission line profile design • Structure assembly drawings, including required tolerances for installation

Level B Documents	Description/Comment
Transmission Line – Other Documentation	Including, but not limited to the following: • Electrical design report, including conductor selection (size, current rating, resistance, number of circuits, type, strength, etc.), insulation, loading, clearances, conductor sagging, etc. • Earthing study and earthing design drawings • Specifications for all components, including conductors, insulators, OPGW and hardware. • Calculations to confirm audible noise, radio frequency interference, electric field and magnetic fields satisfy the regulatory requirements and Applicable Standards. • Work method statements, ITPs (inspection and test plans) and commissioning plans for all HV transmission line works, including concrete testing, foundations, pole assembly, pole erection, conductor and OPGW stringing, jointing and terminations • Drawings showing details of conductor clearances and member clearances • Drawings showing clearances of conductor sagging and existing vegetation and other objects • Line route survey drawings and data • Pole schedule • Line schedule • Design of access routes, including drawings • Details of provisions for climbing and working at heights • Signage
Transmission Line – Earthing Verification Report	Earthing Verification Report, which verifies through measurement of the as-built earthing systems, that the HV Transmission Line will be safe for the lifetime of the Facility. This shall include measurements of step and touch potentials.
Electrical / Control Drawings & Documentation	Single line diagram of the Wind Turbine(s), in sufficient detail to show all protective devices, overvoltage protection, isolation and earthing facilities; • Wiring diagrams (three-wire) for all main power and auxiliary circuits in the Wind Turbines • Control system block diagram of the Wind Turbines; • Wind Turbine earthing drawings • Wind Turbine 33 kV system interface drawings, showing MV switchgear and Wind Turbine Transformer • Drawings and schematics for WTG located MV switchgear (if applicable), including configuration, placement, connections, civil works and/or mounting arrangements, cable terminations, and • Vendor data sheets for main electrical components in the Wind Turbines, including generator, main circuit breaker and converter/inverter (if present)

Level B Documents	Description/Comment
Electrical Power System Studies and Design Calculations Reports	Electrical Design Report(s) with detailed calculations indicating method, assumptions and outcomes of design and dimensioning of all elements in the Wind Power Plant Electrical System, having regard to the potential output of the Wind Turbines, the characteristics of the Work, Owner's reliability and availability requirements and Prudent Industry Practices. The Electrical Design Report shall include without limitation: • Load flow study, including voltage levels at all buses, cable rating calculations and loss calculation at zero, partial and full loads, and annualized losses in percentage of annual energy • Fault study showing minimum and maximum fault levels at all buses • Soil Electrical Resistivity Survey results, in sufficient number of locations to allow design of the entire Wind Power Plant Earthing System • Earthing study, based on justifiable assumptions and proving conclusively that the Site shall be safe for the lifetime of the Facility, addressing transferred potentials and step and touch voltages • Protection study and protection settings report, showing compliance with Owner's requirements and other relevant requirements • Harmonics and flicker study • Insulation co-ordination study • Reactive Power and Voltage Control Report
Electrical System Optimization Report	Final optimization of power cable and overhead conductor size
Electrical Works Method Statement	Method statement for all Electrical Works.
MV/HV Works Electrical System Design Report	Design of proposed electrical systems including, but not limited to: • Single Line Diagrams (SLD) for MV/HV Substation, reactive plant and Collector System, incorporating protection (or provided separately) • Earthing GA drawings and schematic diagrams • Substation GA drawings, including overall GA drawing, MV Switchroom GA drawings (including MV and LV switchboards, protection panels, SCADA, battery / UPS, chargers, etc.), lightning mast locations • Schematic diagrams and distribution board schedules for MV Switchroom equipment, LV supplies and metering • Details of equipment redundancy • Electronic copies of all studies, models, rating evaluations, etc. performed for the above requirements. Specific software and version information to be provided by Owner.
Protection Settings Signoff	Written endorsement by the interconnection provider in respect of all protection settings in the Wind Power Plant and Wind Turbines
Reactive Plant Voltage Regulation & Reactive Power Control Design Report	Voltage regulation and reactive power flow control and coordination study to demonstrate the proposed methods of integration and coordination of voltage and reactive power control devices.
Wind Power Plant Cable Route Layout and associated design drawings	Wind Power Plant Cable Route Layout and associated design drawings including, but not limited to: • MV cable route diagram, including details of creek and road crossings • Trench layout diagrams, showing cross-section of all buried cable configurations • LV cable route diagrams between the Wind Turbines and transformer kiosks (if applicable)

Level B Documents	Description/Comment
WTG Transformer	WTG Transformer specifications, including MVA rating, nominal voltage rating, tap changer details, insulating medium, vector group, thermal ratings, temperature rise, fault ratings, insulation ratings, IP level, fire protection, corrosion protection, load and no-load loss guarantees, manufacturer and standards compliance. WTG Transformer design drawings, including enclosure, fittings, locations and bund details. WTG Transformer type test certificate and a fitness for purpose statement (considering environmental conditions, corrosion, cyclic loading, peak voltages and fire risk)
Detailed Function Specifications and Design Drawings	Detailed Functional specification and design drawings of all elements of the Wind Power Plant SCADA & Communications system, including but not limited to the following: • Network used to communicate with the Wind Turbines (transmission medium, network topology, communication protocols and fault tolerance) • Interfaces • Redundancy and UPS • Remote access • Viewing and display • Data collection and storage • Control • Reporting • Software and licenses • Comprehensive user manual explaining the operation and use of all the functions • Hardware manuals for all hardware and computers systems • Documentation including manuals, quality control, installation, commissioning and testing procedures
SCADA Design Report	Details of Wind Turbine interfacing, Wind Power Plant and Wind Power Plant HV/MV Substation and 33kV equipment with design inputs, design criteria, design outputs comprising: • Systems Architecture Diagram showing all components in block form, specifically identifying redundant elements and interfaces • System platform details including details of software OS & hardware for SCADA platform including details of redundant elements and expected availability • Data map and interfacing details • Identification of all data points, interfacing points, including how the interconnection and interfacings are to be provided as described in this document • Optic fiber architecture
SCADA System - Warranty Calculation Method & Results	Documentary evidence that the SCADA system is sufficient for recording and analysis of the data for the Warranty Tests; and confirmation and detailed report of how the SCADA system stores data and provides values to enable availability calculations.
Calibration Certificates	Copies of calibration certificates for all instrumentation mounted on all Met Masts, provided by recognized independent agencies and done in accordance with the appropriate calibration standards.

Level B Documents	Description/Comment
Met Mast Design Report	Specification and drawings for meteorological masts including but not limited to: • Mast general layout • Proposed locations and non-wake-affected sectors • Earthing and lightning protection • Mast instrumentation & mounting arrangements • Aviation warning markings (e.g. marker balls) • Enclosures and cabling • Fencing/protection • UPS • Power supply and SCADA connection
Met Mast Installation Report(s)	An installation report for each mast including, but not limited to: • Details of installer • Installation date • Grid coordinates of mast (including details of coordinate system and datum) • Elevation of mast above sea level • Mast and equipment details including, but not limited to: - Mast dimensions - Instrumentation types, serials numbers and installation heights and positions - Dimensions and orientations of all booms and arms installed on the mast - Data logger configuration and details - Commissioning details - Reference photos
Method Statement – Delivery to Site	For Main Transformer and other critical equipment and oversize loads
Method Statement – Commissioning	Method Statement describing pre-commissioning and commissioning tests on all items in preparation for completion of individual Section of Works and to reach Substantial Completion.
Reinforcement specifications & testing	Reinforcement specifications, testing, FATs
Reinforcement, Supplier Accreditation	Certificates confirming manufacturers and processors of steel reinforcement hold a valid certificate of approval.
Factory Acceptance Test Schedule	Test schedule for all major equipment included in the Work and as described in this document.
Factory Acceptance Tests, Certificates and Reports	Copies of test certificates for all routine factory tests applied to all major items included in the Work, including Wind Turbine components and electrical system components including, but not limited to, switchgear, power transformers, instrument transformers, protection relays and revenue metering systems.

Level B Documents	Description/Comment
Factory Acceptance Tests, Certificates and Reports, WTG Components	FAT certificates to be provided by Contractor shall include, but not necessarily be limited to, the following components: • Rotor • Blades • Gearbox (where applicable) • Step-up Transformer • Generator • Yaw System • Main Bearings • Service Crane • Wind Turbine Tower • Service Ladder • Service Lift • Fall Arrest and Safety Systems
O & M Manuals	Draft, comprising Overview and Manuals from key equipment suppliers
Permanent Building Designs – 3rd Party Approval	Permanent building designs shall be independently checked and approved by a certified structural engineer
Power Curve Test Procedure	Power Curve Test Procedure describing the procedure to be undertaken by the Power Curve Test Consultant to measure the power curves of the selected WTGs.
Proposal for Conducting the Power Curve Test	The Consultant shall prepare a report (First Report) describing the Consultant's proposals for conducting the Power Curve Test including: • Details of the equipment to be used • Any deviations between the actual conditions for the Power Curve Test and the requirements specified by the Power Curve Test Procedure • The methodology for dealing with those deviations • Details of the site calibration procedure
Testing, Inspection and Test Plans	For all parts of the Work
Type Test Certificates	Type test certificates for any piece of Plant or Equipment
Recommended Spares	Updated list of components and consumables that do not satisfy the Design Life for Work including additional information.
Project Management, Project Schedule	Updated and final Project Schedule as described in this document
Quality Management, Plans	Updated and final Quality Management Plans applicable to: • Design of the Work • Manufacture of the Work • Transportation and Storage of the Work • Installation and erection of the Work • Testing, Commissioning, and Substantial Completion of the Work This shall include, where appropriate, references to FATs of major components and key equipment and materials.
Quality Management, System Description	Updated and final Project specific quality management system
Emergency Response Plan	As described in this document.
Environment Management Plan	As described in this document and complies with Owner's EMP.
Environmental Monitoring Plan	As described in this document.

Level B Documents	Description/Comment
HSE, Management Plan	Updated and final as described in this document. This shall include a comprehensive list of all HSE Laws and Applicable Standards applicable to the Work.
HSE, Management System	Updated and final description of the Health and Safety, and Environment Management System
Performance Test	Final version
HSE, Risk Assessments and Register	As described in this document. Contractor is to provide the outcomes/actions from a risk assessment workshop with the associated risk register.
HSE, Updated Risk Register	Periodic submission of the risk register showing updates on risk assessment and control measures in place to address hazards
Documentation and drawings, 30% or Preliminary Design, Site Layout	For Construction layout drawing(s) of the site showing the location of: • Wind Turbines • Cable routes • Access roads • Laydown areas • Foundations/Footings • Meteorological stations • Site tracks • Crane hardstands • Borrow pits • Batch plant(s) • Construction compound • HV/MV Substation, and • Permanent and temporary buildings • HV Transmission
Documentation and drawings, 30% or Preliminary Design	For Construction documentation and drawings produced for all parts of the physical Work including all design documentation to substantiate the basis for design and fitness-for-purpose (i.e. Contractor's design calculations, etc.). Documentation shall be submitted in complete packets or document package in accordance with major sections of the Work for review by Owner including: • Wind Turbine(s) • Wind Turbine Foundations • Civil Works • Electrical System • Communications Network • SCADA System • Meteorological Station • Spare, Parts, Tools and Permanent Storage • HV Transmission

Level B Documents	Description/Comment
Documentation and drawings, 75% or Issued for Review, Site Layout	For Construction layout drawing(s) of the site showing the location of: • Wind Turbines • Cable routes • Access roads • Laydown areas • Foundations/Footings • Meteorological stations • Site tracks • Crane hardstands • Borrow pits • Batch plant(s) • Construction compound • HV/MV Substation, and • Permanent and temporary buildings • HV Transmission
Documentation and drawings, 75% or Issued for Review	For Construction documentation and drawings produced for all parts of the physical Work including all design documentation to substantiate the basis for design and fitness-for-purpose (i.e. Contractor's design calculations, etc.). Documentation shall be submitted in complete packets or document package in accordance with major sections of the Work for review by Owner including: • Wind Turbine(s) • Wind Turbine Foundations • Civil Works • Electrical System • Communications Network • SCADA System • Meteorological Station • Spare, Parts, Tools and Permanent Storage • HV Transmission
Documentation and drawings, 90% or Issued for Procurement Detailed Design, Site Layout	Updated For Construction layout drawing(s) of the site.
Documentation and drawings, 90% or Issued for Procurement Detailed Design	For Construction documentation and drawings produced for all parts of the physical Work including all design documentation and drawings for final approval prior to being issued for construction. Documentation shall include updates to rectify any issues not otherwise resolved in the Preliminary Design documentation. Documentation shall be submitted in complete packets or document package in accordance with major sections of the Work for review by Owner including: • Wind Turbine(s) • Wind Turbine Foundations • Civil Works • Electrical System • Communications Network • SCADA System • Meteorological Station • Spare, Parts, Tools and Permanent Storage • HV Transmission

Level B Documents	Description/Comment
For Construction documentation and drawings, 100%, Issued for Construction or, Site Layout	Updated For Construction layout drawing(s) of the site.
For Construction documentation and drawings, 100%, Issued for Construction	For Construction documentation and drawings produced to provide all required information to construct the Work. Documentation shall include updates to rectify any issues not otherwise resolved in the Final Detailed Design documentation. Documentation shall be submitted in complete packets or document package in accordance with major sections of the Work for review by Owner including: • Wind Turbine(s) • Wind Turbine Foundations • Civil Works • Electrical System • Communications Network • SCADA System • Meteorological Station • Spare, Parts, Tools and Permanent Storage • HV Transmission
Factory Acceptance Tests, Certificates and Reports, Electrical Works	FAT certificates to be provided by Contractor shall include, but not necessarily be limited to, the following components: • Transformers, including: - MV/HV transformer/s - Auxiliary MV/LV transformer/s - WTG MV/LV transformers - Reactive plant transformers (if applicable) • Instrument transformers (i.e. CTs, VTs) • Reactive plant equipment (if applicable) • HV and MV switchgear and switchboards • LV distribution boards (AC and DC) • Cabling (HV, MV, LV and fiber optic) • HV and MV surge arrestors • Protection relays • Metering systems (revenue, check and power quality) • UPS systems • Stand-by diesel generator, and • Switchroom batteries and chargers

-

Level C Documents	Description / Comment
Quality assurance packages	Complete sets of quality assurance documentation for each of the defined construction milestones referenced in Section 3.10 (commonly recorded via construction job books).
Grid Connection Documentation	Update to all required grid connection documentation
Wind Turbine, As-Built Drawings, Final	As-Built documentation and drawings of the following: • Nacelle • Hub (including electrical and hydraulic systems as applicable); • Blades • Tower sections including internals (platforms, ladders, hatches, control cabinets and safety equipment) • Gearbox (if applicable) • Generator • Mechanical braking system • Hydraulic systems • WTG Electrical cabinets • Safety equipment • Site specific modifications • Single line diagram of the Wind Turbine(s) using Australian Standard electrical symbols, in sufficient detail to show all protective devices, overvoltage protection, isolation and earthing facilities • Wiring diagrams (three-wire) for all main power and auxiliary circuits in the Wind Turbines • Wind Turbine earthing drawings • Wind Turbine MV system interface drawings, showing MV switchgear and Wind Turbine Transformer
Third-party Structural Design Certificate	Third-party Registered Professional Engineer's Certificate confirming the suitability of the WTG foundation(s) and that they are in accordance with the As-built drawings.
As-Built Drawings, Final, Cable Routes	A GIS database which shall include all as-built cable routes recorded in a minimum of 10 meter steps and in-line joints (if installed).

Level C Documents	Description/Comment
Electrical System, As-Built Documentation	Complete drawings including: • As-built SLD's for MV/HV Substation, reactive plant and Collector System. Protection SLD's to be incorporated or provided separately • As-built Earthing drawings • As-built MV cable route diagram, including details of creek and road crossings and in-line cable joint locations (if applicable). Diagram shall include GPS coordinates of Wind Turbines and meteorological masts • GIS database including all As-Built cable routes recorded in a minimum of 10 meter steps and in-line cable joints (if installed) • MV Protection Schematics • MV CB Control Schematics • LV Air CB Schematics • UPS Schematic • Battery Charger Schematic • Distribution Board schedules • Cable schedules (HV, MV and LV) • LV systems and auxiliary generator schematics And General Arrangement drawings including: • As-built MV/HV Substation GA drawings • As-Built MV Switchroom GA drawings, including MV and LV switchboards, protection panels, SCADA, battery / UPS, chargers, etc. • As-built WTG transformer kiosk GA drawings (if applicable), including LV cabling between WTG and transformer kiosk
Electrical System, Certificates of Compliance	All Electrical Certificates of Compliance
Transmission Line , As-Built Documentation	Complete As Built and General Arrangement drawings and installation and commissioning records including, but not limited to: • Foundations • Pole assembly • Pole erection • Conductor, and • OPGW stringing, earthing, jointing and terminations
Electrical Power System Studies and Design Calculations Reports, Updated	Updated Electrical Design Report following any design changes during construction.
As Left Settings	As left settings including: • Alarm set points • Complete I/O database including description of each I/O
Instrumentation	Copies of calibration sheets for all sensors/transducers as appropriate in accordance with the appropriate calibration standards. Sensors/transducers shall include those mounted on: • Temporary and Permanent Wind Turbine met masts • Switchgear • Monitored equipment • Statcom equipment, and • Power Quality Metering

Level C Documents	Description/Comment
SCADA System, As-Built Drawings	Comprehensive and complete drawings including, but not limited to: • Detailed architecture, interfacing and component product identification • Network Data Communication, detailed wiring diagram • Fiber network • Interfacing • Power supply – SCADA distribution board SLD
SCADA System, Documentation	The SCADA system shall be supplied with three sets of comprehensive, complete and up-to-date documentation packages relevant to all the hardware and software supplied. This shall include: • A comprehensive user manual explaining the operation and use of all the functions • Detailed descriptions of the underlying theory and calculations employed especially with regard to availability and power curve measurements. These shall include complete details of any data processing carried out by the Wind Turbine controllers • A complete electrical wiring diagram showing connections to the controller and the communications links • Hardware manuals for all hardware and computers systems • An administrator manual for system administration and configuration • Quality control, installation and commissioning documentation
Maintenance Log(s)	Each installed mast shall have a maintenance log detailing all work carried out on the individual mast. The maintenance log shall be such that can be used by Owner for the continuing operation of the mast over its Design Life.
Final Substantial Completion Test reports	Completed installation and commissioning checklists, including commissioning test results, for the entire Wind Power Plant Electrical Works, including, but not limited to, MV/HV Transformer/s, auxiliary transformers, Reactive Plant (if applicable), protection systems and switchgear, WTG step-up transformers and switchgear, MV cables, fiber-optic cables, metering, LV equipment, auxiliary generator, in-line cable joints (if applicable), earthing connections at MV/HV Substation and WTG's, terminations and joints.
Installation and Commissioning, Reports	The results of all inspections, checks and tests carried out, together with any subsequent analysis.
Power Curve Test Report and Certificate	Upon satisfactory completion or upon failure of the Power Curve Test, as the case may be, the Consultant shall issue to Owner a report and a Performance Test Certificate to that effect.
Testing, Reports	The results of all inspections, checks and tests carried out, together with any subsequent analysis including documentation of all Acceptance, and Performance Tests (if complete) and applicable certifications
HSE Risk Register - Final	Final risk register
As-Built Documentation and Drawings, Final, Site Layout	Updated As-Built layout drawing(s) of the site.

Level C Documents	Description/Comment
As-Built Documentation and Drawings, Final	As-Built documentation and drawings produced for all parts of the physical Work. Documentation shall be submitted in complete packets or document package in accordance with major sections of the Work for review by Owner including: • Wind Turbine(s) • Wind Turbine Foundations • Civil Works, including - Roads - Crane pads - Drainage - Earthwork and compaction • Electrical System • HV Transmission • Communications Network • SCADA System • Meteorological Station • Spare, Parts, Tools and Permanent Storage Shall include marked up Issued for Construction documentation or drawings to show any and all changes made during construction, including documentation of any and all non-conformances and rectification.
Punch List	Documentation listing and detailing any and all minor non-conformances and proposed rectification not required to be completed prior to substantial completion.
O&M Manuals	Complete and final O&M manuals, including: • Overview of the Wind Power Plant Works • All relevant specifications • All details for the safe and effective use, operation and maintenance of the complete Wind Power Plant Works

20 Appendix H-2 – Technical Specifications for Owned Solar Resources

Template provided in a separate document available for download on PortlandGeneralRFP.accionpower.com.

Portland General Electric Company

SOLAR RESOURCE TECHNICAL SPECIFICATION**

Renewable Energy Resources

****NOTE: PGE's final issuance of the 2016 Request for Proposals (RFP) for Renewable Energy Resources is subject to Oregon Public Utility Commission approval of both the draft RFP and the Petition for Partial Waiver of the Competitive Bidding Guidelines, including the expedited RFP timeline.**

May 23, 2016

Table of Contents

1. DEFINITIONS 2

2. SCOPE OF WORK 3

3. PLANT ELECTRICAL DESIGN AND EQUIPMENT REQUIREMENTS 21

4. PROJECT SUBSTATION 62

5. HIGH VOLTAGE TRANSMISSION LINE DESIGN AND EQUIPMENT REQUIREMENTS 77

6. PLANT COMMUNICATIONS NETWORK DESIGN AND EQUIPMENT REQUIREMENTS 84

7. SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA) OR DATA ACQUISITION SYSTEMS (DAS) 86

8. TELECOMMUNICATIONS FACILITIES 108

9. CIVIL/STRUCTURAL DESIGN AND EQUIPMENT REQUIREMENTS 112

10. CONSTRUCTION MANAGEMENT 117

11. ELECTRICAL EQUIPMENT INSTALLATION 119

12. COMMISSIONING, PERFORMANCE TESTING, AND PERFORMANCE GUARANTEE 138

13. APPROVED SUPPLIERS 139

14. EXHIBIT A – COMMISSIONING AND PERFORMANCE TESTING 143

15. EXHIBIT B – PERFORMANCE GUARANTEE 176

1. DEFINITIONS

As used in this Solar Resource Technical Specification ("Technical Specification"), the following terms have the meanings set forth below. Other capitalized terms used and not defined in this Technical Specification have the meanings given to them in the form of Engineering, Procurement and Construction Contract included in the RFP.

a. AC Collector System – A network of transformers connected together to transfer the System's generated power to the point of interconnection.

b. Agreement – The agreement to be executed by Owner and Contractor, pursuant to which Contractor will construct the System. To the extent applicable, the Agreement will be based on the form of Engineering, Procurement and Construction Contract included in the RFP.

c. Construction – The installation and implementation of all equipment required to operate the System, including but not limited to, clearing and grubbing, grading, pile driving, mechanical and electrical installation of the PV and SCADA equipment.

d. Contractor – Person or Persons responsible for constructing the System pursuant to the Agreement.

e. Effective Date – The date the Agreement becomes effective, as set forth therein.

f. Engineer – Contractor's engineer of record in charge of the design of the System, as further described in Section 2.6 of this Technical Specification.

g. Inverter – Converts the Direct Current power produced by the solar modules to Alternating Current power.

h. Owner – Portland General Electric Company and any successors or permitted assignee under the Agreement.

i. Point of Interconnection (POI) – The point at which the System connects to the utility grid.

j. Project – electric generation project that is the subject of the Agreement, as described in the Scope of Work.

k. Scope of Work –The general overview of the System design, as set forth in this Technical Specification. The Scope of Work as described in this Technical Specification describes the general requirements for the equipment, materials and design of the Project, but is not intended to constitute a detailed project-specific scope of work, as will be included in the signed Agreement.

l. Solar (PV) Module – A series of photovoltaic cells that converts sunlight into electricity, constructed into a unit for application in a PV System.

m. Step-Up Transformer – the equipment that transforms the voltage that is output from the inverter, to a higher voltage level, to match the utility's distribution grid level, or that of the AC collector system.

n. System – The generation facility, including all of the associated equipment and infrastructure necessary to produce electricity.

2. SCOPE OF WORK

2.1.1 The design specifications set forth herein shall be used to define general, design, equipment, and installation requirements, criteria, and specifications for the Work.

2.1.2 This Technical Specification is not intended to provide a detailed design specification for the System. It describes major equipment, materials, installation methods, quality, testing, and commissioning services to define project minimum requirements and performance standards.

2.1.3 If there are other or different requirements than are specified in this Technical Specification or the Agreement (including any exhibits thereto) that are necessary in order to provide Owner with a System that: (i) has no Defects, (ii) reflects Prudent Industry Practices; and (iii) is capable of performing on a sustained, fully operational basis to generate the electricity as described herein, Contractor is to satisfy such requirements as part of the Work.

2.2 Project Description

Owner is requesting proposals for a newly constructed solar power project meeting all requirements of the Agreement including but not limited to those listed in this Technical Specification.

2.3 General Requirements

2.3.1 The System shall be a fully functional, turn-key solar generation facility, for which Contractor will provide engineering, procurement, and construction services. The System shall be designed and constructed to adhere to all applicable codes and standards, along with any additional conditions set forth by local or state agencies.

2.3.2 **Engineering:** The engineering portion of the scope shall consist of system layout and design, including electrical, civil, and structural engineering. The Engineer shall ensure that all of the equipment specified in the design is in compliance with the standards set forth in this document.

2.3.3 **Procurement:** It is Contractor's responsibility to procure all of the equipment necessary for the construction of the project, with the exception of that which will be provided by Owner. Contractor shall supply Owner with documentation for all proposed equipment for Owner's approval, prior to purchase.

2.3.4 **Construction:** Contractor shall construct the System based on the Engineers' design standards; and shall use means and methods of construction that will ensure that the installation will last for the intended lifetime of operation.

2.3.5 Contractor shall be responsible for all reclamation activities as required for all areas disturbed during the performance of the Work.

2.3.6 Contractor shall be responsible for the establishment of appropriate O&M procedures, quality management system documentation and warranties for the Work.

2.3.7 Contractor shall plan and execute the Work so as to minimize the effect of work by others on its own operations and the effect of its work on the operations of others.

2.3.8 All equipment supplied by Contractor shall be supplied new, complete and operational and shall include all necessary accessories and incorporate all miscellaneous material, minor parts and other such items, whether or not the items are indicated on the drawings or in this document, where it is clearly the intention that they should be supplied or where they are required and necessary to complete and commission the equipment.

2.4 System Life

Contractor will design, engineer, procure, and construct the Project according to the following intended design life:

2.4.1 Civil Works (including racking system and foundations): 30 years

2.4.2 BOP Electrical Works (including collection system and substation): 30 years

2.4.3 Solar Modules: 25 years

2.4.4 Inverters: 25 years

2.4.5 O&M Building(if applicable): 30 years

2.4.6 Transmission Line: 60 years

2.4.7 Contractor shall provide the expected reliability for the first five years of operation of the Photovoltaic Modules, Inverters, Medium Voltage Padmount Transformers and the Main Step-Up Transformers specified in their bid.

2.5 Site Conditions

Contractor will ensure that all aspects of the Work are fit for its intended purpose and suitable for the current and reasonably predicted conditions at the Project Site through inspection, examinations, investigations, explorations, surveys, tests, studies and data collection. All inspections, examinations, investigations, explorations, surveys, tests, studies and data collection will be included in Contractor's proposal and thus, Contractor will not be entitled to any scope change based on results included in these investigations.

It is Contractor's responsibility to ensure that all aspects of the Work are suitable for the existing and predicted conditions of the Project Site including but not limited to:

- Climatic (including, but not limited to, both local and regional wind and snow loading)
- Environmental
- Geotechnical
- Transmission, and
- Hydrological conditions

If aerial survey techniques are employed, Contractor will validate aerial survey data with ground based data collection.

2.6 Engineer of Record

2.6.1 All engineering shall be performed under the responsible charge of the engineer of record, who shall be a registered professional engineer, registered in the corresponding discipline for the reports or drawings produced, and the state(s) in which the site is located. The registered professional engineer shall have experience and competence in the area of engineering being performed as defined by laws and regulations of the applicable jurisdiction.

2.6.2 Final "Issued for Construction" engineering drawings and reports shall be signed and stamped by the registered professional engineer in responsible charge of the engineering work.

2.7 Maintainability

2.7.1 The System shall be provided by Contractor to allow maintenance to be performed safely and efficiently without significant dismantling or disruption to other items or parts of the System or unduly curtailing power generation.

2.7.2 The System shall allow maintenance activities that can be performed by a limited crew using mobile plant and operating in remote locations.

2.7.3 Contractor shall provide sufficient access around all of the System, in accordance with good utility design practice and Applicable Standards, to allow effective maintenance and removal of items from service or parts thereof, while maintaining operation of the System unaffected by maintenance tasks.

2.8 System Safety

The System designed and provided by Contractor shall ensure satisfactory operation in which safety of personnel and continuity of service are the first considerations, and equally to facilitate inspection, cleaning, maintenance and repairs.

2.8.1 The design shall incorporate industry best practice and provision for the safety of all those concerned in the operation and maintenance of the System and of related works supplied under other contracts.

2.8.2 The System shall be designed and constructed so that it complies with all relevant health and safety requirements.

2.8.3 Contractor shall undertake risk assessments and processes in accordance with the relevant standards to ensure that the design complies with the safety requirements of Applicable Standards and this document.

2.8.4 All items supplied by Contractor shall be designed to ensure satisfactory operation under the environmental conditions prevailing at the Project Site and under such variations of load as may be met with under working conditions on the grid including those due to synchronization and electrical faults including short circuit.

2.9 Permits

Contractor will obtain and maintain, at its sole cost, all permits required to design, engineer, procure, and construct the Project.

2.10 Project Management Plan

2.10.1 Contractor shall develop a project management plan for the management and execution of all phases of the Work and shall address as a minimum:

- Construction project manager and key team members
- Communication
- Permits, licenses, certifications and agreements required
- Procurement and sub-contracting
- Project schedule and payment milestones
- Resource loading
- Environment, health and safety
- Management of interfaces

2.11 Project Schedule

Contractor shall develop a Project schedule, which shall be used as the baseline for tracking progress through the design, engineering, procurement, and construction of the Project.

Milestones will be identified to mark completion of specific activities as agreed to by Owner. The schedule will be updated on a regular basis as agreed to by Owner to reflect current progress and expected completion of activities.

Contractor will provide a guaranteed Project Substantial Completion date with associated damage provisions. Project Substantial Completion will be achieved per the Agreement.

2.12 Quality Control

2.12.1 Contractor shall operate a quality system equivalent to the ISO 9000 series of standards and as approved by Owner.

2.12.2 Contractor's quality assurance / quality control plan will be adequate to cover all construction operations.

2.12.3 Contractor will submit all quality assurance / quality control documentation to Owner to show compliance with the requirements of the Agreement.

2.13 Quality Assurance

As the market supports, Contractor shall select manufacturers that have furnished equipment of similar type and size specified which has been in successful operation for not less than the past 5 years. Due to rapid development of new equipment in the solar industry, it is reasonable to expect that a specific model number for a piece of equipment may not have been on the market for the duration specified above. Contractor shall refer to the Specific Vendors section of this document for a list of recommended suppliers. Deviation from the criteria in this section is acceptable, if Contractor can provide sufficient evidence to support the bankability and track record of a proposed vendor.

2.14 Training

2.14.1 Contractor will develop and provide training to Owner personnel in the safe operation of Project equipment including but not limited to modules, inverters, electrical collection system, and Substation.

2.14.2 Contractor will involve Owner's personnel during Project start-up activities.

2.14.3 Contractor will provide training materials and manuals for all equipment provided by Contractor, to facilitate a smooth transition of operational responsibility from Contractor to Owner.

2.15 Design & Engineering

2.15.1 Contractor will complete design and engineering services and will provide comprehensive drawings and specifications for a complete and fully operational Project that meets the requirements of the Agreement.

2.15.2 Contractor will submit 30% (preliminary) design packages for the entirety of the Project for Owner review. Such packages will include, at a minimum, drawings, specifications, and assumptions.

2.15.3 Contractor will submit 75% (issued for review), 90% (issued for procurement), and 100% (issued for construction) design packages for the entirety of the Project for Owner review. Such packages will include, at a minimum, drawings, specifications, design calculations, materials, and assumptions. 100% (issued for construction) design packages shall be issued prior to the commencement of construction.

2.16 Design & Engineering Documentation

2.16.1 An up-to-date printable index listing all previously issued Contractor drawings and specifications by number and title, showing the revision status of each drawing, shall be maintained and shall be available to Owner at all times.

2.16.2 Contractor shall develop a Design Package, associated documents, and reports for the Project inclusive of the following at the appropriate time during the project, as applicable: (The following list does not attempt to define all aspects of the design requirements, those will be defined later in this document, or in a supplemental document supplied by the owner at a later time).

- Index
- Circuit and raceway list
- Material safety data sheets (MSDS)
- Equipment list (issued within 6 weeks of 100% design review approval)
- Equipment Datasheets
- Recommended Spare Parts
- Major subcontractor equipment drawings
- Site Arrangement Drawings
- Piping and Instrumentation Diagrams – using ISA 5.X instrument and function symbology
- Module, Inverter, and Combiner Box Location and Serial Number Maps
- Inverter/Step-up Transformer Plan and Details
- Pre-Engineered Building, as applicable
- Control Building Plan and Details
- Foundation Plans and Details
- Fencing, gate, signage, and label details
- Road plans and profiles, as applicable
- Overall Electrical One Line and Three Line Diagrams

- Electrical One-Line Diagrams, both ac and dc
- Electrical Load List (motors, heaters, etc.)
- Lubrication Schedule
- Communication Drawing and Details
- Room and building layouts
- Fire Control Plan
- Substation and Switchgear Plan and Elevation, as applicable
- Switchgear Elementary Diagrams, as applicable
- Protective Relay Calibration tests, as applicable
- Interconnection Diagrams, both One-Line and Three-Line Diagram (when required by utility or Jurisdiction)
- Trenching Drawings
- Grounding and Bonding Plan and Details, including fence as applicable
- Building Architectural and HVAC Drawings
- QC/QA Manual (Project Execution Plant and Project Coordination Procedure Manual)
- Safety Plan
- Lighting Plans, as applicable
- Lightning Protection Plan and Details, as applicable
- Security Infrastructure of Electrical Equipment, Hardware and Software
- Fire Alarm and Detection Drawings, as applicable
- SCADA/DAS Block Diagrams and Architecture
- SCADA/DAS I/O List
- Index of Vendor Drawings
- Factory Test Reports on new equipment
- Manufacturer Field Service Reports
- Instrument List
- Installation Details
- Asset Maintenance Information
    - Asset Description
    - Equipment Type
    - Preventative Maintenance Interval and Tasks and Intervals
    - Recommended Critical Spare Parts
    - Condition Based Monitoring, as applicable:
        - Applicable test method
        - Applicable test criteria
- Performance Monitoring Information
    - Environmental Monitoring Equipment, e.g., prediction of local weather events.
    - Equipment Degradation Monitoring, e.g., panels failing before design life.
    - Correctable Condition Monitoring Equipment, e.g., dirty panels.
- Reliability Monitoring Information
    - Monitored Points
    - Monitored Points Warning and Trip Setpoints
    - Equipment alarm codes
- Calculations, as applicable
    - Assumptions and quantified constants used in calculations
    - Cable sizing and pulling calculations
    - EMF calculations
    - Conduit sizing calculations
    - Load calculations
    - Electrical losses

- Voltage drop calculations
- Short circuit calculations
- Reactive power capabilities and contributions
- Inverter saturation and output model calculations
- Overcurrent device coordination
- Arc flash calculations and labels
- HVAC calculations, as applicable
- Structural calculations

- Civil Studies
  - Surveys (geotechnical, topographic, building rooftop structural, other)
  - Grading plans and Hydrology study (if applicable)
  - Erosion control plans (if applicable)
  - Storm Water Pollution Prevention Plan (if applicable)
  - Road crossing plans for underground or overhead transmission line crossings of public Right-of-Way (if applicable)
  - Offsite road improvement plans (if applicable)
  - Utility improvement plans (if applicable)
- Commissioning, Normal Operation and Shutdown and Emergency Shutdown Procedures

2.17 Design Engineering Submittals

Each submitted drawing shall be unique and shall be clearly marked with the name of the project, facility name, facility designation, specification title, specification number, project equipment or structure nomenclature, component identification numbers and Owner's name.

2.17.1 Engineering Design Document and Drawings Formats

Drawings shall adhere to Owner's CAD Standards. All Contractor and Subcontractor drawings (including shop fabrication drawings) shall be submitted in the following formats:

- Drawings: AutoCAD Drawings (*.dwg) – the latest version as specified by Owner
- 3D Models: Navisworks (*.nwd), AutoCAD (*dwg), AutoDesk Design Web Format (DWF)
- Raster Image Files: Tag Image File (*.tif, *tiff)
- Adobe Portable Document Format (*pdf)

2.17.2 Document Format

Typical project lists shall be submitted in MS Excel format. Examples include, but are not limited to:

- Photovoltaic Module List
- Valve List (if applicable)
- Spare Parts
- Special Tools List
- Electrical Load Lists
- Equipment List
- Instrument List

- Lubrication Schedule
- DCS I/O List
- Cable and Conduit Schedule
- Pipe Line List (if applicable)

All PDF documents shall be unlocked, indexed, word searchable and editable. Project lists shall be submitted in MS Excel format.

2.17.3 Manuals

The electronic versions of the O&M Manuals shall be word searchable PDF format, fully indexed and shall not be protected. The index shall link to the pages referenced in the index and the bookmarks shall coincide with the required tabs in the paper form.

Manuals which contain information on multiple manufacturer models shall have the model used at projected clearly highlighted. Manuals shall include as a minimum:

- Maintenance intervals and tasks; including
- Procedures
- Tool
- Inspection criteria
- Troubleshooting guide
- Condition monitoring intervals and tasks, including procedure and criteria

2.17.4 Equipment Numbering

Contractor shall use Owner's equipment numbering scheme for all equipment. Owner's equipment numbering scheme shall also be on all Subcontractor drawings.

2.17.5 Equipment Information

Contractor shall provide as a minimum the information shown in the Project Equipment List Template for all equipment supplied for the project.

Contractor shall supply all spare parts and bill of materials for the project in the format shown in the attached Project Spares Specification.

2.17.6 Within 30 calendar days after finalizing the equipment selection, Contractor shall prepare and deliver to Owner the following documents:

- O&M Manuals – electronic draft version
- Recommended spare parts list
- Lubrication Schedule

2.18 Owner's Review

2.18.1 Owner's review of drawings and other submittals will cover only general conformity of the data to the design specifications, external connections, interfaces with equipment and materials furnished under separate specifications, and dimensions that affect plant arrangements. Owner's review does not include a thorough review of all dimensions, quantities, and details of the equipment, material, device, or item indicated or the accuracy of the information submitted. Review and comment by Owner of Contractor's drawings or other submittals shall not relieve Contractor of its sole responsibility to meet the requirement of the Agreement and to supply Work that conforms to the requirements of the Agreement.

2.18.2 Owner will review and supply comments on submittals for approval within a mutually agreed timeframe after receipt from contractor. Contractor will have 10 working days to respond, in writing to owner's comments. Some resolutions to comments may require an extended period, which shall be granted to the contractor upon owner approval.

2.19 Health, Safety and the Environment

2.19.1 Contractor shall have and maintain documentation detailing its HSE system and if combined, Contractor's policy is expected to have two separate and distinct sections related to: (1) Health and Safety and (2) the Environment.

2.19.2 Contractor shall be responsible that the health and safety requirements extend to all sub-contractor work associated with or included in the Agreement.

2.19.3 If requested Contractor will be required to provide documentary evidence to show compliance with the requirements of this document.

2.19.4 Contractor is required to have an operational HSE management system including, at a minimum a method for the identification of hazards during the execution of the Project and subsequently through the Design Life of the System through risk assessments, hazard reporting, planned inspections, regular maintenance of the System, and personnel qualification reviews.

2.19.5 Contractor will submit for approval by Owner the following management plans prior to commencing the Work:

- A Health and Safety Management Plan (HSMP);
- An Environment Management Plan (EMP); and
- An Emergency Response Plan (ERP).

2.19.6 Both the HSMP and the EMP shall be specific to the Agreement and Work.

2.19.7 The HSMP and EMP shall be reviewed at regular intervals as agreed between Owner and Contractor to ensure that it remains current and relevant to the Work.

2.19.8 The HSMP and EMP shall establish the process for incident reporting in accordance with the Contract requirements.

2.19.9 A formal risk register shall be created and used to record the identified hazards, risk assessment and risk control methods to be employed by Contractor throughout the duration of the Work.

2.19.10 Contractor shall provide a description of Contractor's permitting system and safe work procedures for the applicable high risk work associated with the Contract (e.g. management of hazardous substances, working at height, confined spaces, extremes of temperature and electrical switching, other where relevant).

2.19.11 Contractor shall notify Owner immediately of any incident, involving injury, property or environmental damage or near miss incidents that had the potential to impact HSE, which occurs during the carrying out of the Work.

2.19.12 Contractor shall comply with all relevant Applicable Standards and its obligations under the Contract including this document for the handling, storage and disposal of hazardous materials and solid waste.

2.19.13 Contractor shall be responsible for the safe disposal of all waste, toxic and hazardous materials during the course of the Work. Such disposals shall be in accordance with the requirements of the relevant Authorities.

2.19.14 Contractor shall be responsible for obtaining all approvals, permits or other authorizations required for the disposal of waste.

2.19.15 Contractor shall be responsible for providing adequate fire protection equipment for protection of the System during the course of the Work including any requirements stipulated in the planning permit such as the supply of fire water tanks.

2.20 Solar Field Layout

2.20.1 For a ground-mounted system, the area available for the PV arrays is limited by the geotechnical survey landscape, protected areas, and other site constraints specified in the ALTA Survey Map.

2.20.2 Design parameters other than those specified in this document shall be defined by Contractor.

2.20.3 Row spacing (frame to frame) shall be specified by Contractor, but shall be adequate to allow access for customary maintenance vehicles such as commercial mowing equipment suited for ground-mounted systems, and maintenance personnel for rooftop systems.

2.20.4 Module tilt shall be specified by Contractor, but shall be adequate to allow proper water shedding.

2.20.5 The inverters shall be specified by Contractor, but shall be commercially viable, as approved by Owner.

2.20.6 The dc to ac ratio, defined as the ratio of the sum standard test condition (STC) rating of modules to the sum nameplate rating of inverters (otherwise known as the inverter loading ratio – ILR), shall be defined by Contractor, but shall not violate requirements and limits of the inverter manufacturer.

2.21 Design Codes and Standards

2.21.1 Work performed under these Technical Specifications shall be in accordance with standard engineering practice and all of the latest codes and standards listed below and otherwise referenced herein in addition to any other requirements set forth in the Agreement. 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 on the Effective Date shall apply. The referenced codes and standards shall govern the Work, except where they conflict with Owner's specifications set forth in the Agreement, and in such case, the conflict shall be referred to Owner for final resolution.

- Local building codes and amendments.
- Local energy codes and amendments.
- Local environmental protection agency.
- Local soil erosion and sediment control regulations.
- American National Standards Institute (ANSI).
- American Society of Civil Engineers (ASCE)
- American Society for Testing and Materials (ASTM).
- American Institute of Steel Construction (AISC).
- American Concrete Institute (ACI).
- Occupational Safety and Health Administration (OSHA).
- United States Code of Federal Regulations (CFR).
- Institute of Electrical and Electronics Engineers (IEEE).
- International Electrotechnical Commission (IEC)
- International Electrical Testing Association Inc. (NETA)
- International Building Code (IBC).
- International Fire Code 2009.
- National Electrical Code (NEC).
- National Electrical Manufacturer's Association (NEMA).

- National Electrical Safety Code (NESC).
- National Fire Protection Association (NFPA).
- Underwriters Laboratories Inc. (UL).
- County and/or Local Authorities Having Jurisdiction (AHJ).

2.22 Electrical Design Criteria

2.22.1 The design shall take into account ambient temperature, relative humidity, elevation above mean sea level, and proximity to potentially corrosive environments. The electrical design shall take into consideration the available short circuit current, from the utility side, and ensure that all specified equipment meets the appropriate protection levels to prevent hazards or damage to that equipment or personnel.

2.22.2 All electrical equipment shall be designed in accordance with all applicable codes and standards, to ensure that it is safe to operate within the specified application, and that it will be reliable.

2.22.3 All design drawings and specifications produced shall be sealed by a Professional Electrical Engineer licensed to practice in the state where the Project is located. The professional Electrical Engineer of Record shall review drawings and specifications that are produced by other disciplines in order to ensure compatibility and consistency throughout the design.

2.23 Civil, Structural, and Architectural Design Criteria

2.23.1 The design shall take into account all applied loads including dead, live, impact, thermal, dynamic, settlement, movement, wind, snow, ice, seismic, and other loading conditions where appropriate. Temporary loads during maintenance and erection shall be considered.

2.23.2 All structures and structural elements, including array structures, shall be designed in accordance with all applicable local Building and Codes and standards pertaining to the erection of such structures.

2.23.3 All structural components, including array structures shall be designed in a manner commensurate with attaining a minimum 25 year design life. Particular attention shall be given to the prevention of corrosion at the connections between dissimilar metals.

2.23.4 All design drawings and specifications produced shall be sealed by a Professional Structural or Civil Engineer licensed to practice in the state where the Project is located. The professional Structural or Civil Engineer of Record shall review drawings and specifications that are produced by other disciplines in order to ensure compatibility and consistency throughout the design.

2.23.5 Steel structures shall be designed by either the allowable stress method (ASD) or load and resistance factor method (LRFD). Reinforced concrete structures shall be designed by the ultimate strength method.

2.23.6 Wind Loads

The Project design wind speed is as required by the local AHJ. All structures shall be designed per the 2012 or most recent applicable International Building Code (IBC) with local amendments or as required by the AHJ based on Contractor's overall system design components, at no additional cost to Owner, but in all cases Contractor is ultimately responsible for system survivability.

2.23.7 Site Flooding

For ground-mounted system, the Project Site shall be designed to handle runoff from a 100 year storm and mitigate flood risks from a 500-year storm event should the Project Site be determined to be within a FEMA Flood Zone.

2.23.8 Seismic Loads

Structures shall be seismically designed in accordance with the 2012 IBC with local amendments. Contractor shall determine the appropriate Seismic Design Category for the Project Site based on 2012 IBC and design the structures accordingly. For module support structure design only, Risk Category II shall be utilized to determine the importance factor. The module support structure shall be able to operate after a design seismic event based on the criteria above.

2.23.9 Factors of Safety

Minimum factors of safety for all structures, tanks, and equipment supports shall be as shown in the table below.

Table 2-1 Factor of Safety

PARAMETER	FACTOR OF SAFETY
Overturning	1.50
Sliding	1.10 for seismic load, 1.50 for wind load
Buoyancy	1.25
Uplift due to wind	1.50

2.23.10 Module support frames and foundation support systems shall be designed to allow the modules to function normally after a design wind event as indicated above. Calculations documenting the design, deflection, and functionality shall be submitted for review and approval prior to construction of any systems in the field.

2.24 Engineering Completion

2.24.1 No less than 10 business days prior to commissioning activities, Contractor shall prepare and deliver to Owner an:

- Operations and Maintenance (O&M) Manuals-Final. Vendor will submit the O&M manual in hard copy and electronic form. The O&M manual shall include as a minimum:
  - Equipment description/specifications
  - System description
  - Equipment startup procedures
  - Equipment shutdown procedures
  - Equipment warning and trip setpoints
  - Normal system operations controls
  - Abnormal system operations controls
  - Equipment fault codes
  - Trouble shooting guides
  - Maintenance intervals and tasks; including:
    - Procedures
    - Tools
    - Inspection criteria, as required
  - Troubleshooting guide
  - Systems Descriptions describing normal and abnormal control for system components
  - Equipment Startup Procedures
  - Equipment Shutdown Procedures
  - Normal system operations and controls
  - Abnormal system operation controls
  - Equipment faults codes
  - Condition monitoring intervals and tasks; including:
    - Inspection procedures
    - Inspection criteria

2.24.2 Within one 30 calendar days of completion of commissioning activities, the following submittals shall be provided to Owner as applicable.

- Protective relay calibration tests
- Trial operation of equipment – summary report
- Manufacturer field service reports

2.24.3 Contractor shall provide the following information and documentation upon Project Final Completion as applicable:

- Hard copy and electronic as-built revision of IFC drawings per Owner CAD standards.
- Electronic CAD versions of As-built revision of IFC drawings per Owner CAD standards
- Electronic CAD versions of vendor supplied equipment and wiring diagrams per OWNER CAD standards.
- Interconnection approvals

2.24.4 User manuals should not substitute for System Descriptions. A complete System Description shall be provided by Contractor for all systems and related equipment.

2.25 Delivery

2.25.1 Contractor shall bear the responsibility for delivery of equipment, spare parts, special tools, and materials to the site and shall comply with the requirements specified herein and shall provide required information concerning the shipment and delivery of the materials specified in this Contract. These requirements also apply to any sub-suppliers making direct shipments to the jobsite.

2.25.2 Owner or Owner shall, from time to time, at their discretion supply equipment, spare parts, special tools, and materials to the site. Contractor shall coordinate receipt of such items and shall apply all requirements set forth herein to those items.

2.25.3 Contractor shall, either directly or through contractual arrangements with others, accept responsibility for the safe handling and protection of the equipment and materials furnished under this Contract by Contractor before and after receipt at the port of entry. Acceptance of the equipment shall be made after it is installed, tested, commissioned, placed in operation and found to comply with all the specified requirements.

2.25.4 All items shall be checked against packing lists immediately on delivery to the site for damage and for shortages. Damage and shortages shall be remedied with the minimum of delay, at no additional cost to Owner when it is Contractor supplied.

2.25.5 Delivery of portions of the equipment in several individual shipments shall be subject to review of Engineer before shipment. When permitted, all such partial shipments shall be plainly marked to identify, to permit easy accumulation, and to facilitate eventual installation.

2.26 Storage

2.26.1 Upon delivery, all equipment and materials shall immediately be stored and protected by reasonable means until installed in the Work. It is assumed that all materials can be

received and stored at the project site. If offsite storage is required, it shall be coordinated and approved by Owner.

2.26.2 Stacked items shall be suitably protected from damage by spacers or load distributing supports that are safely arranged. No metalwork (miscellaneous steel shapes and reinforcing steel) shall be stored directly on the ground. Galvanized steel with architectural purposes shall be stored with appropriate spacers to protect against galvanic discoloring. Galvanic discoloring is not applicable to ground mount array piles for which some discoloring is acceptable. Masonry products shall be handled and stored in a manner to hold breakage, chipping, cracking, and spalling to a minimum. Cement, lime, and similar products shall be stored off the ground on pallets and shall be covered and kept completely dry at all times. Pipe, fittings, and valves may be stored outdoors, but must be placed on wooden blocking. PVC pipe, geomembranes, plastic liner, and other plastic materials shall be stored off the ground on pallets and protected from direct sunlight.

2.26.3 Motors, electrical equipment, and all equipment with antifriction or sleeve bearings shall be stored in weathertight structures maintained at a temperature above 60°F [16°C]. Electrical equipment, controls, and insulation shall be protected against moisture and water damage. Space heaters furnished in equipment shall be connected and operated appropriately to protect equipment from condensation.

2.26.4 Equipment having moving parts, such as gears, bearings, and seals, shall be stored fully lubricated with oil, grease, etc., unless otherwise instructed by the manufacturer. Manufacturer's storage instructions shall be followed by Contractor.

2.26.5 Equipment and materials shall not show any pitting, rust, decay, or other deleterious effects of storage when installed in the Work.

2.26.6 When applicable and reasonable, the packaging of spare units and spare parts shall be suitable for long-term storage in a damp location. Each spare item shall be packed separately and shall be completely identified on the outside of the container.

2.27 Handling

Stored items shall be laid out to facilitate their retrieval for use in the Work. Care shall be taken when removing the equipment for use to ensure the precise piece of equipment is removed and that it is handled in a manner that does not damage the equipment.

2.28 Miscellaneous

Contractor shall be responsible for any damage to the Project Site caused by it or its Subcontractors.

3. PLANT ELECTRICAL DESIGN AND EQUIPMENT REQUIREMENTS

3.1.1 The following sections provide equipment specifications and requirements for electrical equipment. Contractor shall select equipment manufacturers with sufficient capacity to produce and deliver required materials without causing delay in work.

3.1.2 Appendix A shows a list of preferred vendors that may be selected from. Deviation from the criteria in this section is acceptable, if the contractor can provide sufficient evidence to support the creditworthiness and track record of a proposed vendor.

3.2 Photovoltaic Modules

3.2.1 The modules shall be designed to produce electricity for a minimum of 25 years under the environmental conditions of the Project Site. The electricity generation capabilities of the modules shall meet or exceed the capabilities defined by the module electrical data sheet of the product. Annual degradation shall be specified by the manufacturer.

3.2.2 Solar PV modules shall comply with the following parameters:

3.2.2.1 Manufacturer. The module manufacturer shall be as agreed upon by Contractor and Owner or Owner's Engineer.

3.2.2.2 Manufacturer Experience. The manufacturer shall have at least five (5) years of experience manufacturing photovoltaic modules.

3.2.2.3 Manufacturing Capacity. The manufacturer shall have a current minimum manufacturing capacity of at least 100 MW per year.

3.2.2.4 Specifications:

- The manufacturer/supplier shall provide detailed electrical and mechanical specification sheets for the module.
- The manufacturer shall provide the estimated annual degradation of their module and justify the value provided with historical production data.
- The maximum allowable annual degradation for modules used on this Project shall be 0.5 percent.

3.2.2.5 Technology. The cell technology for the PV module shall be either mono or poly crystalline silicon, or "thin-film" technology such as amorphous silicon (a-Si) or cadmium telluride (CaTel).

3.2.2.6 Codes and Standards. Modules shall either be UL listed or certified by an OSHA-approved testing agency to meet the UL 1703 specification. The certificates of factory/laboratories tests and compliance to the

codes and standards referenced by the manufacturer shall be provided to Owner by the procuring Party.

3.2.2.7 Labeling. The modules shall be provided with a permanent label indicating, at a minimum, the following information:

- Make/model identities
- Electrical characteristics, including open circuit voltage (Voc); short circuit current (Isc); maximum power point voltage (Vmpp); maximum power point current (Impp); nominal power (W), maximum series fuse size
- Nominal power conditions, Standard Test Conditions (STC), Nominal Operating (NOCT), etc.
- Environmental operating conditions
- Compliances with standards (UL, IEC, CE, etc)
- Warnings of electrical hazard
- Maximum system voltage
- Date and location of manufacture, manufacturing code
- Serial number

3.2.2.8 Module Design and Construction.

- The modules shall be new and, in order to maintain the homogeneity of the plant, all cells and modules connected to the same single inverter shall be identical, and supplied by the same manufacturer.
- The modules shall include factory installed power conductors at least No. 12 AWG, rated at 600 V DC, 1000 V DC, or 1500V DC (as appropriate) with clearly defined polarities, weather-proofed, UV resistant/outdoor rated and with locking-type plug-in connectors of single polarity and with same environmental and electrical ratings as the power conductors.
- All modules of the same type shall have the same connectors.
- The modules shall include a grounding lug, grounding hole, or some other tested grounding attachment mechanism (applicable for framed modules only).
- The module, and framing where provided, shall be corrosion-resistant, resistant to damage from snow, wind, hail and windblown dust and sand.

3.3 Module Mounting System

3.3.1 The Module Mounting System shall meet the following specifications:

3.3.1.1 The design specifications for the foundations of the module mounting system ("mounting system") shall be provided by Contractor as part of the mounting system design specifications.

3.3.1.2 The mounting system foundation shall be designed to withstand the soil chemistry of the Project Site location (ground-mounted system) for a minimum of 25 years without replacement.

3.3.1.3 The foundation shall be designed to comply with all of the environmental conditions of the Project Site.

3.3.1.4 The mounting system shall be designed to withstand wind speeds up to the maximums specified by applicable codes, over its specified operating lifetime, without compromising its structural integrity for a minimum of 25 years.

3.3.1.5 The mounting system shall be able to operate normally after high wind conditions have been cleared.

3.3.1.6 The mounting system and modules shall be continuously bonded and grounded to the ground grid system.

3.3.2 In addition to meeting the requirements of the mounting system, Contractor in coordination with party procuring the mounting system for the Project, if other than Contractor, shall:

3.3.2.1 Provide detailed information on the materials and design of the mounting system.

3.3.2.2 Provide a detailed structural analysis of the foundations and demonstrate that the design conforms to the applicable standards and codes.

3.3.2.3 Ensure that the modules will stay attached to the mounting structure under all environmental conditions specified by applicable codes.

3.3.2.4 Ensure that the design of the mounting structure will specify the attachment of the PV modules to mounting structure in accordance with the mounting specifications provided by the PV module manufacturer.

3.3.2.5 Submit all structural designs and calculations for the mounting system to Owner for review and approval prior to purchase of any mounting system equipment.

3.3.2.6 For ground-mounted systems, prepare a design to mitigate the effects of corrosive soils on the structural support system, which includes adding sacrificial layer to the structural steel members, galvanizing and/or coating the structural steel members with additional epoxy coating.

3.4 Combiner Boxes

3.4.1 Each combiner box shall include a fused connection between any ungrounded DC circuit wiring from PV strings to provide over-current and short-circuit protection. When applicable, the grounded DC circuit wiring from PV strings shall be connected to a terminal block and bus bar and then connected appropriately to the ground. The combiner box output circuit (homerun) shall be provided with a load-break disconnect switch with exterior lockable handle, rated for the voltage and current of the combined PV strings.

3.4.2 The string fuses and fuse holders shall be finger-safe and rated according to the string DC current and voltage, and environmental conditions. The power terminal blocks shall be rated for use with both copper and aluminum conductors and rated to match maximum system voltage (continuous duty, 600 V DC, 1000 V DC, or 1500V DC, as applicable) and 90°C conductor temperature. The combiner box shall be equipped with a mechanical ground lug and bus, rated for terminations with Al/Cu grounding conductors. Short circuit withstand rating shall be 10 kAIC minimum.

3.4.3 The combiner box enclosure shall be nonmetallic, outdoor-rated, weatherproof, NEMA 4 or NEMA 4X, and the doors shall be easily interchangeable. The manufacturer shall supply a fully assembled combiner box and shall provide detailed drawings, specifications sheets, mounting instructions, and maintenance requirements of its product.

3.4.4 Each combiner box shall provide "touch-safe" power circuit terminations and include provisions for bolted terminations of the output power circuit to the inverter. Each combiner box shall include a provision for a padlock, including a padlock and key.

3.4.5 The combiner box door shall be interlocked with a load-break disconnect switch in such a manner that the door cannot be opened when the switch is "closed." In addition, the switch shall not be capable of being placed in the "closed" position unless the combiner box door is fully closed. An external door interlock defeat mechanism shall be provided to allow authorized personnel access to the interior of the combiner box while the switch is in the "closed position for periodic inspection, troubleshooting, and electrical field measurements.

3.4.6 The combiner box shall be listed to UL 1741 for use in United States applications/ IEC 60146-1-1 and CSA C22.2 No. 107.1 may be substituted if authorized by Owner.

3.4.7 The combiner box shall be rated for an operating temperature range of -20°C to +50°C.

3.4.8 Each combiner box shall be suitable for application of permanent labels in the field and shall include electrical warning labels. The combiner box shall provide a permanent warning label stating the following:

WARNING:
ELECTRIC SHOCK HAZARD
DO NOT TOUCH TERMINALS
TERMINALS ON BOTH THE LINE AND LOAD
SIDES MAY BE ENERGIZED
IN THE OPEN POSITION

DC VOLTAGE IS ALWAYS PRESENT
WHEN SOLAR MODULES
ARE EXPOSED TO SUNLIGHT

3.5 **Inverters**

Each solar PV inverter shall meet the following requirements:

3.5.1 The inverter shall include the necessary DC circuit breakers/disconnect switches, AC circuit breakers/disconnect switches, local controls, remote SCADA/DAS interface, grid operator

control interfaces, and accessories necessary for the inverter to function properly as part of a power generation facility.

3.5.2 Environmental ratings: -20° to +50°C (-4° to 122°F), Humidity: 15 % - 95%, non-condensing, 6,500 ft elevation.

3.5.3 Nameplate: >0.99 power factor above 20% rated power.

3.5.4 Inverters shall be capable of providing voltage regulating capability to regulate the voltage at the Point of Interconnection.

3.5.5 Inverters shall provide capability to operate in power factor control mode within plus or minus 0.90 pf.

3.5.6 Inverters shall include flicker mitigation.

3.5.7 Inverters shall be IEEE 1547 compliant, with allowances for variations to meet Utility specific requirements with approval by the Utility and Owner. Variations shall not defeat or bypass standard safety features or requirements. .

3.5.8 Output current harmonics shall contain <5% total harmonic distortion (THD) at rated power output, per IEEE 519.

3.5.9 Inverter CEC weighted efficiency shall be >97%, at or above 50% rated power, without medium voltage step-up transformer.

3.5.10 Inverters located outdoors shall be enclosed in lockable, NEMA 3R enclosures. The Supplier's design shall include an analysis of the maximum anticipated operating temperature to ensure that the manufacturer's recommended operating temperature is not exceeded.

3.5.11 Enclosure must have a door interlock system to prohibit the door(s) from being opened while energized.

3.5.12 The enclosure shall be arc flash safe, and be designed to channel energy upward and away from panel entry area.

3.5.13 Inverters shall incorporate a non-loadbreak, two (2)-pole, lockable disconnect switch for main DC power disconnect for maintenance personnel safety.

3.5.14 Inverter output shall be protected by a circuit breaker with short and long time adjustable over current protection. This circuit breaker shall be externally operated or Contractor shall furnish an external on/off (start/stop) switch.

3.5.15 Inverters shall be capable of rated output at 50ºC ambient or better without derating.

3.5.16 Inverters shall employ a maximum power point tracking scheme to optimize inverter efficiency over the entire range of PV panel output for the given Site design conditions.

3.5.17 Inverters shall be equipped with all hardware for data collection and communication to the central SCADA/DAS server, including the ability to write to the control registers to reset inverter and modify ac output parameters, including power factor and maximum power. Data collection points shall be integrated into the inverter monitoring and communications package. Data collection points included shall be (at a minimum):

- AC Voltage
- DC Voltage
- AC Current
- DC current per input
- Power (kW)
- Energy (kWh)
- Alarms
- Inverter temperature
- Inverter status and faults (including ground fault interrupts)

3.5.18 If a skid-mounted inverter package unit is used, it shall include a fused and disconnectable Control Power Transformer (CPT).

3.5.19 CPT shall be sized and single phase breakers shall be included to supply power to a convenience receptacle, inverter heaters or air conditioners (if required to meet manufacturer recommended humidity requirements), fluorescent light fixtures, HVAC (if required to meet manufacturer recommended operating temperature requirements), inverter control power, and power for tracker motors (if applicable).

3.5.20 Inverters shall be equipped with multiple fused, disconnectable DC inputs with built in current and fault monitoring for input to the SCADA system.

3.6 Met Station

Met station shall be equipped with all hardware for data collection and communication to the central SCADA/DAS server. Data collection points included shall be (at a minimum):

- Air Temperature
- Cell Temperature
- Relative Humidity
- Wind Speed
- Global Irradiance

3.7 Medium Voltage, Pad-Mounted Transformers

3.7.1 This section covers compartmented, tamper-resistant, weatherproof, medium voltage, pad-mounted transformers. Transformers shall be designed, constructed, and tested in accordance with the applicable standards of ANSI, NEMA, UL, and NEC, with the following list of specific standards, unless indicated otherwise:

- ANSI C57.12.00 and C57.12.27 (general)
- ANSI C57.12.70 and C57.12.80 (connections and terminology)
- ANSI C57.12.90 (test code)
- ANSI/IEEE C57.109 (transformer damage curves and protection)
- ANSI C57.12.26 (dead-front high-voltage bushings)
- ANSI/IEEE 386 (separable connectors)

3.7.2 Medium voltage, pad-mounted transformers shall meet the following requirements:

3.7.2.1 A nameplate with unit description shall be provided on each transformer.

3.7.2.2 Nameplates shall be black and white laminated phenolic material of suitable size, engraved with 3/4 inch [19 mm] high letters.

3.7.2.3 The engraving shall extend through the black exterior lamination to the white center.

3.7.2.4 An instruction nameplate shall be mounted inside the low-voltage compartment door and shall be readable with cables in place.

3.7.2.5 All doors giving access to high-voltage parts shall be posted with DANGER - HIGH VOLTAGE - KEEP OUT signs.

3.7.2.6 The signs shall be constructed of heavy gage metal, with red letters on a white background.

3.7.2.7 Transformer primary high voltage winding configuration shall be delta or wye-solidly grounded.

3.7.2.8 Transformer secondary low voltage winding configuration shall be three-phase, and shall comply with applicable inverter manufacturer step-up transformer requirements.

3.7.2.9 When two inverters are connected to the low voltage side of one transformer, the secondary low voltage winding configuration shall have two or more windings, as applicable for galvanic isolation as required per inverter types to be interconnected.

3.7.2.10 Frequency shall be 60 Hz.

3.7.2.11 For multiple transformers to be connected in series, transformer primary winding configuration shall be loop type with feed-through inserts and integral fused load-break switch.

3.7.2.12 The transformer tank and terminal compartments shall be bolted together to form an integral unit of weatherproof construction, suitable for outdoor installation.

3.7.2.13 The transformer shall be completely enclosed, with one high-voltage and one low-voltage compartment door, each independently operable.

3.7.2.14 No externally removable bolts, screws, or other fastening devices shall be used (with the exception of pentahead bolts for security) that provide access to the energized parts within the enclosure.

3.7.2.15 The enclosure shall be of tamper-resistant design.

3.7.2.16 Transformer shall have full height, air-filled, dead-front incoming and outgoing terminal compartments with hinged doors located side by side, separated by an isolation barrier.

3.7.2.17 The low-voltage compartment shall be on the right when facing the transformer.

3.7.2.18 The fastenings of the high-voltage compartment door shall be independently operable – such that opening of the high-voltage compartment is not predicated by opening of the low-voltage compartment.

3.7.2.19 Both compartment doors shall have a 3-point latching mechanism with vault type handle and provisions for a single padlock each.

3.7.2.20 The doors shall be equipped with stainless steel lift-off type pin hinges and doorstops to hold the doors open when working in the compartments.

3.7.2.21 The doorsills shall be removable to permit the transformer to be rolled or skidded into place over conduit stubs.

3.7.2.22 Each compartment shall be suitable for installation of incoming and outgoing cables through the bottom.

3.7.2.23 A tank-grounding pad shall be furnished in each compartment.

3.7.2.24 The tank shall be built with sealed construction, capable of withstanding 10 psi without permanent distortion. Transformer shall be self-cooled. Transformer fluid shall be mineral oil. A less-flammable or fire resistant hydrocarbon type (Cooper Envirotemp FR3, OAE), may be considered.

3.7.2.25 Transformers shall meet efficiency standards set forth in the Department of Energy “Energy Conservation Program for Commercial Equipment: Distribution Transformers Energy Conservation Standards; Final Rule,” published October 12, 2007.

3.7.2.26 Transformers shall be rated to withstand 5% THD, to accommodate inverter source operation.

3.7.2.27 The average temperature rise of the windings, measured by resistance, shall not exceed 65°C (or 55°C) when the transformer is operated at rated kVA output at an average ambient temperature of 30°C (or 40°C) over 24 hours, with a maximum of 40°C (or 50°C).

3.7.2.28 The primary winding shall have four 2-1/2 percent fully rated taps, two above and two below rated voltage.

3.7.2.29 The tap-changer shall be used only when the equipment is de-energized and shall be operated with a hot or hook-stick tool.

3.7.3 The basic impulse level (BIL) of the high-voltage windings shall conform to the following:

Table 3-1 Basic Impulse Level for High Voltage Windings

Phase-to-Phase Voltage (kV)	BIL Voltage (kV)
2.4	45
4.16 and 4.8	60
7.2 and 8.3	75
12.0 through 14.4	95
24.9 delta	125
24.9 wye	125
34.5 wye	150
34.5 delta	200

3.7.4 Transformers shall have the following impedances at their lowest self-cooled ratings:

Table 3-2 Medium Voltage Transformer Impedance Ratings

Transformer Size (kVA)	Impedance (percent)
75, 112.5 and 225	4.0
300 and 500	4.5
750 and 1000	5.75
1500 and 2000	5.75
2500 and 3000	5.75
3500, 3750 and 5000	6.5

3.7.5 Transformer impedance requirements may differ, depending on inverter manufacturer specifications. The inverter manufacturer's requirements shall supersede the impedance values listed in the above table.

3.7.6 The transformer tank shall be of sealed construction, with a welded cover.

3.7.7 A bolted tamper-resistant handhole shall be provided in the cover for access to internal connections.

3.7.8 The tank shall have provisions for installation by lifting, jacking, or rolling into position.

3.7.9 The transformer shall be equipped with a liquid level indicator; a pressure relief device; and standard provisions for filling, draining, and sampling, in a lockable cabinet outside the energized cabinets.

3.7.10 The high-voltage terminations and equipment shall be dead-front type conforming to ANSI C57.12.26.

3.7.11 Dead-front construction bushings shall be either universal bushing wells or one-piece integrated bushings for use with separable connectors.

3.7.12 Six bushing wells shall be provided with ratings of 200 A or 600 A as applicable.

3.7.13 Bushings shall be externally clamped and front removable.

3.7.14 Each bushing shall have an adjacent parking stand.

3.7.15 Transformer primary fuse and disconnect switches shall be furnished to isolate the transformer in case of an internal fault.

3.7.16 The transformer and switch configuration shall be designed for loop feed.

3.7.17 Switches shall be internal, liquid-immersed four-position load break type.

3.7.18 Switches shall be rated a minimum of 200 A or 600 A continuous, as applicable

3.7.19 Bayonet type fuses shall be provided and shall be liquid-immersed, expulsion fuses accessible through the primary compartment.

3.7.20 The fuses shall be removable for external replacement of fuse links using a hot-stick tool without disassembly of the primary cabinet.

3.7.21 The secondary terminations shall consist of low-voltage bushings.

3.7.22 The bushings shall be of molded epoxy, and shall be provided with blade-type spade terminals with NEMA standard hole spacing arranged for vertical takeoff.

3.7.23 The low-voltage neutral shall be an insulated bushing, grounded to the tank by a removable link (check with inverter manufacturer to ensure that there are no special provisions required).

3.7.24 Each transformer shall have alarm contacts for the following conditions: oil level, oil pressure, and temperature. Provisions for analog / digital output of oil pressure and temperature, voltage and current quantities, and ground-fault detection, shall be considered and provisioned for in the SCADA or Inverter communication requirements as directed by the O&M provider. Alarm contacts may be housed in an attached weather-proof cabinet outside either energized cabinet

3.7.25 All iron and steel surfaces, except stainless steel and machined surfaces, shall be shop painted with the manufacturer's standard coating to a minimum thickness of 3 mils.

3.7.26 Finish color shall be ANSI 61 (gray) for indoor and outdoor equipment, unless otherwise specified by Owner.

3.7.27 A sufficient quantity of additional coating material and thinner shall be furnished to permit field touchup painting of damaged coatings.

3.7.28 All tank cabinet and fin steel shall be painted in accordance with ANSI C57.12.28 with a final coat in light gray, wheat, or any earth tone. The paint finish shall be capable of passing the following tests:

3.7.29 A 1500 hour salt spray test per ASTM B117

3.7.30 A 1000 hour humidity test

3.7.31 An impact test per ASTM D-2794,

3.7.32 A three-day oil immersion test

3.7.33 All standard factory tests required by the ANSI/IEEE C57.12.90 test code shall be performed.

3.7.34 Completed test reports shall be provided.

3.7.35 Manufacturer shall allow the option for Owner to personally witness these factory tests on at least one production unit that will be delivered to the project site.

3.8 Lightning Protection

3.8.1 Lightning protection shall be determined in accordance with risk calculations included in NFPA 780 using lightning flash density maps, or as specifically required by Owner.

3.8.2 Lightning protection with traditional air terminals shall be provided atop the following structures:

- Inverter/transformer canopies
- Inverter walk-in enclosures
- Control building
- Other similar structures

3.8.3 Lightning protection equipment shall be either Class 1 or Class 2, depending on the height of the structure to be protected in accordance with NFPA 780. Lightning protection equipment shall include, but not be limited to, the following:

- Air terminals
- Air terminal supports
- Main conductor
- Bonding conductor

3.8.4 All lightning protection equipment shall be UL listed.

3.9 Raceways

3.9.1 Contractor shall design, provide, and install a complete electrical raceway and/or ductbank system as required by applicable codes and as specified herein. Cables supported in free air as approved by the NEC are acceptable for installation of module wiring and harnesses to the combiner boxes as applicable.

3.9.2 Conduits shall be EMT, RGS, LFMC, or PVC schedule 40 or 80, as applicable, and specified below.

3.9.2.1 Electrical Metallic Tubing (EMT)

EMT conduit shall meet the following requirements:

- Hot dip galvanized, corrosion resistant
- Listed to UL 797 and UL 514B
- Conform to ANSI C80.3
- Fittings shall be integral compression type and watertight

3.9.2.2 Rigid Galvanized Steel (RGS)

RGS conduit shall meet the following requirements:

- Hot dipped galvanized, corrosion resistant
- Listed to UL 6 and UL 514B
- Conform to ANSI C80.1
- Fittings shall be threaded type and watertight

3.9.2.3 PVC Schedule 40/80 Conduit

PVC Schedule 40/80 conduit shall meet the following requirements:

- Sunlight or UV Resistant
- Listed for UL 651
- Conform to NEMA TC-2

3.9.2.4 Liquidtight Flexible Metallic Conduit (LFMC)

LFMC conduit shall meet the following requirements:

- Hot dipped galvanized steel core
- Flame retardant PVC jacket
- Sunlight or UV resistant
- Moisture and oil resistant
- Listed to UL 360
- Fittings shall be threaded type and watertight.

3.10 Grounding

Grounding shall be designed and provided as required by NEC, NESC, IEEE, and local code requirements. In addition, specific requirements are listed below:

3.10.1 Ground grids or ground loops shall be provided under/around major electrical equipment (step-up transformers, medium voltage switchgear, inverters, etc.).

3.10.2 The grounding system shall consist of bare copper conductor and copper-clad steel or stainless steel ground rods.

3.10.3 The system shall be designed to protect Project personnel and equipment from the hazards that occur during power system faults and lightning strikes.

3.10.4 Conductors utilized for grounding shall be appropriate for the Project Site's soil conditions.

3.10.5 Contractor shall design the station grounding grid for adequate capacity to dissipate heat from ground current under the most severe conditions in areas of high ground fault current concentrations, and in such a way that it is possible to maintain grid spacing to achieve safe voltage gradients.

3.10.6 For ground grids below grade, each junction of the grid shall be bonded with exothermic welds.

3.10.7 Major items of equipment such as inverters and transformers shall have integral ground buses connected to the station ground grid.

3.10.8 Contractor shall route a grounding conductor parallel to all power conductors operating above 208Y/120 volts.

3.10.9 For grounded dc systems (inverter type determines), the module dc system grounding electrode(s) shall be common with, or bonded to, the ac grounding electrode as indicated in NEC Article 690.47. Module grounding shall be in compliance with module manufacturer recommendations for grounding.

3.10.10 Contractor shall perform grounding calculations in accordance with IEEE standards and submit to Owner for verification that step and touch potentials are within the acceptable limits. Design shall also conform to IEEE Standard 665. Contractor shall determine the values used in the calculations through testing and shall not use typical values or estimates.

3.11 Power and Control Wiring

Cables shall be selected with an insulation level applicable to the system voltage for which they are used and ampacities suitable for the load being served. The type of cable used shall be determined by individual circuit requirements, temperature, and individual equipment manufacturer's recommendations. Current carrying conductors shall be copper. All exposed wiring shall be clearly indicated as sunlight or UV resistant.

3.11.1 DC Cables (module to module or combiner box)

DC cables connecting modules to modules and modules to combiner boxes shall meet the following requirements:

3.11.1.1 DC cables shall be sized in accordance with the NEC requirements for "Solar Photovoltaic Systems" (Article 690) and shall be rated according to the maximum system voltage.

3.11.1.2 Conductors shall be sized accordingly taking into account any ambient temperature or ampacity de-rate factors and voltage drop considerations. DC cabling shall be sized to not exceed a maximum voltage drop of 2 percent at Standard Test Conditions.

3.11.1.3 "PV Wire" is required for dc string cables.

3.11.1.4 Conduit (flexible or rigid) shall be used for transitions "entering" and "exiting" the cable trench to meet NEC 300.5(D) requirements.

3.11.1.5 DC conductors installed in PVC conduit are acceptable.

3.11.1.6 Cable insulation levels shall be rated according to the maximum PV system voltage.

3.11.1.7 Insulation and jacket materials on all dc conductors, regardless of location, shall be made from thermoset materials such as XLPE or EPR. No thermoplastic insulation or jacket materials are permitted for dc conductors. Cable insulation type shall be sunlight resistant, rated for wet locations, and have a temperature rating of 90° C or better.

3.11.1.8 If wind gusts exceed 100 mph at the Project Site, exposed DC string wiring shall be secured at intervals of approximately 24 inches, on center, maximum.

3.11.2 DC Cables (combiner box to inverter)

DC cables connecting combiner boxes to inverters shall meet the following requirements:

3.11.2.1 Conductors shall be sized accordingly taking into account any ambient temperature or ampacity de-rate factors and voltage drop considerations. DC cabling shall be sized to not exceed a maximum voltage drop of 2 percent at Standard Test Conditions.

3.11.2.2 Conduit (flexible or rigid) shall be used for transitions “entering” and “exiting” the cable trench to meet NEC 300.5(D) requirements.

3.11.2.3 DC conductors installed in PVC conduit are acceptable.

3.11.2.4 Cable insulation levels shall be rated according to the maximum PV system voltage.

3.11.2.5 Insulation and jacket materials on all dc conductors, regardless of location, shall be made from thermoset materials such as XLPE. No thermoplastic insulation or jacket materials are permitted for dc conductors. Cable insulation type shall be rated for wet locations, and have a temperature rating of 90° C or better.

3.11.3 AC Power Cable (inverter output to step-up transformer, auxiliary power)

AC cables connecting inverters to step-up transformer, or for auxiliary power, shall meet the following requirements:

3.11.3.1 Copper conductor

3.11.3.2 All power and control cables shall be UL listed.

3.11.3.3 Cables shall be routed in UL listed wireway, conduit, direct buried PVC conduit, or underground duct banks, as required.

3.11.3.4 A maximum of 3 percent ac voltage drop is acceptable in other ac circuits not associated with solar power production.

3.11.3.5 Less than 600 VAC applications

- Cable insulation levels shall be rated 600 VAC.
- Conductors installed in PVC conduit are acceptable.
- Low voltage power cables for loads up to 480VAC and control cables (i.e., 120VAC) shall have copper conductor with 600 volt-class insulation.
- Power cables shall be Type XHHW-2 with concentric-lay, uncoated copper, strand B conductor, rated for normal maximum operating temperature of 90° C in wet and dry applications, cross-linked thermosetting polyethylene insulation, and conforming to ICEA S-95-658 (NEMA WC 70).

3.11.3.6 Between 600 VAC and 1000 VAC applications

- Cable insulation levels shall be rated 1000 VAC.
- Conductors installed in PVC conduit are acceptable.
- Insulation and jacket materials on all conductors, regardless of location, shall be made from thermoset materials such as XLPE. No thermoplastic insulation or jacket materials are permitted for conductors. Cable insulation type shall be rated for wet locations, and have a temperature rating of 90° C or better.
- In cases where inverter output voltage may exceed 1000VAC, a 2000VAC insulation rating is required.

3.11.4 Medium Voltage AC Power Cable (AC collection system)

AC collection system cables shall meet the following requirements:

3.11.4.1 Copper or Aluminum conductor.

3.11.4.2 In areas with higher ambient temperatures, larger conductors shall be used in accordance with the NEC for temperature correction, or higher temperature rated insulation shall be selected.

3.11.4.3 Conductor size and ampacity shall be coordinated with circuit protective devices.

3.11.4.4 Cables shall conform to ANSI/ICEA S-94-649, AEIC CS-8, and RUS U-1.

3.11.4.5 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.

3.11.4.6 AC collection cables shall be rated at for the appropriate voltage class with 100 or 133 percent TR-XLPE or EPR insulation, MV-105 copper or aluminum conductor, tape shield or concentric neutral, with an overall outer jacket suitable for direct burial.

3.11.4.7 Medium voltage power cable shall be installed in conduits, direct buried PVC conduit, or underground concrete-encased duct banks.

3.11.4.8 Medium voltage power cable phases shall be maintained in a trefoil configuration in all trenches and conduits. Cross-bonding the cable shields may be allowed as a supplement to, but not a replacement for, the trefoil configuration. Direct buried cables are not acceptable under concrete slabs, buildings, roadways, or other permanent structures.

3.11.4.9 In general, for medium voltage power cable using bare copper concentric neutral under jacket, the following guidelines shall be used unless design calculations indicate otherwise:

- Conductors smaller than 500 kcmil - full neutral
- Conductors at 500 kcmil - 1/3 neutral
- Conductors larger than 500 kcmil - 1/6 neutral

3.11.4.10 Tape shield may also be used, unless design calculations indicate otherwise.

3.11.4.11 Medium Voltage Splices

- Medium voltage splices shall be enclosed in a vault or junction box. There shall be no direct-buried splices. If vaults are used,

incoming medium voltage cable from each end shall loop once around the enclosure before splicing.

- Splice kits shall have a voltage rating that meets or exceeds the voltage rating of the medium voltage cable. Splice kits shall be cold shrink, inline, compression or crimp type, suitable for MV-105 cables. Hot shrink kits are not acceptable.
- The cold shrink splice body shall be a one-piece molded design made of formulated silicone rubbers.
- The cold shrink jacket shall be made of EPDM rubber for physical protection. The minimum BIL rating shall be appropriate for the voltage class and meet or exceed the requirements of ANSI/IEEE Standard 404.
- Splice kits shall be rated for continuous operation at 105° C and an emergency overload of 140° C.
- Splice kits shall be TE, 3M, or approved equal.

3.11.4.12 Terminations for cable onto transformer primary bushings or switchgear shall be made with 200 A minimum EPDM type elbows complete with junction modules, bushing inserts, parking stands, grounding wells, bushings, protective caps, standoff insulators, and other necessary accessories suitable for use with subsurface or pad-mounted installations, submersible to 10 feet of water. Termination kits shall be TE, or approved equal.

3.11.4.13 AC collection system cabling shall be sized to not exceed the “X” percent maximum voltage drop used in the energy production models. If NO value is provided, do not exceed 1.0 percent maximum voltage drop.

3.11.5 Grounding (medium voltage AC collection system)

Medium voltage ac collection system grounding cables shall meet the following requirements:

3.11.5.1 A minimum of 2/0 AWG bare or coated copper grounding conductor, in non-corrosive soils, shall be installed in the same trench, conduit, or raceway as the ac collector system cables.

3.11.5.2 In corrosive soils, an appropriate ground (e.g., insulated cable or tinned copper grounding conductor) shall be used in place of the bare copper grounding conductor.

3.11.6 Auxiliary Power Cables (lights, receptacles, computers, tracker motors and controllers, PLC, heating/ventilation)

Auxiliary power cables shall meet the following requirements:

3.11.6.1 Auxiliary power cables for loads up to 480 VAC and control cables (i.e., 120 volts ac) shall have copper conductor with 600 volt class insulation.

3.11.6.2 All power and control cables shall be UL listed.

3.11.6.3 Cables shall be routed in UL listed wireway, conduit, direct buried PVC conduit, or underground duct banks, as required.

3.11.6.4 A maximum of 3 percent ac voltage drop is acceptable in other ac circuits not associated with solar power production. The maximum voltage drop shall always be confirmed to against connected equipment's voltage operating range to ensure proper operation.

3.11.6.5 When not supplied by the manufacturer of the connected equipment, power cables shall be Type XHHW-2 with concentric-lay, uncoated copper, strand B conductor, rated for normal maximum operating temperature of 90° C in wet and dry applications, cross-linked thermosetting polyethylene insulation, and conforming to ICEA S-95-658 (NEMA WC 70).

3.11.7 Control Cables (alarms, contacts, etc.)

Control cables shall meet the following requirements:

3.11.7.1 Shall be Type THHN/THWN 600 volt rated with stranded, uncoated copper conductor, rated for normal maximum operating temperature of 90° C dry and 75° C wet applications, polyvinyl chloride insulation, jacket thickness of 4 mils minimum, and conforming to ICEA S-95-658 (NEMA WC 70) and UL 83.

3.11.7.2 Control cables shall be terminated with uninsulated ring-lugs, where applicable.

3.11.8 Analog Instrumentation (analog signals)

Cables for analog instrumentation shall meet the following requirements:

3.11.8.1 Twisted Shielded Pair type

3.11.8.2 16 AWG seven-strand

3.11.8.3 Concentric-lay

3.11.8.4 Uncoated copper conductor

3.11.8.5 Rated for normal maximum operating temperature of 90° C dry and 75° C wet applications

3.11.8.6 Polyvinyl chloride insulation not less 15 mils average thickness

3.11.8.7 Twisted pair of 1-1/2 inch to 2-1/2 inch (38.10 mm – 63.5 mm) lay

3.11.8.8 Shield consisting of combination aluminum-polyester tape and seven-strand #20 AWG minimum tinned copper drain wire

3.11.8.9 With shield applied to achieve 100 percent cover over insulated conductors

3.11.8.10 Jacket thickness of 4 mils minimum

3.11.8.11 Conductor color identification with one black conductor and one white conductor

3.11.8.12 Conforming to UL 62 for Type TFN, and UL 1277 for vertical-tray flame test requirements.

3.11.9 Fiber Optic Cable (SCADA)

Fiber optic cable shall meet the following requirements:

3.11.9.1 Single-mode or multi-mode, as applicable

3.11.9.2 6 strand minimum

3.11.9.3 OM3 cable for inside plant applications

3.11.9.4 Single armor (corrugated steel tape), single jacket when installed in conduit

3.11.9.5 Black polyethylene inner and outer jacket. Nominal wall thickness of 0.06 inches.

3.11.9.6 Gel filled

3.11.9.7 Overall water swellable barrier tape with 25 percent overlap

3.11.9.8 Tensile load (installation) of 600 lbs

3.11.9.9 Minimum bending radius 20 times cable diameter

3.11.9.10 Operating temperature -40° C to 70° C

3.11.10 Category 6 Cable (communications and analog signals)

Category 6 cable shall meet the following requirements:

3.11.10.1 Sunlight, oil, and gas resistant

3.11.10.2 Industrial grade

3.11.10.3 4 bonded pairs, #22 AWG

3.11.10.4 Solid copper conductor

3.11.10.5 Polyolefin insulation

3.11.10.6 Black PVC jacket, 0.03 inches

3.11.10.7 UL listed

3.11.10.8 Operating temperature of -25° C to 75° C

3.12 Site Lighting

3.12.1 Site lighting shall be provided at the following locations:

- All plant entrances
- Entry doorways to all buildings
- Parking areas

- Substation or switchyard

3.12.2 Site lighting shall include light fixture, mounting poles, lighting controls, etc., as applicable.

3.12.3 Light fixtures shall be suitable for outdoor locations in wet locations.

3.12.4 Light fixtures shall be light emitting diode (LED) type.

3.12.5 All site lighting equipment shall be UL listed.

3.12.6 Lighting control shall consist of a HAND-OFF-AUTO switch.

3.12.7 Photocells shall be used for automatic control.

3.12.8 Photocells shall be weatherproof, swivel adjustable, with built-in time delay to prevent accidental turnoff by momentary brightness.

3.12.9 Photocells shall be rated at 1800 VA, 120 volts ac.

3.12.10 Photocells shall be field adjustable from 1 ft/c turn-on to 15 ft/c turn-off.

3.13 **Site Security System**

Contractor shall provide a security system for the Project Site that meets the following requirements:

3.13.1 Fiber Sensys perimeter fence protection - single zone around the entire perimeter all fences.

3.13.2 Bosch Intrusion Alarm system - Bosch Panel, Bosch Keypad, Bosch output relays and position switches for all gates and building doors.

3.13.3 Access Control on all personnel gates, vehicle gates and building entry doors, arm/disarm reader.

3.13.4 Vicon CCTV System, consisting of eight exterior perimeter PTZ cameras and one camera at the control house entry door.

3.13.5 Provision of the required low voltage power supplies for the systems listed above.

3.13.6 Program and commission this system into the OWNER Security System with an OWNER representative.

3.13.7 All wiring shall be installed in raceways provided by Contractor.

3.13.8 Contractor will provide the wire from the control house to the gates, cameras and security fence.

3.13.9 The Project Site shall be enclosed by a steel expanded metal perimeter fence, constructed in accordance with the relevant Section(s) of the NESC and Owner requirements.

3.14 Low Voltage Dry-Type Transformers

Low voltage dry-type transformers shall meet the following requirements:

3.14.1 Low voltage dry-type transformers shall be provided in the phases, kVA, and voltages as specified on the drawings.

3.14.2 Transformers shall have copper windings.

3.14.3 Transformers shall be self-air-cooled, dry type, wall- or floor-mounted, and enclosed for wiring in conduit.

3.14.4 Transformer enclosures shall be NEMA 3X, weatherproof.

3.14.5 Transformers shall have at least two full capacity voltage taps.

3.14.6 Transformers shall meet NEMA TP1 guidelines for energy efficiency.

3.14.7 Transformers shall be UL listed.

3.15 Low Voltage Panelboards

Low voltage panelboards shall meet the following requirements:

3.15.1 Panelboards shall be dead-front with molded case circuit breakers of the size and type as specified on the drawings.

3.15.2 Panelboards shall be 120/240 volt, single phase, 208Y/120 volt, three phase, or 480Y/277 volt, three phase.

3.15.3 Panelboards shall have a flush-mounted or surface-mounted enclosure.

3.15.4 Enclosures shall be NEMA Type 1 for installations indoors, or NEMA Type 3R for installations outdoors.

3.15.5 The enclosure shall have a hinged trim (cover).

3.15.6 Breaker operating handles shall be accessible through a latched, lockable, door.

3.15.7 Circuit breakers shall be thermal-magnetic, bolt-in, individually front replaceable, and shall indicate "On," "Off," and "Tripped."

3.15.8 Breakers indicated as multiple-pole shall be common trip.

3.15.9 Breakers shall have interrupting ratings in excess of fault current required.

3.15.10 Handle clips to prevent casual operation of breakers shall be provided for 10 percent (at least two) of the breakers and applied to the circuits directed.

3.15.11 Breakers and provisions for future breakers shall be provided in the quantities, number of poles, and ampere ratings indicated on the drawings.

3.15.12 The panel shall have main and neutral buses insulated from the cabinet, and a ground bus.

3.15.13 Buses shall be copper, with ampere ratings and main lugs or breaker as indicated.

3.15.14 The ground bus shall be similar to a neutral bus and shall have a solid ground connection to the cabinet, a removable bond to the neutral bus, clamp type lugs for the ground cable in each supply conduit, and connections for a ground cable in each load conduit.

3.16 Medium Voltage Switchgear

Unless otherwise controlled by more stringent Utility stipulated interconnection requirements, medium voltage switchgear shall meet the following requirements:

3.16.1 Medium voltage switchgear shall be metal-clad or metal-enclosed of the configuration, size and type as specified on the drawings.

3.16.2 Switchgear shall conform to the standards of ANSI, NEMA, UL, and NEC, with the following list of specific standards:

- IEEE 48-90
- C37.04
- C37.06
- C37.11
- C37.20.2
- C37.09
- C37.90
- C37.90.1
- C57.13
- ANSI Z55.1
- NEMA SG-4
- SG-5-81

- AB-1-75
- TR-1-80

3.16.3 A master nameplate shall be attached to the switchgear giving switchgear designation, voltage and ampere rating, short circuit rating, manufacturer's name, general order number and item number.

3.16.4 Each circuit breaker and instrument on the front of the switchgear shall have a suitable nameplate.

3.16.5 Each incoming line section shall be furnished with a nameplate to indicate the power source, circuit, panel, or substation from which it is fed.

3.16.6 The nameplates for the distribution circuit breakers shall indicate the equipment fed through the breaker.

3.16.7 Nameplates shall be black and white laminated phenolic material of suitable size, and shall be engraved with 3/4 inch high letters for section and circuit breaker identity and 1/8 inch letters for other information.

3.16.8 The engraving shall extend through the black exterior lamination to the white center.

3.16.9 Each control device and each control wire terminal block connection inside the units shall be identified with permanent nameplates or painted legends to match the identification on the manufacturer's wiring diagram.

3.16.10 Frequency rating shall be 60 Hz.

3.16.11 Switchgear enclosure shall be NEMA Type 1 for indoor locations, or NEMA Type 3X for outdoor locations.

3.16.12 Switchgear lights, receptacles, heaters, and fans shall be served by an integral control power transformer.

3.16.13 All outdoor type switchgear shall be provided with weathertight gasketing on all exterior doors, removable covers, and panels.

3.16.14 The switchgear assembly shall consist of individual vertical sections housing various combinations of circuit breakers and auxiliaries, bolted together to form a rigid metal-clad switchgear assembly.

3.16.15 Each vertical section shall accommodate breakers stacked one-high or two-high.

3.16.16 Metal side sheets shall serve as grounded barriers between adjacent structures.

3.16.17 Solid removable metal barriers shall isolate the primary major sections of each circuit.

3.16.18 Two rear covers shall be furnished for each vertical section for circuit isolation and ease of handling.

3.16.19 The circuit breakers shall be three-pole, single-throw, and shall be furnished complete with all equipment on a draw out carriage.

3.16.20 The breakers shall be operated by a stored energy mechanism consisting of a heavy-duty spring, charged normally by a universal electric motor, and, in an emergency, by a manual handle.

3.16.21 The circuit breaker control voltage shall be as required.

3.16.22 Each circuit breaker shall contain three vacuum interrupters, separately mounted in a self-contained, self-aligning housing which can be removed as a complete unit.

3.16.23 The vacuum interrupter pole unit shall be mounted on glass polyester supports.

3.16.24 Each vacuum interrupter shall be provided with a contact wear gap indicator which requires no tools to indicate available contact life, and is easily visible when the breaker is withdrawn on the extension rails.

3.16.25 For ease of inspection and maintenance, the breaker front panel shall be removable when the breaker is withdrawn.

3.16.26 Interlocks shall be provided to prevent closing of a breaker between operating and test positions, to trip breakers upon insertion or removal from the housing, withdrawing a circuit breaker from the cubicle while the closing springs are charged, insertion of a breaker of incorrect ampere rating or inadequate interrupting capacity, and to discharge the stored energy mechanism upon insertion or removal from the housing.

3.16.27 The breaker shall be secured positively in the housing between, and including, the operating and test positions.

3.16.28 The main bus shall consist of rigidly supported, tin-plated copper bars of suitable design and cross-sectional area to satisfactorily carry the rated current without exceeding the specified temperature rise.

3.16.29 The bus shall have insulation, bus joint covers, and supports of molded epoxy that is nontracing, nonflammable, and nonhygroscopic.

3.16.30 Bus supports shall be glass polyester inserts.

3.16.31 The bus shall be capable of withstanding the magnetic forces imposed by short-circuit currents equal to the close and latch rating of the largest circuit breakers.

3.16.32 The current-carrying capacity shall be based on actual service conditions, including skin and proximity effect, insulation, steel enclosure, and an ambient temperature of 40°C.

3.16.33 The bus shall be derated in accordance with NEMA SG-5 for ambient temperatures higher than 40°C.

3.16.34 The bus shall be supplied in unit lengths that will permit the reassembly of the units in the field.

3.16.35 All joints shall have tin-to-tin contact surfaces and minimum contact resistance.

3.16.36 Joints shall be equipped with removable insulating fittings at least equal to the bus bar insulation.

3.16.37 To prevent undesirable or destructive mechanical strains in the bus supports and connections, provisions shall be made for bus expansion through an ambient temperature range of -30 to +50°C.

3.16.38 Expansion joints shall be supplied as necessary.

3.16.39 An uninsulated ground bus of tin-plated high conductivity copper, with momentary and short time ratings at least equal to those of the largest circuit breaker shall be furnished through the entire length of the switchgear.

3.16.40 All switchgear equipment requiring grounding shall be connected to this ground bus.

3.16.41 A clamp type connector shall be provided on each end of the ground bus for external connection of a 500 kcmil [240 mm^2] stranded copper grounding cable to the grounding system.

3.16.42 A clamp type connector shall also be provided in each vertical section for connection of stranded copper grounding cable run with incoming and outgoing phase wires, as indicated on the drawings.

3.16.43 Provide a grounding disconnecting device between each circuit breaker removable element and the equipment ground bus which shall maintain contact at all times, except when the primary disconnecting devices are separated at a safe distance.

3.16.44 Provide a static grounding device on each potential transformer drawout carriage to contact the primary fuses in the disconnect position.

3.16.45 Each drawout carriage shall be bonded to the ground riser bus assembly.

3.16.46 Each breaker shall be furnished with a sufficient number of auxiliary contacts and auxiliary switch contacts to provide all necessary interlocks for proper operation of the equipment.

3.16.47 Not less than two spare NO and two spare NC auxiliary contacts shall be furnished on each breaker.

3.16.48 In addition, mechanically operated auxiliary switches mounted in the stationary switchgear housing shall be provided with not less than two spare NO and two spare NC contacts.

3.16.49 All auxiliary contacts and auxiliary switch contacts, including spare contacts, shall be wired to terminal blocks for use with control circuits.

3.16.50 All current-carrying connections to the main buses shall be insulated copper of suitable capacity and shall conform to the requirements of the main bus insofar as bracing and temperature limits are concerned.

3.16.51 Connections to the bus shall be made with suitable bus clamps or bolts with lock washers, and the copper bars shall be tin-plated at current-carrying connections.

3.16.52 Molded removable covers or similar devices shall be used at connections to the bus.

3.16.53 Connections from the current transformers shall permit the transformers to be easily replaced.

3.16.54 Insulated cable connections shall be furnished for the potential transformers and control power transformers.

3.16.55 The thermal and mechanical ratings of the current transformers shall be coordinated with the circuit breakers. Shorting terminal blocks shall be furnished on the secondary of all current transformers. Current transformers rated 600 amperes and smaller shall be of the wound type, with tin-plated primary terminals and insulated to withstand ANSI standard test voltages for the switchgear.

3.16.56 The accuracy of these current transformers shall be suitable for the meters and relays specified with the normal burdens of the various devices, and not less than ANSI standard accuracy classification of 0.3 with burdens B-0.1 and B-0.5, and 1.2 with burden B-2.0.

3.16.57 A compartment enclosed by metal plates shall be provided to house separately the current transformers in each unit.

3.16.58 Metal barriers shall isolate each current transformer from other component parts and adjacent circuits.

3.16.59 Arc flash safe design shall direct energy from arc flash event to safe area.

3.16.60 Infrared windows shall be provided to allow thermographic inspection of the breaker, bus, and current transformers.

3.16.61 Potential and control power transformers shall be supplied in the quantities and of the ratings specified herein or specified on the drawings.

3.16.62 Potential or control power transformers up to 15 kVA single phase shall be mounted in a drawer or a tilt-out carriage in an auxiliary compartment.

3.16.63 Opening the drawer shall ground the primary fuses of the transformer and permit easy inspection, testing, and fuse replacement.

3.16.64 Shutters shall isolate primary bus stabs when drawers are withdrawn.

3.16.65 Control switches shall be 600 volt, 20 ampere, multistage rotary type with black handles.

3.16.66 Each switch shall have a fixed pistol grip handle with an engraved black plastic escutcheon plate.

3.16.67 All circuit breaker control switches mounted on the front instrument panels shall be equipped with red, amber, and green indicating lights.

3.16.68 Green lights shall indicate breaker trip and shall be wired in series with a breaker auxiliary normally closed contact and control switch slip contacts, so the light will not be energized when the breaker is operated by the control switch.

3.16.69 Each electrically operated breaker shall be provided with a two-pole control power disconnecting and protective device in the closing circuit and another in the tripping circuit.

3.16.70 The disconnecting and protective device shall be either a molded-case circuit breaker or an enclosed fuse pullout.

3.16.71 Additional control devices shall consist of auxiliary relays and switches, control wiring and operating mechanism required for the particular breaker, an operation counter, a manually operated trip bar or lever, and provisions for manual closing.

3.16.72 Switchgear protective relays shall be of the draw out type in a semiflush mounting case, with test switches and devices incorporated in the relay unit.

3.16.73 Relays shall have hand reset indicators.

3.16.74 Exposed metal surfaces of relays shall have a dull black finish. Relays shall be wired so that the tripping current of the circuit breaker trip coil will be interrupted by means other than relay contacts.

3.16.75 Relays shall have low burden, solid-state, microprocessor based circuitry and shall meet or exceed ANSI/IEEE standards.

3.16.76 All settings shall be stored in non-volatile memory.

3.16.77 Relays shall be manufactured by Schweitzer (SEL), GE Power Management.

3.16.78 Microprocessor based metering and protection units shall be capable of monitoring and displaying values of phase amperes, phase voltage, watts, vars, power factor, frequency, watt-hours, and watt demand shall be provided where shown on Drawings.

3.16.79 The protection functions shall include voltage phase loss, current phase loss, phase voltage unbalance, phase voltage reversal, overvoltage, undervoltage, and time delay for overvoltage, undervoltage, and phase unbalance.

3.16.80 Microprocessor based multiphase and ground, instantaneous and time overcurrent relay (devices 50/51 and 50N/51N) shall have programmable trip parameters (time curve, time dial, timed pickup and instantaneous) accessible from the front of the unit.

3.16.81 Push buttons and a digital display shall be provided for manual programming.

3.16.82 The relay shall have eight groups of time overcurrent curves selectable from the relay memory.

3.16.83 Fault records for at least four faults shall be stored in memory for use in trouble-shooting and system analysis.

3.16.84 Timed overcurrent pickup range for the relay shall be 25 to 250 percent of CT secondary amperes adjustable in steps of 1 percent.

3.16.85 Instantaneous current pickup range shall be 1 to 18 times phase pickup adjustable in steps of 0.1.

3.16.86 Time dial range shall have at least 32 selections for each curve.

3.16.87 A lockout relay (device 86), shall be wired to trip the bus tie and the associated incoming feeder breakers.

3.16.88 Utility metering sections shall consist of a sheet steel enclosed stationary cubicle of sufficient width to provide the specified spacing and clearance required by Owner.

3.16.89 The sections shall include the following equipment:

3.16.89.1 Set of draw out carriage and mounting provisions for metering potential transformers with primary windings connected line-to-line, and associated primary fuses. The potential transformers and fuses will be provided by the contractor.

3.16.89.2 Set of mounting provisions for metering current transformers. The current transformers will be provided by the contractor.

3.16.89.3 Set of primary leads for potential transformers. These leads shall be connected to the main bus and shall be coiled during shipment.

3.16.89.4 Set of secondary leads for the potential transformers. These leads shall be connected to a meter test block and shall be coiled during shipment.

3.16.89.5 Set of secondary leads for current transformers. These leads shall be connected to a meter test block.

3.16.89.6 Blank inner panel, not less than 30 inches [760 mm] wide and 30 inches [760 mm] high, with at least 15 inches [380 mm] clearance between the face of the panel and the front door, for field mounting of metering equipment.

3.16.89.7 Hinged door on the draw out side of the switchgear, with provisions for a padlock and a nameplate.

3.16.90 The switchgear manufacturer shall provide suitable terminal blocks for secondary wire terminations and at least 25 percent spare terminal points.

3.16.91 Switchgear secondary wire shall be 14 AWG, Type SIS, rated 600 volts, 90°C, and furnished with wire markers at each termination.

3.16.92 Wires shall terminate on terminal blocks with ring type, crimp on wire lugs, with marker strips numbered to agree with detailed connection diagrams.

3.16.93 Control wiring shall terminate in approved, molded, screw type terminal blocks.

3.16.94 All secondary and control wiring within the high voltage compartment shall be completely shielded in a protective grounded metal covering and shall be stranded.

3.16.95 Taps to switchgear alarm, direct current, potential, or other busses which cross several panels shall have terminal block connections arranged so that the tap can be disconnected without opening the associated bus.

3.16.96 A separate direct current power system shall be provided for the control circuits and shall have ample capacity for the control functions indicated and shall be maintenance-free, lead-calcium alloy grid type assembly in polypropylene – heat sealed case, complete with inter-cell connectors and electrolyte.

3.16.97 The DC system shall provide 48 or 125 volts direct current for operation of the breaker breakers and any controls deemed necessary for the safe operation of the switchgear in accordance with all codes.

3.16.98 The battery system shall consist of individual cells with all interconnections, mounted on a rack suitable for Seismic Zone 4.

3.16.99 The battery rack shall be painted with two coats of acid-resistant paint before assembly.

3.16.100 Switchgear batteries shall be installed with a rated 3-way load-break transfer switch, for compliance testing. The transfer position shall remain open.

3.16.101 The switchgear manufacturer shall confirm adequacy of proposed battery system based on the actual equipment installed.

3.16.102 The battery system shall be sized in accordance with IEEE Standard 485. Calculations shall be based on an 8-hour outage of the battery charger system with all the breakers tripping at the end of the 8-hour period.

3.16.103 The battery system shall be provided with complete hardware and software, Battery Monitoring System capable of automatically monitoring and communicating with the SCADA/DAS and displaying, battery voltage at minimum.

3.16.104 The charger shall be static type silicon rectifier with no moving parts and shall be equipped with automatic regulation and provision for adjusting the charging rate.

3.16.105 Redundant battery chargers shall be installed.

3.16.106 The output voltage shall be maintained within 1 percent from no-load to charger rated output amperes with AC input voltage variation of plus or minus 10 percent and input frequency variation of plus or minus 5-Hz.

3.16.107 Output voltage shall be provided with a suitable filter to allow the charger to be used as a DC power supply without battery.

3.16.108 The charger shall have sufficient capacity in order to provide the following:

- Supply the steady state load and float charge the battery between 2.20/2.24 volts per cell.

- Supply periodically and equalizing charge at 2.33 volts per cell.
- Supply the load demand without being connected to batteries
- Recharge the batteries from a 20 percent discharge condition to 80 percent of capacity within 8 hours.

3.16.109 The charger shall be equipped with all hardware for data collection and communication to the central SCADA/DAS server. Data collection points included shall be (at a minimum):

- Temperature
- Charge Voltage
- Charge Current
- Charger alarms/state

3.16.110 Special tools, instruments, and accessories required for proper maintenance; and special devices for lifting or handling shall be furnished. The following accessories shall be supplied with the metal-clad switchgear.

- Set of special wrenches or tools required for installation, operation, or maintenance of the equipment.
- Test cabinet with test jumper for testing breakers out of the housing, for mounting on the wall, and wired for a power source separate from the switchgear control bus.
- Breaker lifting device and transfer truck for moving the circuit breaker into and out of the breaker housing.
- Set of extension rails.
- Maintenance closing lever for closing the circuit breakers.
- Manual operating lever for moving the breaker element into and out of the operating position.
- Set of test plugs suitable for testing the relays.

3.17 GFCI Receptacles

Ground fault circuit interrupting receptacles shall meet the following requirements:

- Duplex type.
- 125 volts.
- 20 amperes.
- Differential tripping at 5 milliamperes.
- NEMA configuration 5-20R.
- Interrupting rating of 1,000 amperes without damage.
- No. 12 AWG copper TW wire insulated pigtails.
- Feed-through configuration for downstream protection.
- Conform to NEMA WD 1.
- UL listed.

3.18 Light Switches

Light switches for standard lighting systems shall meet the following requirements:

- 120 or 277 volts.
- 20 amperes.
- Screw terminals.
- One-way or three-way switches, as required.
- Totally-enclosed.
- AC type.
- Quite tumbler
- Suitable for 100 percent tungsten filament or fluorescent lamp loads.
- Weatherproof, gasketed enclosure
- High conductivity copper.
- Brown or ivory operating handles.
- Conform to NEMA WD 1.
- UL listed.

3.19 Disconnect Switches

Disconnect switches shall meet the following requirements:

- Voltage rating shall meet or exceed the circuit maximum possible voltage.
- Continuous current rating as specified on the drawings (minimum 30 A)
- Number of poles required to obtain disconnect rating and wired in accordance with manufacture's requirements.
- NEMA 3X enclosure or better
- Copper bussing or connection cables when available.
- Visible blades for Utility disconnects, and visible or indicators are allowed in other locations.
- Positive, quick-make, quick-break mechanisms
- Operating handle whose position is easily recognizable and which can be locked in the OFF position with three padlocks.
- The ON and OFF positions shall be clearly marked.
- Door interlock that prevents the door from being opened while the operating handle is in the ON position.
- Conform to NEMA 3X, or 4/4X standard.
- UL listed.

3.20 Junction Boxes

Junction boxes shall meet the following requirements:

- Indoor boxes (larger than switch, receptacle, or fixture type) and gutters, shall be constructed of sheet steel, shall be galvanized after fabrication.

- Bolt-on junction box covers 3 feet square or larger, or heavier than 25 lbs, shall have rigid handles.
- Covers larger than 3 by 4 feet may be split.
- Junction boxes and covers shall be traffic rated if subject to vehicle traffic.
- Above-ground junction boxes shall be bordered by red-colored bollards for traffic protection.
- Boxes shall be sized in accordance with the minimum requirements of the National Electrical Code, including space for full size continuations of all underground conduits not originally continued. Where requirements are not explicitly stated within the National Electric Code, owner underground medium-voltage design standards shall be used.
- Conduit arrangement shall leave maximum space for future conduits.

3.21 Concrete Pull Boxes

Concrete pull boxes shall meet the following requirements:

- Pre-cast reinforced concrete body.
- Pre-cast reinforced cover.
- If subject to traffic, concrete pull boxes and covers shall be HS20 traffic rated.
- Extensions, as necessary.

3.22 Arc-Flash Hazard Design Requirements

3.22.1 Systems and equipment shall be designed and furnished to minimize worker exposure to potential arc flash hazards to the extent practical. At a minimum, the auxiliary electrical system shall meet the requirements of NFPA 70E and IEEE 1584.

3.22.2 At a minimum, switchgear shall be provided with remote breaker racking devices and, if provided, local breaker controls operable in the “connected” position shall be located outside the flash protection boundary. The use of high-speed relaying, “maintenance switch” schemes or other method to minimize available incident energy levels is acceptable. Alternatively, switchgear of Type 2 arc-resistant construction, in accordance with IEEE/ANSI C37.20.7, may be provided.

3.22.3 Contractor shall calculate incident energy levels for each bus in accordance with the method contained in IEEE 1584, Guide for Performing Arc-Flash Hazard Calculations. Results shall be summarized into a Flash Hazard Analysis report which shall be submitted to Owner for review and approval. At a minimum, the Flash Hazard Analysis report shall contain the following information:

- Tabulation of worst-case results for each bus, including:
- Voltage
- ID of protective device clearing the fault
- Total arcing current at arc fault

- Total fault clearing time
- Incident energy level
- Working distance
- Flash protection boundary
- Hazard/risk category

3.22.4 As a minimum requirement, labeling shall be provided per NFPA 70E.

3.23 Utility Scale Meteorological Stations

Contractor shall supply and install one stand-alone central meteorological monitoring station. The station shall have a data sampling rate of at least 4 seconds. The average of these samples shall be recorded at a minimum time interval of 15 minutes. The station shall have autonomous storage of a minimum of 15 days of data, and shall have continuous remote network access. The station will track global horizontal irradiance (GHI) and insolation over time, plane-of-array (POA) solar irradiance and insolation over time, ambient temperature, module temperature, and other parameters using the following instruments:

3.23.1 One primary POA pyranometer at the same tilt of the array placed adjacent to the secondary POA pyranometer in a location free of shade all year. Pyranometer shall be a Kipp & Zonen Model CMP 11 or Owner-approved industry equivalent. Heated and dried with heater/desiccant attachment if location has snow.

3.23.2 One secondary POA pyranometer at the same tilt of the array placed adjacent to the primary POA pyranometer in a location free of shade all year. Pyranometer shall be the same model as the primary POA pyranometer. Heated and dried with heater/desiccant attachment if location has snow.

3.23.3 Three or more module temperature sensors, with accuracy of +/- 1 degree Celsius or better. These sensors shall be of the platinum RTD variety attached to back of modules halfway down a row with a thermally conductive adhesive at the base, mid-level and top of a row. Temperature sensors shall be installed at the center of a cell and installation location on the modules shall be consistent amongst the site.

3.23.4 One ambient temperature sensor enclosed in a naturally aspirated radiation shield and installed at a height similar to the average height of the arrays. Accuracy of this device shall be +/- 1 degree Celsius or better.

3.23.5 One primary horizontal pyranometer placed adjacent to the secondary horizontal pyranometer in a location free of shade all year. Pyranometer shall be a Kipp & Zonen Model CMP 11 or Owner-approved industry equivalent. Heated and dried with heater/desiccant attachment if location has snow.

3.23.6 One Remote Terminal Unit / data logger to condition the instruments' signals, record data and communicate to the SCADA server or DAS provider.

3.23.7 One anemometer and one wind vane, installed at the average array height in a location that does not shade the array at any time of the year. Anemometer shall be accurate to within +/- 1 m/s or better, and wind vane to within +/- 5 deg or better.

3.23.8 One barometric pressure sensor, accurate to +/- 1mbar or better.

3.23.9 One relative humidity sensor, accurate to +/- 2 percent or better.

3.23.10 The records stored at the meteorological station shall be time stamped and collected at a sampling rate of at least 4 seconds. The records shall be automatically flushed every 15 days to avoid overflow. The data logger shall include its own power backup system that may or may not be connected to the SCADA UPS system, to allow for standalone operation for at least 5 days. The meteorological station shall include a communications port compatible with a standard laptop computer running Windows OS to be able to read and download data on site. The access to the data logger shall be password protected and Contractor shall provide the required software, cables and instruction manual to connect to the port and access the data.

3.24 Distributed Solar Measurement Stations

Contractor shall supply and install a distributed solar measurement station if the plant's rated capacity is greater than 10 MW, and another centrally-located station for each 10 MW block thereafter. The stations shall have a data sampling rate of at least 4 seconds. The average of these samples shall be recorded at a minimum time interval of 15 minute. These stations shall have continuous remote network access. The stations will track insolation and module temperature. The stations should including the following instruments for each station:

3.24.1 One primary POA pyranometer at the same tilt of the array. Pyranometer shall be a Kipp & Zonen Model CMP 11 or Owner-approved industry equivalent. Heated and dried with heater/desiccant attachment if location has snow.

3.24.2 One or more module temperature sensors, with accuracy of +/- 1 degree Celsius or better. This sensor should be attached to back of modules with a thermally conductive adhesive in the middle of a row at the mid-level of a row.

3.24.3 One ambient temperature sensor enclosed in a naturally aspirated radiation shield and installed at a height similar to the average height of the arrays. Accuracy of this device shall be +/- 1 degree Celsius or better. Required for first distributed station, optional thereafter.

3.24.4 One anemometer and one wind vane, installed at the average array height. Anemometer shall be accurate to within +/- 1 m/s or better, and wind vane to within +/- 5 deg or better. Required for first distributed station, optional thereafter.

3.24.5 One barometric pressure sensor, accurate to +/- 1mbar or better. Required for first distributed station, optional thereafter.

4. PROJECT SUBSTATION

4.1 General

4.1.1 Contractor will design, construct, test and commission a Project substation that is the primary interface between the System and the high voltage (HV) bulk electrical system (BES) of the incumbent utility ("Project Substation"). The Project Substation will be divided into two main sections.

- A HV voltage section that ties the Project Substation to the BES at the Point of Interconnection (POI), and
- A medium voltage (MV) that ties the Project Substation to the collection system of the System.

4.1.2 The HV section of the Project Substation will be configured based on the nature of the interconnection to the POI. In general, two basic types of interconnection are possible, dictating two different HV configurations. The types of interconnection contemplated for this specification are:

- A radial interconnection to an existing HV substation, owned and operated by the incumbent utility; and
- A line tap interconnection to an existing HV transmission line(s), owned and operated by the incumbent utility.

4.1.3 For a radial interconnection, the HV section configuration, as a minimum, shall consist of:

- A full tension deadend structure to support the gen-tie line from the Project Substation to the POI (see Section 8);
- 3 - 1Ø Line Arrestors;
- Combination metering class, HV, PT and CT devices (unless the utility chooses to meter at the POI);
- A motor operated, SCADA connected, Line Disconnect Switch;
- A high side generator step up (GSU) transformer SF6 circuit breaker, with 2 sets of 3Ø, gang operated, breaker isolation switches;
- A GSU transformer rated to support the maximum output of the System, equipped with both high and low side station class lightning arrestors;

- A 34.5 kV low side, SF6 circuit breaker, with 2 sets of 3Ø, gang operated, breaker isolation switches;
- A protective relaying scheme and attendant equipment appropriate to protect all HV, MV and transmission line equipment.

4.1.4 A communications and control system to facilitate both local and remote control of the Project Substation.

4.1.5 Interconnecting bus work, jumpers, terminations, cabling, conductors and hardware necessary to interconnect all equipment.

4.1.6 Support structures, insulators, foundations and hardware necessary to isolate all energized parts from earth.

4.1.7 A complete, interconnected grounding system sized to limit step and touch potentials during high voltage faults.

4.1.8 Note that all HV devices shall be rated commensurately with the nominal operating voltage of the POI.

4.1.9 It may be necessary under some circumstances to utilize two or more GSU transformers, based on the size of the proposed Project. Under such circumstances, the radial configuration will be expanded to accommodate the ultimate size of the Project.

4.1.10 For a Line Tap interconnection, the HV section configuration, as a minimum, shall consist of:

- At least two, full tension deadend structures to support the existing transmission lines;
- At least two sets of 3 - 1Ø Line Arrestors;
- At least two motor operated, SCADA connected, Line Disconnect Switches;
- At least three SF6 circuit breakers connected in a ring bus configuration, with 2 sets of 3Ø, gang operated, breaker isolation switches for each circuit breaker;
- Combination metering class, HV, PT and CT devices;
- A GSU transformer rated to support the maximum output of the System, equipped with both high and low side station class lightning arrestors;
- A 34.5 kV low side, SF6 circuit breaker, with 2 sets of 3Ø, gang operated, breaker isolation switches;

- A protective relaying scheme and attendant equipment appropriate to protect all HV, MV and transmission line equipment;
- A communications and control system to facilitate both local and remote control of the Project Substation;
- Interconnecting bus work, jumpers, terminations, conductors and hardware necessary to interconnect all equipment;
- Support structures, insulators, foundations and hardware necessary to isolate all energized parts from earth; and
- A complete, interconnected grounding system sized to limit step and touch potentials during high voltage faults.

4.1.11 Note that all HV devices shall be rated commensurately with the nominal operating voltage of the POI.

4.1.12 It may be necessary under some circumstances to utilize two or more GSU transformers, based on the size of the proposed Project. Under such circumstances, the ring bus configuration will be expanded to accommodate the ultimate size of the Project.

4.1.13 Contingent upon operating voltage of the HV section of the Project Substation, adequate space will be provided to expand the Project Substation to include up to six breaker positions.

4.1.14 For voltages of 345 kV and above, the Line Tap configuration will be modified to support a breaker and a half configuration.

4.1.15 The MV section shall be comprised of a set of parallel radial feeders to interconnect the collection system to the Project Substation. As a minimum, the MV section shall include;

- 34.5 kV SF6 circuit breakers, equipped with three phase, gang operated breaker isolation switches and a by-pass switch for each collection system feeder;
- 34.5 kV station class arrestors at the termination point of each collection system feeder;
- Interconnecting bus work, jumpers, terminations, conductors and hardware necessary to interconnect all equipment;
- Support structures, insulators, foundations and hardware necessary to isolate all energized parts from earth; and

- A complete, interconnected grounding system sized to limit step and touch potentials during high voltage faults.

4.1.16 Note that 34.5 kV Indoor Metal Clad Vacuum circuit breakers may be considered at the discretion of Owner.

4.1.17 The specific characteristics of the required systems and equipment are described in subsequent sections.

4.1.18 Phase to phase and phase to ground conductor clearance criteria will be in accordance with Owner Substation Design Standards. If required for equipment access, clearances will be increased.

4.1.19 Studies to be completed as part of Project Substation design will include, at a minimum, in both report and software-specific file format, where applicable:

- Short circuit analysis(EasyPower file)
- AC and DC system studies
- Bus ampacity study
- Direct stroke protection analysis for lightning
- Arc flash hazard analysis, EasyPower file
- Grounding study (CDEGS file)
- Relay coordination study
- Insulation coordination study
- Electro Magnetic Compatibility (EMC) Study

4.1.20 All design choices should be based upon results from the above mentioned studies. Contractor is responsible for obtaining all necessary data needed for the studies mentioned above.

4.1.21 The Project Substation shall minimize electrical losses as far as is economically advantageous. Contractor shall use the value defined in Section **Error! Reference source ot found.** in determining the value of any energy gained/lost in the optimization process.

4.1.22 Specific Owner requirements include:

- SEL GPS clock for relay time synch
- All intelligent electronic devices shall be provided with an Ethernet port and DNP 3.0 TCP/IP communication protocol if available or Modbus TCP/IP protocol if DNP is not an available option.
- Test switches on all trip, close and wetting voltage connections. Slip links or disconnecting terminal blocks on all other connections.
- Redundant relays, including lockouts
- Preference for open air breakers (SF6 insulated) on the 34.5 kV side of the substation

4.1.23 Non-insulated ring type terminal connectors shall be used on all control circuits as well as current and potential transformer circuits. All other terminal connectors for conductors smaller than 8 AWG shall be non-insulated ring type or preinsulated spade type. The indent mark form the crimp tool must be clearly visible.

4.2 Security

4.2.1 The Project Substation shall be enclosed by a steel expanded metal perimeter fence, constructed in accordance with the relevant Section(s) of the NESC and Owner Substation Design Standard.

4.2.2 The Project Substation shall have access control and monitoring provisions to ensure that Owner is able to capture, record and monitor all personnel, authorized or unauthorized that enter the site area. Contractor shall coordinate the preferred access control methodology with Owner along with additional provisions such as video monitoring and motion detection.

4.3 Substation Foundations

4.3.1 All foundations for substation support structures and equipment pads shall be designed in accordance with applicable building codes, the recommendations of the Geotechnical Engineer (including consideration for wind and seismic withstand capability), and Owners Substation Design Standards.

4.3.2 Blasting to facilitate the Substation foundation is not permitted without authorization from Owner.

4.3.3 Precast trenches will be free of water and firm throughout and during the life time of the substation.

4.3.4 Transformer pads for main power transformers shall be designed based on Owners Substation Design Standards. The containment pit should be sized accordingly based on oil capacity and estimated volume of rain water with quench rock surrounding the transformer capable of containing the complete volume of transformer oil plus an additional 6" of rain water Oil containment shall include active monitoring for oil detection along with EMS/SCADA alarm points.

4.4 Potential Transformers

4.4.1 All potential transformers used for metering shall be of the wire wound type with shell or core construction. They shall be at least 0.3 class outdoor units with NEMA pads. Contractor shall determine the rating, connection type and turns ratio based on applicable system studies and metering system designs.

4.4.2 Potential devices shall meet the requirements of IEEE C57.13-2008

4.4.3 Capacitive Coupled Voltage Transformers (CCVT) may be used for detection or verification of line or bus potential only

4.4.4 Capacitive Coupled Voltage Transformers shall be of the passive filter type.

4.4.5 Capacitive Coupled Voltage Transformers shall be of the passive filter type.

4.5 Current Transformers

4.5.1 All MV current transformers shall be connected through an indoor, panel mounted, current test switch, specifically a States Type FMS or ABB equivalent. Each current transformer neutral shall be brought into the control building for single point grounding within the associated protection relay panel.

4.5.2 Provisions shall be made to enable the secondary leads of all current transformers to be shorted via removable links.

4.5.3 Current transformers to be used for metering shall be of at least 0.3 accuracy class with a rated overload factor of 2.0.

4.5.4 Current transformers shall meet the requirements of IEEE C57.13-2008

4.6 Generation Step Up (GSU) transformers

4.6.1 The GSU transformer(s) shall be sufficiently sized to allow the full Project capacity to be delivered to the POI at the maximum of its ONAN / ONAF / ONAF rating.

4.6.2 The GSU shall be new, outdoor, non PCB mineral oil filled, 3Ø, 60Hz, Cooling class ONAN/ONAF/OFAF, 65°C Rise. The main step-up transformer(s) shall be in accordance with the requirements set forth in Table 3 herein, at a minimum.

Table 4-1. Substation Transformer Specifications

Description	Value
Quantity	1
Type	Mineral Oil filled, hermetically sealed, outdoor installation
Voltage ratio	TBD* / 34,500 / 13,200 Volts (HV / MV / TV)
Phases	3
Windings	3 (HV, MV, Tertiary)
Steady state temperature rise	65°C above ambient
Frequency	60 Hz
Impulse levels	TBD kV (HV), 200 kV (MV), 110 kV (Tertiary)
Vector group	Grounded wye
Cooling	ONAN / ONAF / ONAF
Tapping range	±5%, 2.5% steps, manual control DETC Contractor shall determine the need for an OLTC based on the results of applicable system studies. If an OLTC is specified it shall have a ±10% range with 32 0.625% taps. If employed the OLTC shall have provision for remote or local control.
Paint finish	ANSI 70 sky grey color
Guaranteed losses	TBD
Temperature gauge	Required
Pressure level indicator	Required
Pressure relief device	Required
Oil sampling valve	Required
Filling orifice	Required
Tank ground tag	Required
Oil level indicator	Required
Oil Gas Analyzer	Serveron TM
Bushing CTs	Minimum of two sets on both primary and secondary windings. Class to be determined by relaying scheme.
Grounding	Solid (primary and secondary windings) Buried delta (tertiary winding)

4.7 High Voltage Circuit Breakers

4.7.1 HV and MV circuit breakers shall be rated and selected based on the requirements of Owner Substation Design Standards.

4.7.2 Basic parameters for HV circuit breakers are SF6 insulated, three-pole, single throw, with dead–tank design and dual trip coils.

4.7.3 Basic parameters for MV circuit breakers are vacuum interrupters, three-pole, single throw, with dead –tank design.

4.7.4 All circuit breakers shall contain instrument transformers for metering and/or protective relaying applications.

4.8 Disconnect Switches

4.8.1 Disconnect switch placement and selection is based on Owner Substation Design Standards. Disconnect switches are typically placed in the following locations:

- HV Line Disconnect
- HV Breaker Disconnect
- MV Line Disconnect
- Breaker Disconnect
- MV Capacitor & Reactor Switch
- MV Grounding Transformer Switch
- Disconnect switches are typically manually operated, 3 gang, non-load break, outdoor rated and provide the ability to ground
- All disconnect switches shall be three phase, gang operated devices
- Where motor operators are employed, provisions for de-coupling the motor and manual operation shall be provided
- A DNP 3 compatible SCADA interface shall be provided with all motor controllers

4.9 Grounding Transformers

4.9.1 Grounding transformers shall be sized to effectively ground the portion of the collection system circuit that is disconnected from the main Project Substation 34.5-kV bus when the Project Substation feeder or collector breaker is open. However, at a minimum, grounding transformers shall be capable of carrying 300A per phase for 10-seconda and 900A in the neutral to ground circuit for 10 seconds.

4.9.2 Grounding transformers shall be 3-phase, and may be configured either Wye-Delta or Zig-Zag.

4.9.3 Grounding transformers installed inside or near the outside of the substation fence shall be installed with ground-fault detection provisions.

4.9.4 The cable design is not permitted to include splices. Whenever possible all conductors and cables should be a single continuous run.

4.9.5 No splices shall be made in conductors for instrument circuits or control circuits. Shields may be spliced where necessary to permit connection to the station ground. Power cable circuits may be spliced only by methods and at locations acceptable to Owner.

4.10 Surge Arrestors

4.10.1 All surge arresters should be sized according the results of the insulation coordination study.

4.10.2 HV & MV surge arrestors shall meet the requirements of ANSI C62.11 for Station Class installation in a 60-Hertz outdoor installation.

4.10.3 Equipment surge arrestors shall be station class, metal-oxide type surge arrestors for outdoor use and polymer housing. Surge arrestors shall be shatterproof.

4.11 Rigid Bus

4.11.1 Design of the bus systems shall be in accordance with IEEE 605 and Owner Substation Design Standard, at a minimum.

4.11.2 Loading and seismic performance shall be in accordance with the Project design and Project Site location. Such information is subject to verification by Contractor.

4.11.3 Station post insulators shall be of sufficient strength to support the rigid bus and shall be ANSI 70 gray color.

4.12 Connectors and Fittings

4.12.1 Connectors and fittings shall be of the proper size and design to assure permanent, secure, and low-resistance connections.

4.12.2 Connectors and fittings shall be in accordance with ANSI C119 & CC 1 along with requirements of Owner Substation Design Standard.

4.12.3 Rigid bus connections to transformers, breakers, CCVTs, or freestanding current transformers are prohibited.

4.13 Grounding System

4.13.1 The grounding system/grid shall be installed throughout the Project Substation.

4.13.2 The ground grid shall be designed in accordance with IEEE 80 and Owner Substation Design Standard.

4.13.3 The system shall be designed such that Project Substation personnel are protected from step and touch hazards that can occur as the substation grounding system provides the earth return electrode during power system phase to ground faults.

4.13.4 Contractor shall perform ground resistivity testing prior to final design to determine ground analysis parameters. The ground resistivity shall be measured with the methods given in IEEE 81.

4.13.5 Ground conductors shall be sized for fault duration of 0.5 seconds.

4.13.6 Equipment grounds shall conform to the following general guidelines:

- Grounds shall conform to the NESC.
- All equipment grounding connections shall be connected to the ground grid.

4.13.7 The ground grid shall extend at least three (3) feet outside the perimeter fence of the Project Substation and shall be bonded to the fence, according to Owner Substation Design Standards, and as required to meet acceptable levels of both touch and step potential and ground potential rise.

4.13.8 A minimum of six (6) inches of washed crushed aggregate shall cover the entire Project Substation footprint, including those areas reserved for future build-out and five (5) feet outside the Project Substation security fence, in order to help reduce touch and step potentials. A greater level of washed crushed aggregate shall be installed if necessary to meet the Requirements and satisfy the recommendations set forth in the geotechnical engineering report. The minimum resistivity shall be 3,000 ohm-meters. Crushed rock shall conform to ASTM C33, gradation 1.5 to No. 8 particles. Additional design criteria should be considered for vehicular access to the Project Substation.

4.14 Lightning Protection

4.14.1 Lightning protection shall be designed in accordance with IEEE 998, Owner Substation Design Standard, and the results of the lightning protection study.

4.15 Lighting

4.15.1 A lighting system shall be furnished for the Project Substation based on the requirements of Owner Substation Design Standards. The lighting system shall provide personnel with illumination for Project Substation operation and maintenance under normal conditions, and means of egress under emergency conditions.

4.15.2 Lighting levels shall meet, at a minimum, the requirements of the NESC, including Table 111-1 therein.

4.15.3 Outdoor lighting shall be LED type.

4.16 Equipment Labelling

4.16.1 All major equipment and devices shall be properly labeled with nameplates that meet Applicable Standards (including those for safety) and other Requirements.

4.16.2 Equipment labelling conventions shall follow Owner Substation Design Standards, as applicable.

4.17 Electrical Equipment Enclosures

4.17.1 Control cabinets, pull boxes, and junction boxes shall be in accordance with NEMA standards and type number and shall be suitable for the Project location conditions. Minimum design shall be:

- (1) Indoor: NEMA 1
- (2) Outdoor: NEMA 3R, stainless or aluminum.

4.17.2 All enclosures shall be provided with pad-locking provisions.

4.17.3 Junction boxes shall be located adjacent to roadways, and be surrounded by a minimum of four (4) bollards of a red color.

4.18 Battery System

4.18.1 All battery systems shall conform, at a minimum, to the Applicable Standards of IEEE, ANSI, and NEMA.

4.18.2 Batteries shall be provided with racks, connection devices, tools, instruction books, protection shield covers, rail protection system, and other standard items. They shall also include redundant fans for the required ventilation.

4.18.3 Contractor shall supply provide, at a minimum, one complete set of 125 VDC station batteries. For HV sections with a nominal operating voltage of 230 kV or higher, two redundant sets of station batteries will be provided.

- Contractor will provide one fully rated, self-cooled battery charger for each battery set provided, capable of recharging the batteries within eight hours while serving continuous load. The chargers will be served from the Project Substation AC system.

4.18.4 For the Project Substation, Contractor shall provide one (1) DC system, including, but not limited to, batteries, two (2) battery chargers, safety fused disconnect switch, a battery disconnecting means and panel boards.

- Fused disconnect switch shall be a 3-way make-before-break transfer switch between the battery cells and an open ‘alternate’ position, feeding the chargers

and DC load. DC 'transfer' position shall be left unconnected in the switch panel, reserved for future NERC testing.

4.19 Raceway

4.19.1 Raceway shall conform, at a minimum, to the recommendations included in IEEE 525 and Owner Substation Design Standard.

4.19.2 Individual raceway systems shall be established for the following services:

- (1) 600-volt control cable.
- (2) Special electrical noise-sensitive circuits.

4.20 Control and Protection

4.20.1 Contractor will design, procure, construct and test the control and protection system for the Substation. The system will include, but not be limited to, protective relays, indication meters, revenue meters, switches, instruments, devices, and wiring. Relay panels will be installed in the Substation control room.

4.20.2 Contractor will provide drawings sets, for review, comment, and approval by Owner consistent with requirements set forth in Section **Error! Reference source not found.** and nclusive of one-line drawings, three-line drawings, control panel arrangements, fabrication details, bill of materials, nameplate lists, DC control schematics, AC schematics, circuit schedules, auxiliary equipment schematics, wiring diagrams, index sheets, and legends.

4.21 Protective Relaying

4.21.1 Relaying will provide secure and selective isolation of equipment when necessary. Redundant primary and secondary schemes will be included for all high voltage equipment.

4.21.2 All relays will be wired to a central communication processor which will integrate all relaying.

4.21.3 Protection will be included for breakers, bus, transformers, HV & MV lines, capacitors, and inductors.

4.21.4 Protection specifications include:

- Transformers
  - (1) set of CTs, 1 high, 1 low – 2 x SEL-787E
  - (2) More than 2 sets of CTs – 2 x SEL-487E
- Bus

- (1) 15kV, or lower, switchgear – 1 x SEL-587Z
- (2) All other bus configurations:

  (a) 6 or fewer positions on ultimate build out – 2 x SEL-487B

  (b) 7 or more positions on ultimate build out – 2 x 3 x SEL-487B

– Feeder (15kV and below)

- (1) No remote source (radial circuit) – 2 x SEL-751A
- (2) Possible remote source (including bus ties) – 2 x SEL-751

– Collector circuits (34.5kV)

- (1) 2 x SEL-751

– Line – 2 x SEL-411L
– Owner has standard part numbers for each relay type; deviations from those part numbers need to be approved in advance.
– All relays shall communicate to Owner SCADA via DNP 3.0 over Ethernet.
– Redundancy

- (1) Redundant CTs and VT secondaries shall be used in all cases except:

  (a) 15kV and lower balance of plant circuits

  (b) SEL-587Z applications

  (c) Transformer neutral CTs when multiple CTs are not available

– DC Circuity should be fully independent between relays; sourced from separate battery systems.

- (1) Circuits associated with a single close coil may have a single DC circuit connected to each relay.

– Lockout Relays

- (1) Electroswitch per Owner design masters.
- (2) Two per zone

  (a) Fully redundant for tripping, common close block circuits.

  (b) Tripped by local protection as needed, tripped by adjacent zones for breaker failure.

– Test Switches

- (1) FT type test switches shall be provided for:

(a) Each protective relay shall have sufficient positions to accommodate the following circuits. Name plates shall be provided to identify the purpose of each test switch.

- Each AC circuit to the relay, one switch position per voltage circuit and two per current circuit.
- Positive and Negative side of relay power.
- Both sides of each output used to trip (breaker or lockout) or close.
    - Input wetting voltage.

(b) Each lockout relay shall have sufficient positions to accommodate each trip circuit.

- Wiring
    - (1) All schematics shall be per Owner design masters where such exist
    - (2) All wires provided with wire labels at each end per Owner design master
    - (3) All crimped lugs shall be non-insulated ring lugs.
    - (4) Any terminal on the Phoenix blocks on the SEL-7xx relays that requires more than one conductor shall utilize an appropriate crimped ferrule.
    - (5) All SIS wiring shall be appropriate for the Phoenix blocks on the SEL-7xx relays, 41 strand #14.
    - (6) All CT circuits from field to relay racks shall terminate on shorting terminal blocks. All other circuits shall terminate on slip link terminals.
    - (7) All cables provided with cable tags at each end per Owner design master
- Racks
    - (1) 36” rack design, one rack per zone of protection. Rack design masters will be provided.

4.22 Metering

4.22.1 The Plant shall be metered at the Point of Interconnection in accordance with Interconnection Agreement requirements. The meters shall be electronic meters approved by the TSP; and Contractor shall be responsible for obtaining meter approval.

4.22.2 Check meters

- In addition to the revenue metering equipment required by the Interconnection Agreement, redundant SEL-735 meters shall be provided to meter net plant output.
- Check meters shall have full power quality monitoring capability.
- At a minimum the metering equipment will meet the following specifications:

- (1) Current Transformers: +/- 0.3% @ B0.1 - 1.8 ohms, 10% - 100% rated current
- (2) Voltage Transformers: +/- 0.3% through B. ZZ @ 90% through 110% of nominal voltage

4.22.3 LV Supply

4.22.4 Contractor shall provide the most cost efficient design for the Substation LV power supplies incorporating the following requirements:

- Normal supply shall be a metered service from the local utility, if so required by local statues. Else, this service shall be the back-up source.
- Backup-supply shall be fed via MV through a local transformer at any time the MV system is energized;
- Normal and Stand-by supplies shall never be paralleled.

4.22.5 The backup supply may be obtained from the existing distribution network in the area, provided that reliability is demonstrated and that the supply is not sourced from the same substation/s that the HV supply is derived from.

4.23 EMS SCADA System

4.23.1 EMS SCADA system is to include RTU, HMI, SCADA Input/Output devices and an Ethernet network connecting intelligent electronic devices, designed and constructed according to owner design masters.

4.23.2 Contractor shall provide a complete EMS SCADA drawing set, including network block diagrams, schematics and wiring diagrams created according to owner design masters.

5. HIGH VOLTAGE TRANSMISSION LINE DESIGN AND EQUIPMENT REQUIREMENTS

5.1 General

5.1.1 The HV Transmission Line shall be designed, assembled, constructed and tested consistent with all Applicable Standards including:

- ANSI / IEEE C2 – National Electric Safety Code
- ASCE 48-11 - Design of Steel Transmission Pole Structures
- ASCE Manual No. 74 - Guidelines for Electrical Transmission Line Structural Loading, 2010, Third Edition
- IEC 60826 - Design criteria of overhead transmission lines
- IEEE-738 - Standard for Calculating the Current-Temperature Relationship of Bare Overhead Conductors

5.1.2 Furthermore the HV Transmission Line shall be designed, assembled, constructed and tested in accordance with local and international industry best practice and guidelines and achieve compliance with the requirements of:

- RUS Bulletin 1724E-200 – Design Manual for High Voltage Transmission lines
- IEEE P1863 - Guide for Overhead AC Transmission Line Design
- IEEE Std. 524, 1992 - IEEE Guide to the Installation of Overhead Transmission Line Conductors
- Project Approvals
- Owner Standards
- Any other relevant requirements of local, state and national authorities

5.2 Line Route and Access

5.2.1 The line route and pole locations shall be in accordance with the Project Approvals.

5.2.2 Transmission Pole Spotting Criteria:

- Minimize contact with environmentally sensitive areas, streams, forested areas, or other valuable natural habitats.
- Minimize contact with property parcels that have incompatible zoning or land use planning classifications.
- Minimize contact with areas where terrain or drainage would interfere with transmission line construction and maintenance.
- To the extent practical, if any existing structures require replacement, the structure should be replaced on a structure-for-structure basis. All new structures will be placed as close as possible (either ahead or back along the center-line) to the existing structures.
- The structures at line angle points (P.I.s) will be placed in the same location as the existing structures. Temporary structures will be used during construction to support

the existing circuit in order to remove the existing P.I. structure and replace with a new structure.

- Where the rights-of-way are sufficiently wide, new structures will be placed along side of the existing structures to facilitate a 10-hour return to service time of existing transmission lines during construction.
- Some structure locations may be shifted significantly for more optimal design or as dictated by environmental factors.

5.2.3 Perform any field surveys to acquire topography and other field data, as necessary, for transmission line design. Provide all electronic copies of the associated AISC survey files to Owner. Contractor shall be responsible for the staking of all proposed locations for core borings, Right of Way acquisition and any other associated engineering activity such as wetland delineation.

5.2.4 Perform subsurface utility analysis to address construction access and external loading limits for all foreign utility crossings.

5.2.5 Design solutions and obtain crossing approvals for all foreign utility crossings from other owner utilities (e.g. power lines, state or county roads, communications cables, railway lines, gas pipelines, etc.).

5.2.6 Review to determine whether any Federal Aviation Administration regulations apply, provide written notification to those agencies for their review and acceptance, incorporate any requirements in the design and note any specific construction details on the new drawing set. Aviation marker spheres shall be used as part of the construction requirements on all prominent crossings, such as limited access highways, river or major ravines. Any aviation marker lights that are required must have an automatic monitoring system installed with each light.

5.2.7 Acquire transmission line right-of-way covering the line from the collector substation to the POI.

5.2.8 Minimize disturbance areas, damage to cultivated crops or pastureland and avoid native vegetation sensitive areas as far as possible.

5.2.9 Drainage and erosion control shall meet the requirements of Clause **Error! Reference ource not found.**.

5.2.10 Reinstate and re-vegetate all disturbed areas.

5.3 Foundations for Poles or Towers

5.3.1 Pole or tower foundations shall be designed in accordance with the Applicable Standards, and meet requirements of the geotechnical report, as well as requirements for concrete in this specification.

5.3.2 All transmission line custom steel pole structures and any guy anchors shall be supported by drilled reinforced concrete caissons. The foundations shall be designed per current industry standards and the designer shall use Ensoft, inc's LPILE-CADD-foundation design computer program.

5.3.3 FAD Program inputs (pole loading, soil conditions data from core borings and Geo – Tech report output) and output results shall be provided to Owner. Contractor must perform a geotechnical and subsurface investigation at each foundation structure location that will include a boring to determine the soil parameters to be used in the design.

5.3.4 If shallow bedrock is encountered in the soil borings, the caisson foundations shall be designed to be embedded into solid rock a length equal to at least one caisson diameter.

5.3.5 The ultimate strength of overturning moment and uplift of the foundation shall not be less than 1.25 times the design factored load reactions of the structure. The ultimate strength of foundations subjected primarily to compression load shall be not less than 1.10 times the design factored load reaction of the structure. Overturning moment foundations designed by rotation or pier deflection performance criteria shall use factored structure reactions for determination of the foundation performance.

5.3.6 The minimum caisson diameter for each structure shall be the custom designed steel pole manufacturer's anchor bolt circle diameter including sufficient allowance to place the concrete while encompassing the anchor bolt cage (including template) and rebar with a minimum 6" of cover. However, the minimum desired shaft diameter shall be no less than 5.50 feet. The maximum shaft diameter is desired to be the minimum pier diameter plus 1.00 foot.

5.3.7 The pedestal height above ground line shall be designed with a minimum of 12 inches of reveal above final grade unless prior approval is given by Owner.

5.4 Design

5.4.1 Owner requires preparing the line design utilizing PLS-CADD. A copy of the final PLS--CADD design file shall be provided electronically to Owner.

5.4.2 All final drawings shall be approved and sealed by a Registered Professional Engineer certified within the state of proposed construction.

5.4.3 Contractor will stake and acquire a core boring and a geotechnical report for each structure site and perform a customized foundation design for each structure.

5.4.4 Contractor shall determine and specify all of the associated hardware that will be required for the OPGW installation along with splice locations determined. The hardware specified must meet the wire manufacturer's specifications and utilize their recommended supplier.

5.4.5 Contractor shall locate all proposed OPGW splice locations at easily accessible structures. Slice points shall also be located near other telecom utility crossings or a point nearest to a telecommunication provider's infrastructure if a crossing doesn't exist.

5.4.6 Contractor shall comply with the manufacturer's recommendations and Applicable Standards for all assemblies and installation of poles, conductors and other components.

5.4.7 All new Transmission structures should be direct embedded Round Wood Pole (Monopole, H-Frame style, or 3-Pole style) or Tapered Tubular Steel supported by a drilled reinforced concrete foundation. Tapered Tubular steel pole structures and associated attachments shall be weathering steel or galvanized steel.

5.4.8 Conductor installed should be one of Owner's standard conductors. Conductor shall be single bundled. The use of multiple bundled conductor shall be approved by Owner.

5.4.9 All insulators, style and manufacturer, shall be pre-approved by Owner. Non-Ceramic insulators are not permitted to be used for voltages above 138kV. For 230kV lines, insulators must be toughened glass (Seves) or Porcelain (NGK).

5.4.10 Contractor shall hire an Engineer to complete a grounding study, incorporating the mutual coupling and induced voltage of the phase conductors and shield wire(s). This study shall inform the grounding scheme for the Transmission Line and OPGW system to ensure public and worker safety. This study is required to be presented to the owner prior to completion of the Transmission Line Design.

5.5 Assembly and Installation

5.5.1 Contractor will provide off-loading and secure storage facilities and shall be held responsible for the proper protection and safekeeping of all material until the completion date. Contractor shall be held responsible for any loss or damage to material after delivery.

5.5.2 Contractor will verify and confirm the quantities of material supplied by vendors. Conductor used is to be optimized to obviate excessive waste. A nominal amount (dependent on the terrain - max. 5%) of phase and earth conductor will be allowed for sags and jumpers.

5.5.3 The applicable type of tower shall be erected on the completed foundation. In the case of self-supporting tower concrete foundations, towers shall not be erected until the concrete has had at least 14 days in which to cure, or test breaks have proved the Design strength of concrete has been achieved, whichever is later. In the case of guyed tower concrete foundations and/or anchors, towers shall not be erected until the concrete has had as least 21 days in which to cure, or test breaks have proved the Design strength of concrete has been achieved, whichever is later. Guyed steel structures are discouraged and require approval from Owner.

5.5.4 All design tolerances shall be documented and provided to Owner and achieved.

5.5.5 Substantial temporary conductor supports shall be used, or equally effective measures taken, to prevent encroachment of statutory clearances, or other clearance requirements stated in the permits, between the conductor being strung and other power or communication lines, roads or railways being crossed.

5.5.6 Suitable structures under each phase will be erected to protect all fences from conductor damage during stringing.

5.5.7 Temporary changes in poles, fixtures or conductors of lines being crossed will only be carried out if accepted by Owner. Contractor shall indicate any changes considered necessary and will co-ordinate any changes with the owner of the service.

5.5.8 Contractor will endeavor to arrange that all crossings be made with the crossed line de-energized. The time of line outages shall be kept to the absolute minimum. All preparatory work shall be done prior to the work permit coming into effect. Upon completion of the work, Contractor shall immediately notify the applicable utility that lines are clear and release the working permit.

5.5.9 All phase and earth conductors shall be tension strung. Stringing shall be done in daylight hours only.

5.5.10 The equipment and methods used for stringing the conductors shall be such that the conductors will not be damaged. Particular care shall be taken at all times to ensure that the conductors do not become kinked, twisted, bird-caged or abraded in any manner.

5.5.11 Contractor shall make suitable arrangements for temporary staying of towers, and anchoring of conductors when necessary. Conductors may not be anchored to any portion of any tower, except strain towers, and then only at the points designed for conductor attachment. Temporary anchoring to footings and guy anchors will not be permitted. Where temporary anchoring is required, suitable temporary anchors shall be provided. Installation and removal of temporary anchors will be Contractor's responsibility

5.5.12 All conductors shall be strung by the controlled-tension method by means of rubber faced, double bullwheel-type tension stringing equipment. This equipment must be so designed that there shall be no conduction of the heat generated by the braking action, to the bullwheels. There shall be appropriate mechanical braking on the reels to prevent loose conductor between the reels and the bullwheels, but sufficient tension to pull the conductor in between layers remaining on the reel. Brake controls shall be positive and fail-safe in order to minimize the danger of brake failure.

5.5.13 The tension shall be controlled individually on each conductor, and when the desired tension is obtained, the same constant tension shall be held so long as the brakes are left at this setting. Tensions, while pulling, must be sufficient to clear all obstacles safely without damage to the conductor. At no time shall the pulling tension exceed the tension shown on the sag charts.

5.5.14 Adequate protection shall be provided where there is danger of conductors being damaged by vehicles or other equipment and objects. Conductors shall not be left in contact with the ground, vegetation or any conducting or semi-conducting material. Wood lagging or similar material shall be used to protect the conductor when working at ground level.

5.5.15 Before stringing commences, Contractor will be required to compress sample phase and earth conductor mid span joints, as well as phase conductor dead/end assemblies on site using the matched and numbered dies and compressors intended to be used on the line during stringing. The length of conductor between any two fittings on the sample shall be not less than 100 times the overall diameter of the conductor. At an acceptable testing authority a tensile load of about 50% of the breaking load of the conductor shall be applied and the conductor shall be marked in such a way that movement relative to the fitting can easily be detected. Without any subsequent adjustment of the fitting, the load shall be steadily increased to 95% of the breaking load and then reduced to 90% of the breaking load and maintained for 1 min. There shall be no movement of the conductor relative to the fitting due to slip during this period of 1 minute and no failure of the fitting. The conductor shall then be loaded to failure, and shall again withstand a minimum load of 95% of the minimum breaking strength of the conductor for it to be deemed acceptable. If the sample fails this test, a further three (3) samples shall be tested and will all be required to pass the above. A copy of the test report shall be provided to Owner prior to stringing.

5.5.16 Records of temperature, sag and tension for each section regulated shall be kept by Contractor, and a copy supplied to Owner.

5.5.17 OPGW shall be installed for the dual purpose of providing a lightning shield for the conductors and fiber-optic communications. A minimum of 48 individual fibers shall be provided in the OPGW conductor.

5.5.18 All conductor shall be Sagged using the T-t Transit method and by installing a dyno at the far end of the deadend section. The Transit targets and dyno shall confirm adequate sag has been reached. Identical processes shall be followed when installing additional phases in the same deadend section.

5.5.19 Structures requiring guy wires will have fencing to protect them from wildlife and vehicles.

8.5.19 Fire preventative coating will be applied up to 8ft on structures if wooden products used.

5.6 Earthing

5.6.1 The earthing system shall clearly and demonstrably ensure the safety of personnel, the public and equipment under all normal and abnormal operating conditions and all fault conditions.

5.6.2 The earthing system shall ensure that there is no risk to personnel, the public or livestock of electric shock (e.g. transferred potential, step voltages and touch voltages).

5.6.3 Pole structures shall have a maximum footing resistance of 10Ω, unless a requirement for lower resistances is determined by the earthing study.

5.7 Comissioning

5.7.1 Contractor to provide owner with as-built LiDAR survey of complete Transmission Line. The Survey of existing facilities shall be commissioned and completed within 1 month of conductor installation.

5.7.2 Contractor to provide owner with IR survey of entire transmission line after the line has been energized and is delivering not less than 80% of anticipated nominal load.

8.7.3 Contractor to provide owner with Corona survey of the entire Transmission Line after the line has been energized and is delivering not less than 80% of anticipated nominal load.

6. PLANT COMMUNICATIONS NETWORK DESIGN AND EQUIPMENT REQUIREMENTS

The solar plant communications network shall connect to all inverters and Meteorological Stations on the Project Site and shall connect to the terminal points as specified in this document, including but not limited to the TSP communication network.

Contractor shall be responsible for achieving a fully functional communications link between the SCADA server(s), each of the inverters and the Meteorological Stations.

6.1 General

6.1.1 The communications network will connect to the terminal points as specified, be compliant with Applicable Standards, and meet any additional requirements of the TSP Interconnection Agreement.

6.1.2 Fiber optic cables shall be used for the communication network.

6.1.3 The communications network shall be suitable for the Project Site, including:

- Immunity from the effects of fault and lightning currents
- The expected ambient temperature range
- Geotechnical conditions
- Protection from pests and rodents

6.1.4 No joints in the fiber-optic cable are permitted.

- Prior to fiber-optic cable installation, all cable will be inspected and tested with optical domain reflectometer.

6.1.5 Communications network requirements

- Underground fiber optic cable shall be as follows:
  - Conduit EPDM SDR 11 minimum
  - 12 fiber for individual collector circuits
  - For rodent protection a combination of the following methods shall be used
    - Non-armored fiber-optic cable in Pest Duct
    - Non-armored fiber-optic cableinstalled in a minimum of 4” schedule 40 PVC or HDPE innerduct
    - Armored fiber optic cable
    - Any concreted encased duct bank or metallic conduit
    - Any owner approved substitution that achieves equal protection from rodent damage
  - Collapsed fiber-optic ring system layout design, installation and testing.
- The communication network will be designed for a minimum of one (1) GB bandwidth

- The fiber-optic cabling will be either 12 strand multimode or 12 strand single mode, as applicable and consistent with standard industry practice
- Fusion splicing will be used if required, and completed in above-ground pedestals.
- Splice vaults shall be composed of reinforced concrete or fiberglass and equivalent in size to 4'x4'x4' with interior racking to mount splice case off the bottom of vault. Vault shall have an open bottom with gravel base.
- Extra fiber-optic cabling (slack) will be included at each end of all cable runs consistent with standard industry practices
- The communication system will have a maximum attenuation of 0.35 dB/km at 1310 nm or 0.25 dB/km at 1550 nm and will include a minimum system margin of between four (4) and six (6) dB
- In the event fiber-optic cables are placed in trenches with wiring associated with other parts of the System, underground rated subduct that also provides the ability to eliminate or decrease damage due to wildlife infestation. will be used to protect and separate the cable

  – Redundancy

    - The communications network shall have redundancy, so that the failure of a single component or communications link in the Communications Network shall not result in the loss of communication to more than one Wind Turbine, Meteorological Station, Terminal Point or Interface.

    - Redundancy may be achieved by using ring topology for the fiber-optic network such that communications can be maintained to all Wind Turbines in the event of a break in one of the cores of the fiber-optic cable. Re-routing of data shall take place automatically and not require manual intervention.

7. SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA) OR DATA ACQUISITION SYSTEMS (DAS)

7.1 SCADA/DAS General Requirements

7.1.1 SCADA system or DAS shall meet the specifications described in the below sections and any other specifications required by Authorities Having Jurisdiction (AHJ) or the interconnecting Utility.

7.1.2 SCADA systems with servers and data historians hosted in data centers, as opposed to at project sites, will be considered. DAS with servers and historians hosted in data centers are required.

7.2 Networking

7.2.1 Contractor shall furnish all devices necessary to implement the communications networks design as specified herein. These devices shall be installed in system cabinets and may include, but not be limited to, communications Modules, modems, hubs, routers, switches, line drivers, receivers and transmitters, protocol converters, fiber-optic patch panels, fan out kits, media converters, signal conditioners, prefabricated cables, and cable adapters/ connectors.

7.2.2 The SCADA/DAS System shall support RS-232, RS-485, and RS-422 as required by monitored equipment.

7.2.3 The SCADA/DAS System shall support TCP/IP as required by monitored equipment.

7.3 Protocols

All devices shall support either Modbus or DNP3. All other protocols must be approved by Owner before use. Owner will only consider open protocols managed by an independent organization. Contractor shall provide a comprehensive list of all protocols which are supported by the system being proposed.

7.4 Access Types

Native access shall mean the user is equipped with a copy of the native SCADA/DAS software permitting the user (with authentication) to full access of the SCADA/DAS system.

7.5 Users

Users shall be organized into groups based on permission level. Permissions shall be assigned to groups, and alarm notifications shall be sent to groups. Group privileges shall be configurable.

7.6 Submittals

7.6.1 Contractor shall provide a list of documents and drawings Contractor intends to submit for Owner review during the course of the Project. This should include, but not be limited to the following: point lists, SCADA/DAS diagram, I/O connection drawings, network layout, sensor locations, sensor orientations, point addressing scheme, sample HMI (human-machine interface) screens, sample web interface screens (if different from HMI), performance ratio and other applicable calculations, grounding requirements, datasheets for all hardware and software.

7.6.2 Contractor shall provide a summary of optional components that Contractor recommends Owner consider for enhanced performance monitoring, including a statement regarding the benefits of purchasing such options.

7.7 Nameplates and Tagging

7.7.1 Nameplates shall be furnished and installed on the exterior of all major SCADA/DAS equipment, including all operator interface cabinets/consoles, control and electrical panels, and cabinets.

7.7.2 Equipment designation nameplates shall be furnished and installed on the front and back interior of all cabinets and panels. This provides for equipment designation with doors removed. Internal nameplates shall also be furnished and installed for all cabinet and panel internal components including, but not limited to, internal devices, Modules, and terminal blocks (identification scheme to be finalized during detailed design).

7.8 Security System Integration

The system shall have the capability to integrate with a security system to, at minimum, indicate whether any security alarms exist. Security alarms shall be accessible from the alarm screen and home screen.

7.9 Uninterruptible Power Supply

The uninterruptible power supply (UPS) system shall provide for up to 4 hours of backup power to the equipment.

7.10 Serial Cabling

Serial networks shall use only shielded cable and shall be selected based on the serial interface and maximum distance to monitored equipment.

7.11 Requirements for New DAS System

The DAS system shall be composed of a primary DAS gateway, remote server, web interface, and all necessary communications equipment and cabling to communicate with all monitored equipment. The DAS gateway shall be installed in the shade.

7.12 DAS Monitored Equipment

7.12.1 The DAS system will be responsible for communication, monitoring and data acquisition with the following equipment: combiner boxes (if they contain string monitoring equipment), inverters, meteorological stations, and revenue meters.

7.12.2 Contractor shall provide all hardware and drivers to communicate with Owner-furnished foreign devices, such as the Data Processing Gateway.

7.12.3 The communications medium shall be twisted shielded copper conductors for indoor locations and those areas not subjected to induced signal noise. For communications networks routed outdoors or in areas where induced signal noise is probable, fiber-optic cable shall be used.

7.12.4 Contractor shall furnish all devices necessary to implement the foreign device interfaces (FDI).

7.13 Requirements for New SCADA System

7.13.1 Standards

Work performed under these specifications shall be in accordance with the codes and standards referenced herein. 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 Owner's specifications. In case of conflict, the latter shall govern to the extent of such difference.

Table 6-1 SCADA Standards

Work Element / Component	Standard

Work Element / Component	Standard
Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange	EIA RS-232-D
Racks, Panels, and Associated Equipment	EIA RS-310-D
Electrical Characteristics of Balanced Voltage Digital Interface Circuits	EIA RS-422-A
Standard for Electrical Characteristics of Generators and Receivers for Use in Balanced Digital Multipoint Systems	EIA RS-485
Standard for SCADA and Automation Systems	IEEE C37.1
Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus	IEEE C37.90.1
Recommended Practice for Data Communications Between Remote Terminal Units and Intelligent Electronic Devices in a Substation	IEEE 1379
Standard Digital Interface for Programmable Instrumentation	IEEE 488.1
Standard Codes, Formats, Protocols, and Common Commands	IEEE 488.2
Guide for Installation of Electrical Equipment to Minimize Electrical Noise Inputs to Controllers from External Equipment	IEEE 518
Binary Logic Diagrams for Process Operations	ISA S5.2
Graphic Symbols for Process Displays	ISA S5.5
Environmental Conditions for Process Control Systems	ISA S71.02
Functional Diagramming of Instrument and Control Systems	Formerly SAMA PMC22.1
Information Technology-Open System Interconnection-Basic Reference Model	ISO OSI 7498-1
Enclosures for Electrical Equipment	NEMA 250
Enclosures for Industrial Controls and Systems	NEMA ICS6
National Electrical Code	NFPA 70
Cabinets and Boxes	UL 50
Industrial Control Equipment	UL 508

7.13.2 Scope

Scope of supply shall include furnishing a complete SCADA system as described in this specification.

7.13.3 SCADA Equipment

7.13.3.1 The SCADA system shall be composed of a primary SCADA server, backup SCADA server, web server, SCADA historian server, SCADA workstation, , and all necessary communications equipment and cabling to communicate with all monitored equipment.

7.13.3.2 All equipment shall be installed in cabinets, consoles, or panels furnished by Contractor, suitable for the operating environment. All SCADA equipment shall be installed in a 19 inch rack. All SCADA hardware shall have clearly marked indicator lights on their front panels. All SCADA equipment shall be protected by surge suppression equipment that complies with IEEE C37.90.1.SCADA Monitored Equipment.

7.13.3.3 The SCADA system will be responsible for communication, monitoring, data acquisition, and control (where required) with the following equipment: combiner boxes (if they contain string monitoring equipment), inverters, meteorological stations, revenue meters, protective relays, high voltage circuit breakers, and step-up transformers.

7.13.3.4 Contractor shall provide all hardware and drivers to communicate with Owner-furnished foreign devices, such as the Data Processing Gateway.

7.13.3.5 The communications medium shall be twisted shielded copper conductors for indoor locations and those areas not subjected to induced signal noise. For communications networks routed outdoors or in areas where induced signal noise is probable, fiber-optic cable shall be used.

7.13.3.6 Contractor shall furnish all devices necessary to implement the foreign device interfaces (FDI) noted herein. FDIs are defined as any device installed by or for the use of a third party. These devices shall be installed in system cabinets, and may include, but not be limited to the following: communications modules, modems, hubs, routers, switches, protocol converters, fiber-optic patch panels, media converters, signal conditioners, and prefabricated cables.

7.13.4 Spare Capacity

7.13.4.1 The SCADA system shall provide spare hardware capacity for up to 20 percent input/output (I/O) after full buildout without requiring

additional hardware or server licensing. The SCADA system servers shall provide spare capacity for up to 100 percent additional I/O after full buildout without requiring the SCADA server hardware or software to be upgraded. That is, an updated license may be required to accommodate additional I/O, but no other software upgrades or additions shall be required.

7.13.4.2 The SCADA rack shall provide for 12U of spare space after the full build-out.

7.13.5 SCADA Location

7.13.5.1 The SCADA hardware rack and direct interface shall be located in the System substation building, the System O&M building, or as agreed upon by Contractor and Owner.

7.13.5.2 The room in which the SCADA is located shall be environmentally controlled to a temperature range of 50 to 78° F, humidity range of 20 to 40 percent, and provide air filtration to meet the manufacturer's recommendations for the SCADA equipment and other sensitive electronic equipment.

7.14 SCADA Cyber Security

Contractor shall furnish and configure the following security features as part of the SCADA system to be compliant with meet NERC Critical Infrastructure Protection (CIP) and purchaser's internal standards.

7.14.1 Security Center

1. Contractor shall provide a security center to accompany the SCADA system.
2. Contractor will supply all necessary servers, one local view station, and any necessary networking devices to connect the Security center to the SCADA system
3. Each security appliance (with the exception of the vulnerability scanner) must reside on its own virtual machine operating in separate subnets, with strict access rules governing which communications are allowed into and out of the networks.
4. Security appliances:
    a. Patch Management:
        i. Contractor shall supply an on-site patch management server capable of deploying patches for all software, hardware, and integrated third-party applications within the SCADA system, security center, and all other sub systems
        ii. Vendor shall evaluate, test, and provide appropriate patches to all devices and software within the SCADA system, security center, and all other sub-systems

iii. Patches will be provided on a monthly basis
iv. The patch management server will compile a comprehensive, centralized view of the patch status of each computer through agent-based scans, which will be capable of being displayed on a graphical dashboard. This information will also be integrated into the SIEM.
v. Patch Management functions will operate in a virtualized environment, utilizing agents installed on SCADA system, security center, and other subsystem devices.

b. Malware prevention
   i. All Windows endpoints within the SCADA system, security center, and any other sub-system will have host-based whitelisting
   ii. Malware prevention will provide centralized configuration and control of malware prevention agents that reside on each client.
   iii. Malware prevention agents will restrict which executables can run on the client by creating a whitelist of programs that are allowed to run; anything not on that list will be permitted to run.
   iv. Malware detection will be reported to the SIEM, and standard reports must be capable of running on an automated schedule
   v. Malware prevention functions will operate in a virtualized environment, utilizing agents installed on SCADA system, security center, and other subsystem devices.

c. Backup and Restoration
   i. Contractor shall provide an on-site backup server to schedule and preform automatic backups
   ii. Contractor shall provide a Network attached Storage (NAS) to store backups
   iii. Contractor shall provide specific recovery instructions for all devices
   iv. All capable devices within the SCADA system, security center, and any other sub-system shall be backed up
   v. Other devices within the SCADA system, security center, and any other sub-system, such as networking devices, shall have their configurations, firmware, and any other applicable configuration files pulled automatically on a scheduled basis
   vi. All backup files shall be encrypted
   vii. Backup and restoration functions will operate in a virtualized environment, utilizing agents installed on SCADA system, security center, and other subsystem devices.

d. Anti-Virus
   i. The Vendor shall integrate approved anti-virus software for all Windows systems within the SCADA system, security center, and all other sub systems.
   ii. Vendor shall provide an on-site Anti-Virus management server to apply updates to end point software

iii. All Windows endpoints will have host-based anti-virus software running at all times
iv. Vendor shall provide updated anti-virus definitions on a weekly basis
v. The anti-virus software will automatically detect, repair, and quarantine any spyware, adware, viruses, and other malicious intruders
vi. The anti-virus software will be installed on a dedicated anti-virus management station and will be used to:
    1. Integrate client software
    2. Configure and manage SCADA clients
    3. Distribute anti-virus signatures
    4. Generate anti-virus status reports
vii. Client anti-virus software will continually monitor client's machine for known viruses, the client must be installed and configured such that it does not adversely affect the operation of the SCADA system or delay operator actions
viii. The anti-virus software will provide a standards set of reports that can be run on an automated schedule and will be incorporated into the SIEM. The reports that will be included with the anti-virus software will be, at a minimum:
    1. Viruses report
    2. Protection status report
    3. Protection coverage report
    4. License usage report
    5. Anti-virus software version report
    6. Users of infected computers report
    7. Most infected users report
    8. Anti-virus database usage report
    9. Incompatible applications report
    10. Errors report
ix. Anti-virus software must also have the ability to create custom reports
x. Anti-virus functions will operate in a virtualized environment, utilizing agents installed on SCADA system, security center, and other subsystem devices.

e. Vulnerability Scanner
    i. Vulnerability scanner will perform scheduled scans to identify missing patches, viruses, identify vulnerabilities, detect out-of-date anti-virus signatures, etc. so they are remediated before they can are exploited
    ii. The vulnerability scanner will be capable of running detailed configuration checks that enumerate ports, users, shares, groups, agents, and services. Scans will be users-scheduled to collect information that is integrated with the SIEM.
    iii. Vulnerability scanner can reside on the same device virtualized environment as another security appliance.
f. Security Incident and Event Manager (SIEM)

i. The SIEM will provide centralized collection and correlations mechanisms to monitor and report on the SCADA system security posture.
ii. The SIEM functions will consolidate and normalize all event logs generated by a variety of firewalls, NID devices, anti-virus products, anti-malware products, Netflow, vulnerability scanners, SCADA servers, etc.
iii. The SIEM shall simplify large amounts of disparate types of data in order to provide an indication that a security event may be happening.
iv. The SIEM shall be capable of running customizable reports on an automated schedule
v. Contractor must supply a NAS for all log storage
vi. The SIEM appliance shall be compatible with existing Owner centralized SIEM
vii. The SIEM device can be standalone or virtualized, but must be agreed upon by vendor and purchaser.

5. Security Center Computer requirements
    a. Server:
        i. General
            1. Each server shall be an independent Microsoft Windows based computer capable of stand-alone operation.
            2. Servers shall connect to SCADA system through an Ethernet NIC
            3. Rack mountable
            4. Servers shall be configured for redundancy complete functionality shall be available with the loss of any server
        ii. Operating System: Microsoft Windows Server 2012 R2 or as recommended by vendor
        iii. Storage
            1. Raid 5 with minimum of 5 drives
            2. Hard drives:
                a. 1 terabyte per virtual machine
                b. SATA Interface
            3. Hot-plug hard drives
        iv. Memory: Minimum 32 Gigabyte RAM per Virtual Machine
        v. CPU Cores: Minimum 4, Intel Xenon or greater, minimum speed 3.0 GHz
        vi. Network Interface: Minimum 5 NICs, 1Gbps
        vii. Power: hot pluggable redundant power supplies
        viii. Virtualization: Up to 4 Virtual Machines per physical host
        ix. Manufacturer: VMWare or Microsoft Hyper-V
        x. Manufacturer: Dell PowerEdge R730 or greater
    b. View Node:
        i. General

1. Each server shall be an independent Microsoft Windows based computer capable of stand-alone operation.
2. Servers shall connect to SCADA system through an Ethernet NIC
3. Rack mountable

ii. Operating System: Microsoft Windows 2010, 64 bit.
iii. Storage: 500 Gigabyte solid state drive
iv. Memory: Minimum 32 Gigabyte RAM
v. CPU Cores: Minimum 2, Intel Xenon or greater, minimum speed 3.0 GHz
vi. Network Interface: Minimum 1 NICs, 1Gbps
vii. Video Interface: Support up to 2 HDMI video outputs
viii. Monitors:
1. Quantity: 2 monitors per view Node minimum
2. Resolution: 1920 x 1080
3. 24 inch diagonal
ix. Manufacturer:
1. Dell Precision Rack 7000 Series or greater

c. Network Attached Storage (NAS)
i. General
1. NAS shall be connect to SCADA system through an Ethernet NIC
2. Rack mountable
ii. CPU architecture: 64 bit
iii. CPU Cores: Minimum 4, 3.0 GHz
iv. Memory: Minimum 4 Gigabyte RAM
v. Drive bays:
1. Minimum 12 drives
2. Hot-swappable
3. 1TB per drive
vi. Network Interface: Minimum 2 NIC, 1Gbps
vii. Power supply: Redundant failover
viii. Manufacturer: Synology

d. Networking Devices
i. Cisco iOS
ii. Netflow capable
iii. Rack mounted
iv. FirePOWER services (for firewalls)

7.14.2 Device Management

1. Networking Devices

a. All networking devices shall receive validated patches from the vendor via the patch management server
b. By default, all networking devices will be managed by Owner, with the option of dual management (Owner and vendor) as required
c. All networking devices shall have all un-used ports disabled
d. post-contract award, the vendor shall provide documentation on all network devices installed with security settings
e. All network devices provided by the contractor shall be capable of generating Netflow data
f. If critical devices, needed to operate SCADA system effectively, do not inherently generate Netflow data, the contractor shall provide Netflow generators to simulate Netflow.
g. Firewalls
    i. Firewalls will be implicit deny with exceptions
    ii. Firewalls will be designed with both ingress and egress rulesets
    iii. Post-contract award, vendor all provide information on all communications through the firewalls
    iv. Firewalls will be Cisco iOS based with FirePOWER services
    v. Firewalls provided must meet all VPN Requirements
h. Network Intrusion Detection (NID)
    i. All communications between different subnets or networks shall be monitored using Network Intrusion Detection System (NID)
    ii. All External access points shall be monitored at the Firewall level, capable of blocking unauthorized traffic
    iii. Contractor shall provide any additional NID appliances
    iv. NID devices shall be Sourcefire appliances
    v. All NID/NIP devices (including firewalls) must be capable of talking up to, and receiving updates from, a purchaser owned Sourcefire management server

2. End Devices
    a. Examples of end devices include, but are not limited to, servers, HMIs, RTUs, controllers, sensors, actuators, meters, and inverters
    b. Post-contract award the vendor shall provide documentation detailing all applications, utilities, system services, scripts, configuration files, databases, and all other system requirements for all end devices
    c. Vendor shall provide documentation of all services required and justification for why they are necessary
    d. Vendor will remove and/or disable all software components not required for operation prior to the FAT
    e. Vendor shall configure devices with least privilege file and account access and provide documentation of the configuration

f. Vendor shall disable (through software or physical disconnection) all unneeded communication ports and removable media drives. Vendor will provide documentation that this has been completed prior to the SAT
g. Vendor shall incorporate a patch management process for all devices (in accordance with patch management section)
h. Vendor shall incorporate host-based appliances for all endpoints required by the security center
i. Pre-contract award the vendor will provide information on the patch management process
j. Vendor shall verify that the additional of security features does not adversely affect connections, latency, response times, and throughout, including during the SAT
k. Vendor is responsible for providing hardware capable of performing its normal functions in addition to all required the security functions

7.14.3 Account Management

1. All default and guest accounts will be removed prior to the FAT
2. Vendor will supply a list of accounts which need to be active and which can be disabled. Purchaser will approve these accounts in writing
3. Contractor will supply a domain controller to manage all windows-based machines and accounts
4. Contractor will supply an Authentication, Authorization, and Accounting (AAA) server for authenticating VPNs and all networking accounts, and device accounts
5. Vendor will hand over management of domain controllers and AAA server post-SAT
6. All account activity, as well as failed login attempts, will be logged and sent to the SIEM
7. All accounts within the SCADA system, Security system, and DMZs will adhere to least privilege permission schemes
8. Pre-contract award, vendor shall provide a separation agreement to determine how vendor employees who have sensitive knowledge of purchaser's control system and who leave their position or have responsibilities changed will be prohibited from disclosing that knowledge, where disclosure could lead to a reduction in security
9. Vendor shall notify purchaser within 12 hours of a vendor employee, who has access to the SCADA system or any sub-system, quits or is terminated with cause
10. Vendor shall notify purchaser within 3 days when a vendor employee, who has access to the SCADA system or any sub-system, retires or changes position to where they no longer need access to the system
11. All accounts will be role based with restricted permissions
12. No local accounts shall be enabled within the SCADA system, where technically feasible

7.14.4 Network Design:

1. Vendor will provide a mechanism for alerting purchaser in the event of a vulnerability or exploit that affects the SCADA system within a pre-agreed upon time frame

2. Vendor shall disclose the existence and reasons for any identified backdoor codes
3. FTP, telnet, and HTTP shall be disabled on all SCADA devices and replaced with SFTP, SSH, and HTTPS or encrypted alternatives where needed
4. SSH, HTTPS, and RDP will be the only methods to remotely log into the site devices, authenticated by the AAA server, and may only originate from inside the SCADA system or
5. Network Segmentation
    a. In addition to all existing DMZs, the SCADA system shall be segmented in a logical manner, to be agreed upon by the vendor and purchaser.
    b. Vendor shall provide ACLs, port security address lists for all communications between subnets
    c. Vendor shall provide and document secure network architecture where higher security zones originate communications to less secure zones
    d. Vendor shall provide and document all communication paths between networks of different security zones
    e. Vendor shall provide a mechanism for isolating specific subnets if they are known to be causing harm to the SCADA system
6. Wireless Communications
    a. Wireless technologies such as microwave, cell, Bluetooth, Wi-Fi (802.11x), ZigBee, WirelessHART, or other wireless technologies shall not be used within the SCADA system or any sub-system
7. Management Tools
    a. Contractor shall provide management tools specific to the hardware and software included in the SCADA system, security system, test environment, or any other sub-system
    b. All tools will be licensed to incorporate all devices provided
    c. Any licensing must be transferable if any device is replace for any reason
    d. Additional licenses shall be available for purchases

7.14.5 Remote Access

1. All remote access traffic will be fully encrypted
2. All remote access will require 2 factor authentication
3. All access points including routable connections, serial links, or other communication methods will be documented and supplied by the vendor
4. All remote access will be managed by purchaser, in cooperation with vendor
5. No vendor (including SCADA vendor) shall have access to SCADA network or equipment remotely without owner authorization
6. Web Access
    a. Under no circumstances will the SCADA system have direct access to the internet
    b. All web (HTTP/HTTPS) access will be performed through a web-proxy

c. Vendor shall provide documentation of input sanitation for all web form inputs including, but not limited to, prevention of command injection, SQL injection, directory Traversal, RFI, XSS, and buffer overflow
d. Vendor shall provide an independent, third party assessment of all web-based interface software

7. VPN Access
    a. All remote access to the control system network must be performed through a VPN
    b. VPN terminal server shall be located in a DMZ
    c. VPN terminal server shall have monitoring software installed to record and forward pre-encrypted traffic to the NID device
    d. VPNs must utilize multifactor authentication (e.g., security token, known key, and/or certificate)
    e. VPN connections shall have communication logging, alarming, and monitoring to protect SCADA system from unauthorized modification or use
8. Dialup and dedicated phone lines
    a. Dial-up and dedicated phone lines will not be used within the SCADA network, security network, or any other sub-system

7.14.6 Physical Security

1. Contractor shall provide a lockable or locking enclosure for all control system components
    b. Core equipment, such as any backbone switches, SCADA servers, Remote access terminals, Firewalls, Routers, etc. must be locked, at minimum, by a non-reproducible keycard. Access to these cards and equipment must be logged, and this system must electronically record and timestamp who enters the room (e.g. AMAG)
    c. Remote equipment, such as remote switches, controllers, media converters, PLCs, RTUs, and other end devices must be secured, at a minimum, by a non-reproducible key or keycard. Access to these keys and equipment must be logged
2. Contractor shall verify and provide documentation that unauthorized logging devices are not installed (e.g. key loggers, cameras, and microphones)
3. All physical security networks must be separate from SCADA networks

7.14.7 Incident Response/Disaster Recovery

1. Pre-contract award vendor shall provide Incident Response and Disaster Recovery plans
2. Vendor must incorporate purchaser's specific IR/DR plans if there are any deficiencies

7.14.8 Test environment

1. Contractor shall provide equipment for a test environment to simulate standard operating conditions. The purpose of this system is not to completely reproduce the SCADA system, rather it should mimic key features of the system for testing purposes.

2. Contractor shall include all hardware necessary to generate this environment including, but not limited to, SCADA servers, HMIs, Firewalls, Routers, Switches, Controllers, Protocol Converters, etc.
3. Contractor shall include all software licenses and patches for all equipment in the test lab
4. This network must be capable of testing patches, backups, and preforming penetration tests
5. Test environment will be solely managed by purchaser

7.14.9 Awareness Training

1. Before any user is granted access to the SCADA system, they must undergo a purchaser approved security training
2. This training must be renewed on an annual basis for all personnel that interact with the SCADA system
3. Vendor may provide their own training; however purchaser must verify that this training meets purchaser's requirements
4. Vendor is responsible for insuring their personal complete cyber security training in the required time if they elect to train their own personnel
5. If vendor does not wish to have their own training, purchaser will provide training to vendor personal
6. All records of this training must be provided to purchaser before a vendor employee is granted access to the SCADA system

7.14.10 Acceptance Tests

1. Factory Acceptance Test (FAT)
    a. Vendor shall provide current configuration files for all devices
    b. Firewall rules, as well as all other access control mechanisms, will be enabled throughout the duration of the FAT
    c. Devices will have logging enabled and logs will be provided to owner at the end of the FAT
    d. All Firewall rules will be reviewed during the FAT
2. Site Acceptance Test (SAT)
    a. Vendor shall ensure all devices are patched to their most current level
    b. Vendor shall provide current configuration files for all devices
    c. Firewall rules, as well as all other access control mechanisms, will be enabled throughout the duration of the SAT
    d. Devices will have logging enabled and logs will be provided to owner at the end of the SAT
    e. All Firewall rules will be verified at the SAT
    f. Vulnerability scans must be performed on critical system components as part of the SAT
    g. Remote access and remote access restrictions must be tested as part of the SAT

h. Vendor will disable, remove, or modify all vendor-owned accounts or negotiate account ownership of these accounts as part of the SAT
i. The vendor will create a baseline of system communication and configurations at the time of the SAT to be provided to the purchaser.
j. Vendor shall document the results of any NID tuning signatures and adjusting thresholds to reduce false positives and minimize false negatives.

7.14.11 SCADA Data Highway Communications Network

The system communications networks shall include a redundant control processor to control processor data highway communications network (a backup SCADA server meets this requirement). The capability shall be provided for connection of future nodes to the data highway communications network, such as additional control and operator interface processors, monitors, programming devices, or FDIs to other systems. The data highway communications network shall be expandable to accept at least 100 percent future additional nodes. The system shall be designed so that new nodes can be added without shutting down the system or causing a loss of control, information display, or alarm information.

7.14.12 SCADA Operator Interface Communications Network

a. The system communications networks shall also include an operator interface communications network for data transfer from the data highway communications network to the operator and operator/engineer interface processors, monitors, keyboards, and printers.

b. All Ethernet based communication networks shall use Category 6 or better unshielded twisted pair (UTP) for cables run inside buildings and multimode, fiber-optic cable for cables run outside or between buildings. Twisted pair cable networks shall conform to 100BASE-TX or 1000BASE-T or newer requirements. Fiber-optic cable networks shall conform to ISO 8802.3 100BASE-FX or 1000BASE-SX or newer requirements. The network shall be designed for maximum speed through the use of Gigabit (or faster) components where possible.

c. Switch ports shall be capable of both 100 Mbps and Gigabit operation, full and half duplex. Switch ports shall be auto sensing so that the correct network bandwidth is applied to the connected equipment.

d. Maximum network segment lengths shall conform to the IEEE 802.3 standard requirements.

e. Ethernet networks shall use a port switched configuration with redundant network hardware, and shall minimize the use of non-switching hubs.

f. Switches shall be auto-sensing with remote management capability. All cabling required to perform remote management (setup) of the switches shall be provided by Contractor.

7.15 SCADA Hardware

7.15.1 SCADA Server

a. A primary SCADA server shall be provided. The primary SCADA server shall run the HMI. The primary SCADA server shall run the communications engine for communicating with all monitored equipment. The primary SCADA server shall be installed with a copy of each manufacturer's software for all monitored equipment (inverters, met station, relays, etc.)

b. The primary SCADA server shall be an industrial grade server with Microsoft Windows Server (version to be approved by Owner; Vista and Windows 7 are not acceptable), and at minimum, 4 GB RAM, removable media storage for backup, 100 Mbps NIC, 4 USB ports, 3 GHz dual core processor, 19 inch flat screen display with a minimum resolution of 1600 x 1200, and a RAID array with a minimum of 500 GB useable storage space.

c. The primary SCADA server shall meet the recommended system configuration of all SCADA software installed.

7.15.2 SCADA Server Backup

a. The backup SCADA server shall meet the same requirements as the primary SCADA server. The backup SCADA server shall automatically become the primary SCADA server if the primary SCADA server ceases to operate.

b. The backup SCADA server shall relinquish control of the network when the primary SCADA server resumes control, with bumpless transfer of communication.

7.16 SCADA Software

7.16.1 General

a. Colors shall be used consistently throughout all software (HMI screens, etc.) Red shall indicate energized, closed, live. Green shall indicate de-energized, open, tripped. Yellow shall indicate loss of communication with a device.

b. No SCADA software shall require a hardware key.

c. Software shall fully support redundant servers and networks, as described herein.

7.16.2 Lockout/Tagout (LOTO)

a. SCADA software shall include a LOTO facility that allows the operator to indicate that a device is being locked/tagged out and a description of the service being performed. Contractor shall provide device tagout logic and operator interface configuration for all equipment included in the scope of Contractor's programming services for control.

b. The SCADA server shall note the time the LOTO tag was entered in the software and the time that the device in question changed state. LOTO data shall be stored in the historian.

7.16.3 General Logs

The SCADA server shall provide facility to enter general log information with customizable categories and time stamp.

7.16.4 Editors/Tools

a. SCADA server shall include software tools to edit/build HMI screens, edit/build reports, edit alarm thresholds, edit user group memberships, edit group privileges, etc. Software tools provided shall include provision to edit/update the points list and device address/mapping.

b. Contractor shall provide a complete list of all software included as part of Contractor's proposed SCADA system for Owner's approval.

c. The HMI builder application shall be of the "drag-and-drop" type and not require programming knowledge to: add symbols to a screen, add conditional logic for color coding, change colors, line widths, line types, etc.

d. Each engineer/operator workstation in the SCADA system shall include a complete set of user-friendly interactive control and information display editors for generation and modification of the displays, macros, custom shapes, and custom colors. The editors shall be of the latest technology including a mouse driven GUI using windowing technology (i.e., drag/drop, cut/copy/paste, etc.) The interactive editors shall allow the user to build, inspect, or modify any display using any or all of the textual, geometric graphic, or symbolic features of the system. New displays shall be able to be created starting from a blank screen or by recalling existing displays, editing, and storing the new display under a new file name.

e. The SCADA system shall allow the user to create and store frequently used shapes and symbols representing plant and process equipment. These symbols shall be available for use in any process control display. The symbols shall have the capability to be located at any place on a display, to be rotated to any orientation, to be magnified or reduced, to be given any color, and to be dynamically linked to any system variable. The system shall include a library of Contractor's standard set of geometric symbols (similar to ISA S5.5 symbols) related to System equipment. The system shall provide the capability to save user defined groups of geometric graphic elements as macro symbols that can then be imported into other process control displays.

7.16.5 Process Logic

Provision shall be made to write simple control algorithms to control equipment and generation alarms based on the status or value of data points. Control algorithms shall be

prevented from energizing equipment when other upstream or downstream equipment is in an unacceptable state. Program logic and screen editing shall be in SAMA format.

7.16.6 Calculated Points

The SCADA server shall generate the calculated points listed on the points list. Calculated points shall be available for use on HMI screens, trending and reporting as if they were raw data points. Provision shall be made for the creation of additional calculated points.

7.16.7 Historian

a. Historian data shall be available to the trending and reporting screens of the HMI. Historian data shall include all points in the SCADA system. Provision shall be made for future expansion.

b. The historian shall support 5 years of full data access without requiring backup media to be used. Provision shall be made for regular backup to removable media. Communication shall be via open protocol.

c. The historian shall be OSI PI historian or Open Protocol Communication. An unlimited site license and two remote site access licenses shall be provided.

7.17 SCADA HMI Functional Requirements

The HMI screens shall meet, at a minimum, the following functional requirements.

7.17.1 Home Screen

a. The home screen shall be a graphical view of the entire System with device icons to represent field equipment and/or systems.

b. This view shall display the most important real-time information from each device (including inverters, revenue meter, meteorological stations, etc.) and shall use color-coded icons to denote status (e.g., inverters, relays and meters shall display power, current, and voltage.)

c. Clicking on a device shall open up a device screen (see below) to display additional details regarding each device and provide control functionality.

d. The home screen shall display a System layout that approximates the actual relative physical location of equipment with device labels that match design drawings and equipment labeling.

e. The home screen shall display a data table of key metrics, including kW, power factor, MWh, yield, irradiance and performance ratio for the current date, month to date, year to date, and lifetime.

f. The home screen shall display a short alarm list of all un-acknowledged alarms and any severe acknowledged alarms that have not been cleared.

7.17.2 Electrical One-Line Screen

The electrical one-line screen shall provide a simplified single-line diagram of the System, including all inverters and higher voltage equipment with key operational metrics. Equipment shall be appropriately color-coded to indicate device state. Equipment shall be represented by appropriate electrical symbols. Clicking on a device shall access the device screen for that device.

7.17.3 Device Screens

Selecting a device from either the home screen or electrical one-line screen shall produce a device screen displaying (or making available) all data points associated with that device. Device screens shall provide a facility for control of the device (reference point list for typical control devices.)

7.17.4 Alarm Screen

a. The alarm screen shall display all alarms. Alarms shall be sortable by acknowledgment status (acknowledged or not acknowledged), alarm status (still in alarm or cleared), alarm code, and device ID.

b. Alarms shall use the date/time stamp of the alarm from the device (where supported).

c. Alarms shall be configurable such that any data point can have upper and lower thresholds set to trigger an alarm. Alarms shall also be configurable such that any data point can have a threshold set over time to trigger an alarm. The SCADA system shall also include an audible alarm that shall have adjustable volume control. The audible alarm shall be user configurable for different tones or patterns to distinguish between a minimum of four alarm priority levels. The system shall use global alarm acknowledgment, allowing a single acknowledgment from any workstation, whether designated as the alarm workstation or not, to acknowledge that alarm on all workstations and to silence the audible alarm.

7.17.5 Trending Screen

a. Graphical and tabular representation of data shall be supported. The graphical view shall support two vertical axes and shall support trending of up to 12 variables.

b. The trending screen shall allow for a user-selectable time scale and shall have built in support for selecting common date ranges (today, yesterday to today, week to date, last 7 days, last 30 days, last 365 days, month to date, year to date, lifetime.)

c. Selecting a point in the graph shall display the raw data for that point.

d. The trending screen shall allow a customized chart/table to be saved as a report for use by the reporting engine (refer to reporting screen below) or for future use in other applications.

e. The SCADA system shall allow any system variable to be trended and shall allow points from short-term and long-term storage to be trended. The trend display period between points on trends using data from short-term and long-term data storage shall be the same as the storage frequency selected for those points.

7.17.6 Reporting Screen

a. A reporting engine shall be provided allowing for reports to be generated from any data point. Contractor shall indicate if this engine is part of the SCADA package, the historian, or a separate package (like Crystal Reports).

b. The reporting screen shall allow for simple mathematical operations and display of results on reports (e.g., sum, average, minimum, maximum.)

c. Reports shall be exportable in CSV format and Adobe PDF format.

d. Reports shall be configurable to run automatically based on thresholds being reached or regularly scheduled.

e. Reports shall be configurable to automatically email the report to specific groups.

7.18 Remote Access

7.18.1 Full Access

Remote access shall be provided utilizing Microsoft Terminal Services or equivalent for remote access of the SCADA server, SCADA backup server, SCADA Web server, SCADA historian and SCADA workstation. The system shall support up to three concurrent remote users in addition to a local user.

7.18.2 Web-Based Access

a. Contractor shall provide the hardware and software necessary to allow remote access of near real-time process information by any Intranet or Internet web browser on any connected personal computer (PC). There shall be no software-based limit on the number of concurrent connections. Web access shall be separated from the SCADA servers by a firewall.

b. Remote access shall provide for functionally equivalent read-only access as if user was operating the SCADA server or SCADA workstation directly. The interface shall provide the ability to convert HMI graphics to web-based objects to allow graphics access from standard web browsers. The interface shall be dynamic and shall not display data older than 5 minutes.

7.18.3 DNP Slave

a. The SCADA server shall include DNP slave protocol for communication with a higher, supervisory system. The configuration shall include provision for setting the DNP address for the System and mapping any data points required.

b. The DNP slave shall provide for control access, support DNP report by exception, and shall include the ability to be polled by two separate DNP masters.

7.18.4 Vendor Access

No vendor (including the SCADA system vendor) shall have access to the SCADA network or equipment remotely without Owner authorization.

7.19 Optional Future Requirements SCADA

The SCADA supplier shall comply with all telemetry requirements set forth by the utility, system operator or balancing authority.

7.20 Data acquisition

7.20.1 All points necessary to monitor and operate the System shall be listed on the points list and shall be collected and accessible through the SCADA server and HMI.

7.20.2 All points shall be assigned a uniquely identifiable number such that they are available programmatically for alarming, trending, reporting, and screen building.

7.20.3 Refer to the sample SCADA points list (I/O list) included in Appendix I as an example of the points list format and minimum information required.

7.20.4 Contractor shall add I/O card and termination information to the database. In addition to providing information on active I/O, Contractor shall populate the database with the hardware information for all available spare points on all cards.

7.21 Control

7.21.1 All control commands shall require a two-step (select before operate) process. Additionally, the user must acknowledge and follow the control requirements (if applicable) by the interconnecting authority.

7.21.2 Users shall have read-only access to the following items:

7.21.3 Web access with near real-time updates at a frequency of no less than 15 minutes or at rate prescribed by the TSO.

7.21.4 Remote access through a web-based interface that provides access to the HMI screens, including access to the point database information and live and historical trend data.

7.21.5 Project's TSO revenue meter and all Project meter data at the Project Site.

7.21.6 Real time access to the Project's Scheduling and Logging for the TSO client application.

7.22 Utility and Grid Operator Connectivity Requirements with SCADA/DAS

Contactor shall comply with all requirements of the Utility, Independent System Operator (ISO) or other agencies as required.

8. TELECOMMUNICATIONS FACILITIES

8.1 SUMMARY:

A. This Section summarizes the communications systems Contractor shall provide as part of its proposal. The proposal shall address three aspects of the telecommunications design.
   1. Intra-site Communications - the Network shall primarily be an Ethernet Fiber network to support intra-site data and voice communications needs.
   2. Substation Interconnect - Contractor shall incorporate plans for the communications needs required to interconnect the facility to the bulk electric power system. This may include transfer trip and any of special or remedial protection schemes needed for the interconnection of the facility to the bulk electric power system. This design shall meet any requirements from the interconnecting utility, the Public Utility Commission, and/or the Independent System Operator for SCADA or Metering.
   3. PGE Connectivity - to support remote monitoring and operation of the facility. This will include one or more data links back to PGE operations center. This shall include connectivity for both the Primary SCADA link as well as the plant operational data link serving plant operations such as sending operational and maintenance data to a historian, allowing remote access and control, and voice communications to the facility.

8.2 TELECOMUNICATIONS APPROACH

Contractor shall provide a bid that both meets these specifications and allocates a budget for the design, procurement, and construction of these telecommunications facilities. The site network and the interconnection requirements should be known and the design and costs of these facilities should be accounted for and well understood. The communications link to Owner will depend greatly on the location, size, and type of facility proposed, and therefore Contractor shall propose a solution that meets these functional specifications. During negotiations this aspect of the design may be revised based on site specific conditions. An allowance for each of these three sections (Intra-site Communications, Substation Interconnect, and Owner Connectivity) shall be provided. The proposal price will not be revised if the ultimate solution remains within these allowances.

8.3 TELECOMUNCATIONS FACILITES

A. The following shall be provided both during and after construction:
   1. Communications during construction: Contractor shall provide a communications network to be used during construction, and specifically communications services to

the on-site trailers used during construction. A minimum of 5 Mbps Ethernet link shall be provided to each PGE trailer, along with (2) phone lines per trailer, which may be either VOIP or POTS. The Ethernet link shall only be dedicated to PGE and no other users. Contractor shall further provide any communications circuits needed for their own use. In addition each trailer shall be equipped with one 7' tall 19" wide communications rack and 20 A of AC power for PGE IT to install routers/switches used to distribute data connections.

2. Intra-Site Network: Contractor shall provide a data network that extends from a central substation or maintenance office to all equipment enclosures throughout the facility that house microcontroller equipment.
    a. This network shall be constructed such that it supports the following applications:
        (1) Shall support the Real-time control for the operation of the plant.
        (2) Shall support remote monitoring for Owner to gather operational data from microprocessor-controlled equipment.
        (3) Shall support monitoring of weather information.
        (4) Shall allow Owner to remotely access remotely configurable equipment to make settings changes and firmware upgrades.
        (5) Shall support the use of Voice at each enclosure, desk, conference room, or security control point.
        (6) Shall support the use of Video where required for security and operations of the plant.
        (7) Shall include Wireless Access Points in Office locations
    b. The network shall be capable of meeting the following specifications:
        (1) Use IP/Ethernet communications over a fiber and copper network.
            (a) At least 60 Strands of single mode (SM) fiber shall be installed between all buildings as part of the project. Fiber shall be configured in a logical ring and where possible into a diverse optical ring.
            (b) Category 6 copper shall be used for all connections between switches and equipment within a building.
        (2) Use gigabit Ethernet connections
        (3) Use VLANS for segmentation of traffic
        (4) Use Quality of Service to Prioritize traffic flows
        (5) Use Rapid Spanning Tree or other advanced ring convergence protocols.
        (6) Support POE where phones or wireless access points are installed.
        (7) Use managed equipment that support the following:
            (a) Centralized authentication via RADIUS or TACACS
            (b) Centralized logging via Syslog
        (8) Use hardened network equipment rated for the environment in which it will be installed.
3. Interconnection to Bulk Electric Power System:
    a. Build any fiber, microwave, or leased facilities needed in order to tie facility into bulk electric power system.
    b. Follow Western Electricity Coordinating Council (WECC) teleprotection standards.
    c. Meet utility interconnection standards.
4. PGE Communications Circuits :
    a. Contractor shall provide the following communication circuits, each with the respective parameters given. These communications circuits can be delivered over the one or more aggregate leased circuits if possible. These circuits may make use of a private data network or a leased facility from a common carrier. Contractor's proposal shall include the capital cost for construction, as well as the estimated monthly recurring cost if applicable. PGE shall not be responsible for any communication links required by manufacturers, such as for remote access by the turbine or generator manufacturer. Contractor shall make use of Owner equipment listed below in Section 7.04-K – Telecommunications Equipment, where such equipment is required:

Circuit Name	LOC A	LOC Z	Type	Capacity	Latency	Avail.	Circuit Description
O&M POTS LINE	O&M	PGE WHQ	FXS	64 kbps	100 msec	99.99%	PHONE LINE
O&M CORPORATE NETWORK	O&M	PGE WHQ	ETH	20 Mbps	100 msec	99.99%	CORPORATE NETWORK SERVICE
O&M SECURITY ETHERNET	O&M	PGE WHQ	ETH	1.5 Mbps	0.5 sec	99.99%	CORP SECURITY LAN
SUB SECURITY ETHERNET	SUBSTATION	O&M	ETH	1.5 Mbps	0.5 sec	99.99%	CORP SECURITY LAN
SUB REMOTE ACCESS LAN	SUBSTATION	PGE WHQ	ETH	1.5 Mbps	0.5 sec	99.99%	REMOTE ACCESS FOR PROTECTION & AUTOMATION GROUP
SUB COMM TECH LAN	SUBSTATION	PGE WHQ	ETH	1.5 Mbps	0.5 sec	99.99%	REMOTE ACCESS FOR COMM TECHS
SUB SCADA	SUBSTATION	PGE WHQ	RS-232	64 kbps	1 sec	99.99%	SERIAL DNP 3.0 SCADA
SUB AGC SCADA	SUBSTATION	PGE WHQ	RS-232	64 kbps	1 sec	99.99%	SERIAL DNP 3.0 AUTOMATIC GENERATION CONTROL
SUB PHONE	SUBSTATION	PGE WHQ	VoIP	64 kbps	100 msec	99.99%	PHONE LINE FOR CONTROL HOUSE
SUB ACCESS CONTROL POTS	SUBSTATION	PGE WHQ	FXS	64 kbps	100 msec	99.99%	PHONE LINE FOR SECURITY ACCESS CONTROL
SUB SECURITY POTS	SUBSTATION	PGE WHQ	FXS	64 kbps	100 msec	99.99%	PHONE LINE FOR SECURITY
INTERCONNECT METER POTS	SUBSTATION	PGE WHQ	FXS	64 kbps	100 msec	99.99%	PHONE LINE FOR INTERCONNECTING UTILITY METER
INTERCONNECT PHONE POTS	SUBSTATION	PGE WHQ	FXS	64 kbps	100 msec	99.99%	PHONE LINE FOR INTERCONNECTING UTILITY PHONE

8.4 TELECOMUNCATIONS EQUIPMENT & INSTALLATION

A. In each major facility provide space for (4) adjacent Communications racks. For the Plant and Switchyard/Substation facilities, locate the Communications racks in the same room or

adjacent to the relay equipment racks. For the O&M Building or Administration Building, in addition to the Communications racks, provide (4) racks for IT Operations and (2) racks for Corporate Security Operations. Locate the Communications racks in the same room or adjacent to racks dedicated for IT Operations and Corporate Security. Each room to include 4'x8' fire-rate plywood backboard (white).

B. In the O&M or Administration Building, provide a Communications room of at least 240 sq. ft., with dimensions of 12' x 20'. For the Switchyard/Substation, the Control House shall be of adequate size to accommodate the telecommunications equipment, -48 VDC charger, and -48 VDC battery, as well as any additional equipment required in preceding or proceeding sections.
C. Provide a -48VDC power system capable of supplying the load with an 8 hour reserve time at each major facility.
D. Provide a SATRAD-G2 satellite phone system with exterior antenna, rack mount equipment, and a dedicated desk phone (PSTN Interface).
E. Communications equipment shall be grounded per Motorola R56 standards in O&M and Administration Buildings. Grounding in the Switchyard/Substation shall follow standard industry practices, and single point grounding methodology.
F. Installation of fiber optic cable shall meet TIA-568C or later, in addition to any other relevant industry standards. Intra-site fiber optic cable shall be installed in innerduct, within appropriate PVC conduit, cable trench or ducting.
G. OPGW fiber optic cable shall be installed in the shield wire position for any new transmission line installations.
H. Contractor shall provide diagrams or drawings matching existing PGE documentation standards for all building/room plans, cable routing, equipment racks, equipment wiring, and circuit schematic diagrams for all installed telecommunication facilities.
I. All equipment and systems shall be tested to ensure desired performance, and the results shall be submitted to Owner in writing. Communications systems shall not be considered approved for operation until the testing results are reviewed and approved by Owner or a designated Owner's representative.
J. All installed cabling shall be labeled to allow Owner or an independent third party to locate and document individual cables at each termination point.
K. Equipment specified for this project shall be of the same manufacturer and model as Owner uses in their existing communications systems:
    1. Dual-post Rack – Chatsworth "Clear", 19" x 84"
    2. Ethernet Switch – Cisco
    3. VoIP Phone - Cisco
    4. Wireless Access Point – Cisco
    5. SONET Fiber Node – Fujitsu 4100 ES shelf and support cards
    6. T1 Multiplexer – RAD MP4100 shelf and support cards
    7. DSX-1 Cross-connect panel – Telect 28-port; 010-0128-0101
    8. Fiber Patch Panel – Clearfield FxDS, with SC/UPC Connectors
    9. ADSS Fiber Cable – OFS AT-3BE17NT-060-CMEA (60-CNT)
    10. OPGW Fiber Cable – AFL DNO-8234 (48-CNT)
    11. -48 VDC Fuse Panel – Telect GMT Dual Feed 20/20-position
    12. -48 VDC Charger Panel – Valere; CK4D-ANL-VC shelf, min 24 hours battery recharging capability while under load
    13. -48 VDC Battery (Plant or Switchyard/Substation) – C&D (flooded), min 8 hours carry time
    14. -48 VDC Battery (O&M or Admin Building) – C&D (flooded) or East Penn Deka Unigy II (VRLA) with one-piece base and interlocking cells, min 8 hours carry time

9. CIVIL/STRUCTURAL DESIGN AND EQUIPMENT REQUIREMENTS

9.1 Site Development and Earthwork

9.1.1 For ground-mounted system, environmentally and culturally sensitive areas shall be identified and protected during construction. Contractor shall comply with permits and instructions from the governing AHJs with respect to the required environmental and archaeological surveys. Contractor shall coordinate the grading activities with the onsite certified specialist(s) on a daily basis or as required by the local authority.

9.1.2 All earthwork shall be per the site's Geotechnical Engineering Report's recommendations. A 3rd party materials testing program will be implemented in parallel with earthwork and structural operations.

9.1.3 All grading shall be per an agreed upon vertical tolerance prior to commencement of construction. An As-Built surveying verification program shall be coordinated and approved prior to construction. Clearing and Grubbing

9.1.4 All site preparation shall be per the Geotechnical Engineering Report recommendations, as required for installation of the specific site improvements within the construction drawings.

9.2 Disposal of Unusable Soils

Excavated materials suitable for fills per the Geotechnical Engineer's recommendations shall be spread uniformly across the Project Site. These materials shall be graded and compacted so as to not interfere with proper drainage from the Project Site. Unused materials shall be disposed of away from the Project Site unless otherwise approved by the Customer.

9.3 Proof Rolling

Following stripping and rough grading, exposed surfaces are to be proof-rolled under observation by the Geotechnical Engineer of record to detect soft spots and assess sub-grade suitability for the proposed improvements.

9.4 Erosion Control

9.4.1 Temporary facilities shall be provided for control of wind and water erosion and turbid runoff during earthwork and land disturbance operations and from graded areas until they are stabilized. Temporary facilities shall be acceptable to the proper AHJ. Contractor shall be responsible for obtaining any necessary erosion control and dust control Permits.

9.4.2 Permanent erosion control facilities for surface runoff as required for ditches and slopes, such as riprap, headwalls, grass, rock surfacing, and slope pavement shall be provided and be acceptable to the proper AHJ.

9.5 Dust Control

Contractor shall be responsible for dust control during construction operations and shall adhere to all applicable codes and requirements of the governing AHJ(s). Water shall be used to control dust as required. Dust palliatives if allowed by applicable law and applicable permits shall be used to control dust on all unpaved roads and any other non-vegetated areas as necessary to comply with the project's dust control plan or environmental permits.

9.6 Existing Underground Facilities

Contractor shall be responsible for identification, protection, redesign, relocation, or removal of underground lines, services, obstructions, or other facilities present at the Project Site. Contractor shall contact underground service alert for location of underground utilities at least 48 hours prior to commencement of construction – phone (Dial 800-332-2344) or 811. Contractor shall verify all existing utilities prior to beginning of any work on the Project Site.

9.7 Excavation

9.7.1 Contractor shall be responsible for dewatering and shoring of excavation works.

9.7.2 All excavation shall be carried out and supported in such a manner as to prevent flooding or ponding of water and damage or interference to structure services, or stored equipment/materials.

9.7.3 The Work shall include removing and disposing of unsuitable materials, such as organic matter, from areas on which fill is to be placed, and excavating and deposing of materials from area where existing grade is to be raised. Unsuitable material will be disposed of properly, as defined by the governing AHJ. Grading of cuts, fills, and drainage ditches shall be provided as required within the approved construction drawings.

9.8 Grading

Finish grading at the Project Site shall be sloped to deter surface ponding and promote surface drainage away from equipment and structures and to provide release. Grading within the PV arrays shall meet the requirements specified by the manufacturer of the module mounting system. All grading and drainage shall be per the approved Civil Engineering plans.

9.9 Fill

9.9.1 Fill materials shall be suitable for the intended purpose and shall not include materials hazardous to health, materials susceptible to attack by ground or ground water chemicals, materials susceptible to swelling or shrinkage under changes in moisture content, highly organic or chemically contaminated materials, or any other unacceptable materials.

9.9.2 Areas to be backfilled shall be prepared by removing unsuitable materials. The bottom of excavations shall be examined for loose or soft areas. Such areas shall be excavated fully backfilled with compacted fill.

9.9.3 Areas below foundations shall be over excavated to the depth below the bottom of foundations specified by the Geotechnical Engineer and backfilled with approved engineered fill. Areas below pavement shall be over excavated to the depth below the bottom of pavement specified by the Geotechnical Engineer and backfilled with engineered soil type A-2 or better (AASHTO Soil Classification System).

9.9.4 Backfilling shall be done in the layers of uniform thickness of six (6) to eight (8) inches or as recommended by the Geotechnical Engineer. Soil in each layer shall be properly moisture conditioned to facilitate compaction to achieve the specified density, within -2 percent to +4 percent of optimum moisture content or as directed by the Project Geotechnical Engineer. In order to verify compaction, representative field density and moisture-content tests shall be taken during compaction.

9.9.5 Granular load-bearing backfill shall be sound, durable coral rock; crushed rock; clean sand; and/or gravel.

9.9.6 Selected suitable backfill material shall be approved material in accordance with the soils report, and shall not contain organic material or rocks larger than three (3) inches. Contractor is responsible for verifying acceptability of excavated soils for fill and for providing suitable fill material from other sources.

9.9.7 Trench bedding material shall be clean sand, as required. If suitable for use, Contractor may use excavated material for trench bedding.

9.9.8 Where it is necessary to remove only a portion of the unsuitable materials and backfill, the backfilling operation shall begin by stabilizing the existing materials to enable proof rolling or normal construction equipment to operate thereon.

9.10 Compaction

9.10.1 Compaction of fill materials shall be carried out as soon as practicable after deposition of fill materials. Fill shall be compacted to the densities appropriate to the design requirements, fill type, and depths of layers.

9.10.2 Structural fill supporting foundations, roads, and parking areas shall be compacted to a minimum of 95 percent of the modified proctor maximum dry density, in accordance with ASTM D1557, or as specified by the Geotechnical Engineer. Embankments, dikes, and backfill surrounding structures shall be compacted to a minimum of 95 percent, or as specified by the Geotechnical Engineer. General backfill shall be compacted to at least 95 percent, or as specified by the Geotechnical Engineer.

9.11 Site Restoration

All Site development areas disturbed during construction shall be stabilized, re-vegetated as required, and restored in accordance with the Project Site grading plan and storm water pollution prevention plan (SWPPP) prepared by Contractor and approved by the Customer. The SWPPP shall be prepared in accordance with ODEQ requirements.

9.12 Testing and Inspections

9.12.1 A program shall be utilized for testing soils during earthwork and when underground Services and foundations are installed. The program shall include the following:

9.12.2 In-place representative field density tests shall be performed, at the frequencies specified below or as approved by the Geotechnical Engineer of Record, in accordance with ASTM D2922. The following frequencies shall be increased in areas where apparent difficulties exist:

Table 9-1 Testing Frequencies

Fill Class	Testing Area	Frequency / Cubic Yards per Test
A	Structural Fill and Foundation Subgrades	250 (or 1600 ft^2 of each lift, once per work shift, or one per foundation, whichever is more frequent)
B	Backfill Surrounding Structures	(Same as Class A)
B	Roads, Shoulders, and Parking Lots	650
C	General Backfill	1800

9.12.3 If a compacted area fails to meet the specified compaction requirements, two additional tests shall be performed for that area. If the results of either of the two additional tests

prove unsatisfactory, the area shall undergo additional compaction and testing until test results meet the minimum compaction requirements.

9.12.4 Records of inspection and testing of soils to ensure compliance with design assumptions shall be turned over to Customer and shall comply with Prudent Industry Practices and the requirements of applicable Law and the local authority regarding notification and inspection.

9.12.5 Testing and inspections of structures shall be in accordance with the state building codes and other licensing requirements.

9.12.6 Concrete test cylinder sets shall be taken at the minimum rate of one set per day, but not less than once for each 150 cubic yards for slabs, foundations, or walls. Concrete test cylinder sets for paving shall be taken at the minimum rate of one set per day, but not less than once for each 150 cubic yards, nor less than once for every 5,000 square feet. As a minimum, one set of cylinders shall be taken for each equipment foundation, with the exception that one set of cylinders may be made for each concrete truck load where multiple small foundations are poured from a single load. Test procedures shall be in accordance with the appropriate ASTM standards. Copies of test data shall be provided to the Customer.

9.12.7 Contractor shall utilize a system to validate type and grade of high-strength bolts by sampling and metallurgical testing.

9.12.8 A testing program of high-strength bolts and nuts shall be conducted by Contractor to ensure that each bolt shipment meets the appropriate ASTM standards for dimensional tolerances and material quality.

10. CONSTRUCTION MANAGEMENT

10.1 Project Management

10.1.1 All materials, workmanship, and testing shall be in accordance with the appropriate specifications, standards, and codes of practice. Methods of Contractor's quality control shall be clearly established and documented.

10.1.2 Working methods shall ensure the construction of stable structures able to withstand all applied loadings during construction and for the design life of the Project without collapse, failure, or excessive deformation such as to cause any damage, loss of function, or durability problems.

10.1.3 A permanent Project benchmark shall be established on the Project Site by Contractor based upon US Geological Survey (USGS) vertical datum NAVD88. Settlement monitoring points shall be provided. The existing elevation at each such settlement monitoring point shall be inscribed on an embedded brass marker before setting of equipment.

10.2 Waste Management

Contractor shall manage construction waste such that it does not disturb Host or construction progress. Waste shall be hauled away at Contractor's expense.

10.3 Dust Control

Contractor shall implement dust control measures at the Project site during construction, as applicable. Dust levels shall be kept at a minimum at all times during construction.

10.4 Temporary Utilities

10.4.1 Office Trailers

Contractor shall provide, at a minimum, two job site office trailers. One trailer shall be dedicated to the owner, with facilities for full time staff members to perform their necessary onsite duties. The second trailer shall be for the contractor, and any engineering or subcontractor staff that require such space on site.

The office trailers shall be a minimum of 8' x 20', and contain all of the necessary provisions to meet local codes and standards, for temporary structures. Each office space shall have access to telephone and high speed internet service, either via hard line or cellular connection.

10.4.2 Electric Power

Contractor shall determine the type and amount of power necessary and make arrangements for obtaining temporary electric service, metering, and shall bear the costs for electric power used during the construction period.

10.4.3 Lighting

Contractor shall provide temporary lighting during construction to meet applicable safety requirements.

10.4.4 Water

Contractor shall provide potable water for construction and drinking by construction personnel during construction.

10.4.5 Sanitary Facilities

Contractor shall provide and maintain sanitary facilities on Site during construction.

10.5 Phone, etc.

10.5.1 See Telecommunications Facilities requirements

10.5.2 Other necessary utilities for construction shall be provided by Contractor, as applicable.

10.6 Site Security and Access

10.6.1 Contractor shall ensure the Project Site is secured, limiting access to construction workers, Owner, and AHJ during construction. All personnel permitted to access the site shall receive the proper training, and bear the appropriate personal protective equipment, commensurate with their level of access and risk while on site. Personnel that are granted access to the site shall wear a security badge, containing either the word “Guest”, or if full time the employee’s company name and position. Security badges shall be worn visibly at all times, and only by the individual to which it has been issued.

10.7 As-Built Drawings

During construction, Contractor shall keep on file one set of current as-built drawings reflecting all field deviations from the design drawings. As a condition to Final Acceptance, Contractor shall submit to Owner a set of as-built drawings which have been fully conformed to the construction records as of the completion of the Work. Drawings shall be provided in AutoCAD DWG/DWF and Adobe PDF format

11. ELECTRICAL EQUIPMENT INSTALLATION

11.1.1 Installation Work shall include receiving, unloading, inventorying assemblies and all sub-system assemblies, storage, removal from storage, hauling, cleaning, installation on foundations, and other Work necessary to place all equipment into successful operation. Factory test reports shall be filed and stored on Site.

11.1.2 In addition, installation Work shall include complete assembly of equipment shipped unassembled; dismantling and reassembly of equipment to make adjustments and provisions of personnel, equipment, and assistance in testing and placing the equipment into operation.

11.1.3 Equipment shall be checked prior to its installation to ensure that it is in conformance with the purchase documents and manufacturer's drawings. Any discrepancies shall be reported to Owner.

11.2 Photovoltaic Modules

PV modules shall be provided with the following information:

11.2.1 The module manufacturer shall provide results from flash testing of modules being provided.

11.2.2 The flash test shall be conducted with an AM1.5G calibrated solar filter to approximate the sun's true spectral distribution following ASTM E927-97(1997) Class A and IEC-904-9 ANSI standards and be made available to Owner in electronic, CSV format.

11.2.3 The results of the flash test shall include, at a minimum, the following measured values: Isc, Voc, Impp, Vmpp, and Pmpp, solar irradiance and cell temperature.

11.2.4 The flash test data shall also include the PV module serial numbers and associated pallet numbers.

11.2.5 Modules shall be shipped and delivered in clearly identified bins that indicate the number of modules and nominal power per module with a manifest of each serial number contained within.

11.3 Module Mounting System

The module mounting system shall be installed in accordance with the following requirements:

11.3.1 The PV modules as installed and attached to the PV module mounting system shall not be exposed to a loading pressure in excess of the maximum loading pressure rating specified by the PV module manufacturer, when subjected to any wind and weather conditions over the entire range defined by the local building code.

11.4 Combiner Boxes

All combiner boxes shall be installed in accordance with the following requirements:

11.4.1 Adequate room for wiring slack shall be provided inside of each combiner box to allow for both module string wiring and PV output cable electrical voltage and current field measurements.

11.4.2 Contractor shall secure combiner boxes such that adequate access and working space per the NEC is provided. For ground based systems, the centerline shall be approximately 48 inches above grade, unless otherwise accepted by Owner. Furthermore, combiner boxes shall be mounted with a minimum of 12 inches of clearance above the established 100 year flood elevation, clear of drive isles, and in a position to not otherwise impede other equipment or cause shading of modules. If aluminum conductors are used, all electrical terminations shall be 18 inches above grade.

11.4.3 Combiner boxes shall be bounded by red-colored bollards, as appropriate, or located outside traffic areas.

11.4.4 Contractor shall install combiner boxes to be plum and level.

11.4.5 Contractor shall permanently secure combiner boxes on Unistrut, piperack, pile, steel pier, or any other suitable means of permanent attachment, subject to the approval of Owner.

11.5 Inverters

All inverters shall be installed in accordance with the following requirements:

11.5.1 Inverters shall be installed in accordance with the equipment manufacturer's installation instructions.

11.5.2 Contractor shall coordinate with inverter manufacturer to perform commissioning of the inverter when back-feed power is available.

11.6 Medium Voltage, Pad-Mounted Transformers

All medium voltage, pad-mounted transformers shall be installed in accordance with the following requirements:

11.6.1 Transformers shall be installed as specified on the drawings.

11.6.2 Transformers shall be installed in accordance with the equipment manufacturer's installation instructions.

11.6.3 Utility phase rotation shall be confirmed prior to installation to ensure proper connection.

11.6.4 Transformers shall be installed to maintain a minimum of 10-ft unobstructed access from the cabinet doors, perpendicular to the cabinet doors, and any adjacent cabinet containing operable electrical components (i.e. load-break switches).

11.6.5 Transformers shall be located near drive or road ways, to allow access by a 2-ton service vehicle with trailer.

11.6.6 Transformers installations shall include red-colored bollards.

11.7 Lightning Protection System

The lightning protection system shall be installed per the National Electrical Code, NFPA 70 using appropriately licensed and certified Lightning Protection Installation Subcontractors

11.8 Raceway

11.8.1 Conduits for ground-mounted systems shall be installed as follows: (all raceway and conductor installations shall be suitable to withstand the potential for rodent damage or intrusion)

- RGS only up to 8 feet above finished grade at ground level (for mechanical protection), EMT above 8 feet AFG and up to roof
- LFMC for short runs of less than 3 feet to combiner box
- PVC schedule 40 for underground, direct buried conduit or concrete-encased where subject to vehicles

11.8.2 Unless otherwise directed by Owner, underground duct banks subject to vehicular traffic shall be concrete-encased, 3000 psi minimum, with PVC schedule 40 conduits buried at the depth required for direct buried cables. Underground duct banks shall have electrical warning tape installed approximately 12 inches below finished grade in the backfill and a bare copper 4/0 AWG ground in the concrete nest serving as a counterpoise ground. Duct banks shall be designed to include spare capacity after completion of installation to allow for future growth and expansion.

11.8.3 Conduit shall be used to route lighting, telephone, and communication circuits where installed above grade.

11.9 Grounding

This section covers the furnishing and installation of the grounding system for the System.

11.9.1 All materials required for a complete grounding installation shall be furnished. Grounding components shall include ground rods, ground conductor, ground bus, above and below grade grounding connections, grounding lugs, and any other hardware required for a complete grounding system.

11.9.2 Grounding shall be compliant with NEC and local AHJ.

11.9.3 Suitable grounding facilities shall be furnished on electrical equipment not so equipped. The grounding facilities shall consist of compression type terminal connectors bolted to the equipment frame or enclosure.

11.9.4 The conduit system is not considered to be a grounding conductor. No equipment grounding conductor shall be smaller in size than 12 AWG, unless it is a part of an acceptable cable assembly.

11.9.5 If ground reference transformers are required by study, they shall conform to Owner design standards. This includes, but is not limited to:

- Zig-zag vectoring
- Current-carrying rating of 300A per phase conductor for 10-seconds
- Current-carrying ratting of 900A in the neutral-ground conductor for 10-seconds.

11.9.6 Ground Rods

Ground rods shall be copper clad, cold drawn carbon steel, manufactured in accordance with UL 467. The copper cladding shall be electrolytically bonded to the steel rod or bonded by a molten welding process. Individual ground rods shall be 5/8 inch minimum diameter and 10 feet long. Stainless steel ground rods shall be installed where soils conditions are considered to be corrosive or cathodic protection invoked for preservation of materials. Ground rods shall be Type ERITECH as manufactured by Erico, or an equivalent approved by Owner.

11.10 Conductors

11.10.1 Exothermic Connections

Exothermal connections shall be a standard duty copper molten weld conforming to the requirements of IEEE 80. Molds and powder cartridges used for making exothermal connections shall be furnished by the same manufacturer. Exothermal connections shall be similar to Type CADWELD as manufactured by Erico, or an equivalent approved by Owner.

11.10.2 Ground Lugs

Ground lugs shall be single hole or two-hole, compliant with NEC based on the application, and compliant with the commissioning criteria for dissimilar metals. Copper bars conforming to the requirements of IEEE 837 and UL 467. Ground lugs used with the exothermal weld process shall be similar to Type LA as manufactured by Erico, or a Owner acceptable equal. Ground lugs used with the compression process shall be similar to Type YGHA as manufactured by Burndy Electrical, or an Owner acceptable equal.

11.10.3 Grounding Installation

Grounding system components shall be installed as required by IEEE, NEC, NESC and applicable local codes.

11.10.4 Ground System Resistance Measurements

All ground resistance measurements shall be made with the Fall of Potential or slope methods as defined in IEEE 81.

After connection of ground rods to the ground system, Contractor shall obtain a ground resistance measurement from a selected location on the ground grid, using methods approved by Owner. This data shall be obtained, identified, and recorded.

The ground resistance measurement data may indicate that additional ground rods are required. Contractor shall furnish, install, and connect additional ground rods as necessary.

11.10.5 DC Cables (module to module or combiner box)

All insulated conductors, except supervisory and communication cable, rated less than 5000 volts shall be tested with a 1000 volt Megaohm-meter (“megger”) or an equivalent testing device. Insulation resistance measurements shall be made between each conductor and ground and between each conductor and all other conductors of the same circuit. Minimum acceptable resistance values shall be approximately 250 Megaohms.

11.10.6 DC Cables (combiner box to inverter)

All insulated conductors, except supervisory and communication cable, rated less than 5000 volts shall be tested with a 1000 volt Megaohm-meter (“megger”) or an equivalent testing device. Insulation resistance measurements shall be made between each conductor and ground and between each conductor and all other conductors of the same circuit. Minimum acceptable resistance values shall be approximately 250 Megaohms.

11.10.7 AC Power Cables (inverter output to step-up transformer, auxiliary power)

All insulated conductors, except supervisory and communication cable, rated less than 5000 volts shall be tested with a 1000 volt Megaohm-meter ("megger") or an equivalent testing device. Insulation resistance measurements shall be made between each conductor and ground and between each conductor and all other conductors of the same circuit. Minimum acceptable resistance values shall be approximately 250 Megaohms.

11.10.8 Medium Voltage AC Power Cable (AC collection system)

All insulated power cables rated 5000 volts and above shall be given an AC high potential test or partial discharge test. The test procedures shall be in accordance with IEEE 400.2 and the cable manufacturer's recommendations.

11.11 Cable Installation

Cable installation shall be in accordance with the following general rules:

11.11.1 Cables shall be installed in accordance with the cable manufacturers' recommendations, circuit lists, raceway lists, the drawings, and these Technical Specifications and Scope of Work. Each circuit shall be assigned a unique number.

11.11.2 All cable supports and securing devices shall be installed to provide adequate support without deformation of the cable jackets or insulation.

11.11.3 Oversized sunlight resistant nylon wire ties shall be utilized for bundling conductors for all exposed wiring. Wire ties shall be snug, but allow for thermal expansion.

11.11.4 Contractor shall identify both ends of the circuits with number and/or color-coding matching the drawings. Contractor shall also identify all circuits at manholes and handholes. Insulation of potentials should be color-coded and incorporated into a wire schedule.

11.11.5 All exposed wiring shall be neatly bundled so that exposed wiring is securely fastened. Exposed wiring running along metal surfaces shall be secured to prevent rubbing and damage from the metal surface or wire tie. Maximum spacing of 24 inches on center between fastening locations shall be such that secured wiring is not free to move due to wind, snow, or other environmental conditions. Use insulating foam spiral wrap, or other means to prevent contact with exposed bolt threads and sharp surfaces.

11.11.6 Phase tape shall be applied to each conductor at the terminations of all power and lighting circuits that are not already properly color coded.

11.11.7 Green shall be used for ground at every voltage level. Phase taping circuits shall not be required if cable with colored insulation is installed.

Table 11-1 Phase Tape Color Chart

Circuit	Taping
208Y/120 V Circuits	Black – Phase A Red – Phase B Blue – Phase C White – Neutral
480Y/277 V Circuits	Brown – Phase A Orange – Phase B Yellow – Phase C Gray/White – Neutral

Table 11-2 Multiconductor Shielded Control Cable Color Chart (per ICEA Table E2)

Conductor	K2 Color Code
1	Black
2	Red
3	Blue
4	Orange
5	Yellow
6	Brown
7	Red with Black Tracer
8	Blue with Black Tracer
9	Orange with Black Tracer
10	Yellow with Black Tracer
11	Brown with Black Tracer
12	Black with Red Tracer

11.11.8 Cable shall not be handled when the temperature is below the minimum temperature recommended by the manufacturer. If cable heating is required prior to placement, the cable shall be stored in a heated building in accordance with the manufacturer's recommendations for at least 24 hours. Cable shall be placed the same day it is removed from heated storage.

11.11.9 The pulling tension of any cable shall not exceed the maximum tension recommended by the cable manufacturer. Pulling mechanisms of both the manual and power types used by Contractor shall have the rated capacity in tons clearly marked on the mechanism. If any excessive strain develops, the pulling operation shall be stopped at once and the difficulty determined and corrected.

11.11.10 Cable shall not be pulled using trucks, forklifts, cranes, or other devices where the tension of the cable pull cannot be easily controlled.

11.11.11 Cable Grips: When pulling loops are used, the entire loop shall be cut off, discarded and recycled when the pull is completed.

11.11.12 Inspection: The outside of each cable reel shall be carefully inspected and protruding nails, fastenings, or other objects which might damage the cable shall be removed. A thorough visual inspection for flaws, breaks, or abrasions in the cable sheath shall be made as the cable leaves the reel, and the pulling speed shall be slow enough to permit this inspection. Damage to the sheath or finish of the cable shall be sufficient cause for rejecting the cable. Cable damaged in any way during installation shall be replaced.

11.11.13 Cable Bends: Tape shielded, flat tape armored, and wire armored cable shall not be bent to a radius of less than 12 times the overall cable diameter. All other cables shall not be bent to a radius of less than eight times the cable diameter.

11.11.14 Spare Conductors: All spare conductors of a multiconductor cable shall be left at their maximum lengths for possible replacement of any other conductors in the cable. Each spare conductor shall be neatly dressed for future use and marked as “spare.”

11.11.15 Lacing: UV rated ties shall be used to neatly lace together conductors entering switchboards and similar locations after the conductors have emerged from their supporting raceway and before they are attached to terminals.

11.11.16 Cable Identification

11.11.16.1 The ends of all circuits listed in the circuit list shall be identified with a circuit tag. Each marker shall bear the number of the circuit according to the Circuit List and drawings. At terminations, Contractor shall identify each circuit. Each phase of multiphase power circuits shall be individually identified. The circuit tag shall be so attached that it is readily visible for circuit identification.

11.11.16.2 Phase tape shall be applied to each conductor at the terminations of all power and lighting circuits. The phase taping for power conductors shall follow Owner Design Standards.

11.11.17 DC String Cable Placement in Free-Air Installations: DC string cables shall be secured with a cable tray, wireway, cable clips or equivalent. Cable ties are not allowed as the only means of securing dc cables. The cables shall be neatly bundled together with no/minimal strain exiting out of the PV module junction box and secured at 24 inches, on center, maximum. If wire harnesses are utilized to connect strings together, same guidelines still apply.

11.11.18 Except as otherwise specified or indicated on the drawings, cable shall be installed according to the following procedures, taking care to protect the cable and to avoid kinking the conductors, cutting or puncturing the jacket, contamination by oil or grease, or any other damage.

11.11.19 Stranded conductor cable shall be terminated by lugs or pressure type connectors. Wrapping stranded cables around screw type terminals is not acceptable.

11.11.20 Stranded conductor cable shall be spliced by crimp type connectors. Twist-on wire connectors may be used for splicing solid cable and for terminations at lighting fixtures.

11.11.21 Splices may be made only at readily accessible locations.

11.11.22 Cable terminations and splices shall be made as recommended by the cable manufacturer for the particular cable and service conditions. All shielded cable stress cone terminations shall be IEEE Class 1 molded rubber type. Shielded cable splices shall be tape or molded rubber type as required. Shielded cable splices and stress cone terminations shall be made by qualified splicers. Materials shall be by 3M Company, Plymouth/Bishop, or Raychem Electric Power Products.

11.11.23 Cable shall not be pulled tight against bushings nor pressed heavily against enclosures.

11.11.24 Cable-pulling lubricant shall be compatible with all cable jackets; shall not contain wax, grease, or silicone; and shall be Polywater "Type J."

11.11.25 Cables operating at more than 2000 volts shall be fireproofed in all cable vaults, manholes, and handholes. Fireproofing shall be applied with a half-lapped layer of 3M "Scotch 77 Arc-Proofing Tape," anchored at each end with a double wrap of 3M "Scotch 69 Glass Cloth Tape," or with equivalent tape by Anixter or Plymouth/Bishop.

11.11.26 Where necessary to prevent heavy loading on cable connections, in vertical risers, the cable shall be supported by Kellems, or equal, woven grips.

11.11.27 Spare cable ends shall be taped, coiled, and identified.

11.11.28 Cables shall not be bent to a radius less than the minimum recommended by the manufacturer. For cables rated higher than 600 volts, the minimum radius shall be 8 times diameter for non-shielded cable and 12 times diameters for shielded cable.

11.11.29 All cables in one conduit, over 1 foot long, or with any bends, shall be pulled in or out simultaneously.

11.11.30 Circuits to supply electric power and control to equipment and devices are indicated on the one-line diagrams. Conductors in designated numbers and sizes shall be installed in conduit of designated size. Contractor shall not field combine circuits to reduce conduit requirements unless approved by Engineer.

11.12 Connectors

This section of this Technical Specification defines methods of connecting cable between electrical systems and equipment. In this section, the term “connector” is applied to devices that join two or more conductors or are used to terminate conductors at equipment terminals for the purpose of providing a continuous electrical path. Connectors shall be installed as follows:

11.12.1 Connector material shall be compatible with the conductor material to avoid the occurrence of electrolytic action between metals.

11.12.2 All medium voltage and low voltage connectors shall be pressure type and secured by using a crimping tool. The tool shall produce a crimp without damage to the conductor, but shall ensure a firm metal-to-metal contact. The tool should be calibrated and approved by the manufacturer. Low voltage terminations shall be permitted to be screw-down lugs where only screw-down lugs are available, such as molded case circuit breakers.

11.12.3 Medium voltage cables require stress cones at the termination of the cables. Stress cones shall be of the preformed type suitable for the cable to which they are to be applied.

11.12.4 Cables shall not be spliced in trench unless authorized in writing by Owner, cable trays or conduits. Connections shall be made in conduit outlet fittings or junction boxes utilizing terminal blocks or an appropriate connector.

11.12.5 Splices, joints, and connections in cable other than cable terminations at equipment shall be made only in pull boxes or junction boxes unless otherwise indicated on the drawings and shall be made in accordance with the instructions of the cable manufacturer.

11.13 Grounding (medium voltage AC collection system)

Bare ground conductor 2/0 or 4/0 AWG and larger shall be soft drawn, stranded copper conforming to the requirements of ASTM B-8. Insulated ground conductor shall be soft drawn, stranded copper conforming to the requirements of UL 83. Insulated ground conductor shall be Type TW or THW having green colored PVC insulation.

11.14 Auxiliary Power Cables (lights, receptacles, computers, tracker motors and controllers, PLC, heating/ventilation)

All insulated conductors, except supervisory and communication cable, rated less than 5000 volts shall be tested with a 1000 volt Megaohm-meter (“megger”) or an equivalent testing device. Insulation resistance measurements shall be made between each conductor and ground and between each conductor and all other conductors of the same circuit. Minimum acceptable resistance values shall be approximately 250 Megaohms.

11.15 Control Cables (alarms, contacts, etc.)

All insulated conductors, except supervisory and communication cable, rated less than 5000 volts shall be tested with a 1000 volt Megaohm-meter (“megger”) or an equivalent testing device. Insulation resistance measurements shall be made between each conductor and ground and between each conductor and all other conductors of the same circuit. Minimum acceptable resistance values shall be approximately 250 Megaohms.

11.16 Analog Instrumentation (analog signals)

All insulated conductors, except supervisory and communication cable, rated less than 5000 volts shall be tested with a 1000 volt Megaohm-meter (“megger”) or an equivalent testing device. Insulation resistance measurements shall be made between each conductor and ground and between each conductor and all other conductors of the same circuit. Minimum acceptable resistance values shall be approximately 250 Megaohms.

11.17 Fiber Optic Cable (SCADA/DAS)

11.17.1 Contractor shall install fiber-optic cable and terminations as specified and in accordance with the cable and equipment manufacturer's recommendations. All fiber-optic accessories required for a complete installation shall be supplied and installed by Contractor. Examples of fiber-optic accessories include fan-out kits, end connections, dust caps, cleaving tools, polishing equipment, etc.

11.17.2 Fiber-optic cable furnished may be 62.5 micron multimode, 50 micron multimode, or 9 micron single-mode type. Fiber-optic cable shall be installed in inner duct with a minimum diameter of 1.25”.

11.17.3 Fiber-Optic Testing

11.17.3.1 As a minimum, all testing shall conform to the requirements of ANSI/TIA/EIA-568B, optical fiber link performance testing, and TIA/EIA-526-14A, end-to-end attenuation testing.

11.17.3.2 Contractor shall submit test documentation to Owner that includes the circuit number, type of test, date of test, test results, etc. In addition, Contractor shall submit installation, termination and as-built documentation to Owner as follows:

- Circuit installation documentation shall include circuit number; origin and destination; routing; cable type, size, length; date of installation, etc.
- Circuit termination documentation shall include circuit number; equipment termination locations; date(s) terminated; etc.
- Modifications to the fiber-optic routing, if any.
- Locations and details of any splice points not included in original Design Documentation, if any.

11.17.4 CAT6 Cable (communication and analog signals)

11.17.4.1 All insulated conductors of communication cable shall be tested for continuity.

11.17.4.2 High performance cable certification shall be performed for the permanent link configuration and documented for all CAT6 cables. Testing shall be accomplished with a Level III (CAT6) compliant test set with a minimum spectral frequency range of 1 to 250 MHz (CAT6). The test specifications for all installed cables must meet or exceed the specifications for CAT 6 cabling, respectively, that are documented within the TIA/EIA-568-B.2.

11.17.4.3 Cables not achieving a PASS rating shall be corrected and re-certified. Cables that cannot achieve a PASS rating shall be replaced and re-certified. A rating of *PASS (marginally pass) or *FAIL (marginally fail) is not acceptable.

11.18 Electrical Tests

Contractor shall provide field-testing of all wire, cable, electrical devices and equipment, and electrical systems delivered and installed on the Project. The following items shall be performed and procedures shall be followed:

11.18.1 Test protocol and forms shall conform to NETA Acceptance Testing Specifications. Contractor shall prepare and submit an electrical testing plan to Owner for review and

approval. Owner shall be informed in writing a minimum of three days in advance of all scheduled testing in order to witness any such electrical testing.

11.18.2 Written records of all electrical tests showing date of test, test equipment used, personnel making test, equipment or material tested, tests performed, and results, including any deficiencies found shall be created and maintained by Contractor and shall be submitted for review by Owner.

11.18.3 All test reports shall include nameplate data of equipment being tested. All tests on electrical equipment and systems shall be undertaken as directed by the manufacturer's field service representatives.

11.18.4 Contractor shall provide all necessary test equipment, labor, materials, and subcontracted testing services.

11.18.5 Contractor shall be responsible for any damage to equipment or material due to improper test procedures or test apparatus handling, and shall replace, or restore to original condition at Owner's discretion, any damaged equipment or material, at no additional cost to Owner.

11.18.6 Contractor shall provide and utilize safety devices during electrical testing including lock-out tag-out, rubber gloves and blankets, protective screens and barriers, barricade tape, danger signs, etc., to adequately protect and warn personnel in the vicinity in which tests are being undertaken.

11.18.7 After Placement

Preoperational tests shall be performed on insulated conductors after installation, as follows:

11.18.7.1 All cables, conductors, bus work, and control wire shall be tested according to OwnerSubstation standards.

11.18.7.2 Insulated conductors with insulation rated 5,000 volts and above shall be given an AC High potential test, according to IEEE 400.2, to confirm adequate dielectric strength of the conductor insulation.

11.18.7.3 All medium-voltage cables shall be separated from pad-mount transformers, inverters, or other like equipment before testing.

11.18.7.4 Low voltage cables shall be either insulation resistance tested before connecting to equipment or functionally tested (at equipment operation voltage) as part of the checkout of the equipment and/or system.

11.18.7.5 Insulated conductors shall be continuity tested for correct conductor identification.

11.18.7.6 All circuits, including lighting circuits, shall be tested with the circuit complete except for connections to equipment. All splices, stress cones on shielded cable, and terminal connector attachments shall be complete prior to testing. Splice technician shall have experience in cable splicing of given voltage class and shall provide certificate of qualifications.

11.18.7.7 In addition to the tests performed after cable placement is complete, continuity tests shall be performed on all supervisory and communication cable before and after each splice is made.

11.18.7.8 Any circuit failing to test satisfactorily shall be replaced or repaired and then retested, at no additional cost to Owner.

11.18.8 All equipment and labor required for testing shall be furnished by Contractor.

11.18.9 Continuity Tests

Continuity tests shall include all tests necessary to confirm that each conductor is continuous throughout its entire length.

11.18.10 Identification Tests

Identification tests shall include all tests necessary to confirm that the conductor being investigated originates and terminates at the locations designated in the Circuit List or indicated on the drawings, and is of the proper phase and/or rotation.

11.18.11 Insulation Tests

Resistance from ground provided by the insulation on all field-installed insulated power conductors shall be measured, excluding 120 VAC non-essential power circuits.

11.19 Experience

Contractor personnel performing fiber-optic Work shall be certified to perform termination for fiber-optic work, and shall use the connectors, tools, or other special equipment by the same Contractor as the equipment being installed. Contractor shall furnish all required special tools.

11.19.1 Dust caps shall be installed on any un-terminated connectors or bushings.

11.20 Redundancy

11.20.1 In general, all fibers shall be terminated. If a cable problem is detected during commissioning, the spare terminated fibers will be available for use without additional fiber-optic terminations.

11.20.2 Provide 100% active redundancy (i.e., one terminated spare for each utilize fiber; additional spare fibers may be coiled).

11.21 Splicing

11.21.1 Splicing of fiber-optic cable shall be avoided unless approved by Owner. Splicing shall be made using fusion techniques compatible with the fiber. Splices shall have a maximum attenuation of 0.15 dB, as determined by an optical time domain reflectometer (OTDR) trace or end-to-end attenuation test. Splices that exceed this attenuation shall be cut and redone until their attenuation is within compliance.

11.21.2 All control cable splicing shall be in a junction box according to Owner Substation Design Standards

11.22 Site Lighting

11.22.1 Site lighting fixtures shall be installed in accordance with the equipment manufacturer's installation instructions.

11.22.2 Lighting fixtures shall be installed plumb and level and aimed as specified on the drawings, as applicable.

11.23 Freeze Protection System

Freeze protection systems shall be installed in accordance with the equipment manufacturer's installation instructions.

11.24 Site Security System

Site security systems shall be installed in accordance with the equipment manufacturer's installation instructions.

11.25 Low Voltage Dry-Type Transformers

All low voltage dry-type transformers shall be installed in accordance with the following requirements:

11.25.1 Low voltage dry-type transformers shall be installed in accordance with the equipment manufacturer's installation instructions.

11.25.2 Mount transformers approximately where indicated on the drawings.

11.25.3 Load any vibration isolators external to the unit properly and provide complete isolation with no direct transformer unit metal in contact with the mounting surface.

11.25.4 Connect electrical circuits to transformers by means of moisture proof, flexible metallic conduit in a manner that prevents transformer vibrations from being transmitted to the building or other equipment.

11.25.5 Ground neutrals and enclosures of all transformers and all moisture proof flexible conduits in accordance with applicable codes and as otherwise may be indicated.

11.25.6 Connect voltage taps on all transformers to give as close as possible to rated output voltage under normal plant load conditions.

11.26 Low Voltage Panelboards

All low voltage panelboards shall be installed in accordance with the following requirements:

11.26.1 Low voltage panelboards shall be installed in accordance with the equipment manufacturer's installation instructions.

11.26.2 Mount panelboards securely where indicated, plumb, in-line, and square with walls.

11.26.3 Unless otherwise indicated, mount panelboard with top of its cabinet approximately 6-feet above the finished floor.

11.26.4 Provide a typewritten circuit directory under a metal-framed transparent plastic cover inside each panelboard.

11.27 Medium Voltage Switchgear

All medium voltage switchgear shall be installed in accordance with the following requirements:

11.27.1 Medium voltage switchgear shall be installed in accordance with the equipment manufacturer's installation

11.27.2 All equipment requiring anchor bolts shall be provided with the anchor materials, complete with bolts, nuts, and washers.

11.27.3 Sills and anchor materials shall be shipped ahead of the scheduled equipment delivery to permit installation before concrete is placed.

11.27.4 The anchor bolts shall be designed for continued operation following a seismic event.

11.27.5 Anchor bolt calculations shall be provided and be signed/sealed by a Structural Professional Engineer.

11.28 GFCI Receptacles

All ground fault circuit interrupt (GFCI) receptacles shall be installed in accordance with the following requirements:

11.28.1 GFCI receptacles shall be installed in accordance with the equipment manufacturer's installation instructions.

11.28.2 Mount receptacles with grounding slot down except where horizontal mounting is indicated, in which case mount with neutral slot up.

11.28.3 Ground receptacles to boxes with grounding wire, not by yoke or screw contact.

11.28.4 Mount weatherproof receptacles with the hinge for the protective cover above the receptacle opening.

11.29 Light Switches

All light switches shall be installed in accordance with the following requirements:

11.29.1 Light switches shall be installed in accordance with the equipment manufacturer's installation instructions.

11.29.2 Mount switches for switch operation in the vertical position.

11.30 Disconnect Switches

All disconnect switches shall be installed in accordance with the following requirements:

11.30.1 Disconnect switches shall be installed in accordance with the equipment manufacturer's installation instructions.

11.30.2 Mount switches for switch operation in the vertical position.

11.31 Junction Boxes

Not used.

11.32 Concrete Pull Boxes

11.32.1 Location Tolerances

Equipment shall be located within +/- 0.5 inch of the dimensional location indicated on the drawing unless otherwise permitted by Owner. Some equipment is indicated schematically without dimensions. Contractor shall coordinate the location of this equipment with all other equipment or materials to be installed.

11.32.2 Alignment

Rigid components such as bus, bus duct, throat connections, and enclosures shall be aligned and connected with special care to prevent excessive stress in joints, supports, and connections. Correct "spacing" hardware necessary for "turning" of field assemblies, usually tracker dampener shocks shall be used.

11.33 Bolted Electrical Connections

11.33.1 Where bolted electrical connections are made to aluminum, the aluminum surface shall be thoroughly cleaned with a wire brush, then coated with joint anti-oxidant compound and thoroughly brushed again through the compound. Additional compound shall then be added and the joint bolted together.

11.33.2 Where bolted connections are made between copper or brass surfaces, the metal surfaces shall be thoroughly cleaned and coated with a suitable anti-oxidizing compound.

11.33.3 It shall be Contractor's responsibility to certify that the torque of each bolt in all bolted electrical connections is in accordance with the manufacturer's recommendations. Factory bolt torques shall be verified as part of the equipment checkout and test procedures. Mark with torque scribe lines.

11.33.4 Bolted electrical connections shall be tightened with manual torque wrenches. Torque wrenches shall be constructed, so that they will visually or audibly indicate when the proper torque is reached. Mark with scribe lines.

11.33.5 The tightened bolts in electrical connections shall be checked at random; ten percent of the connections shall be reviewed and documented. Contractor shall be responsible for coordinating the checking of bolt tightness, so that minimum interference with equipment installation and connections will be experienced. If one percent of the ten percent samplings fail, all connections should be re-torqued and witnessed.

11.34 Equipment Finish

11.34.1 Surfaces of most electrical equipment, such as panels, switchgear, transformers, and circuit breakers are finished at the factory. Care shall be exercised to prevent damage to this original finish during equipment installation and during construction Work.

11.34.2 If factory finish is damaged during the course of construction, the damaged component shall be touched-up or refinished to the satisfaction of Owner, at no additional cost to Owner.

11.34.3 Refinishing paint, if furnished with the equipment, may be used; otherwise the paint shall be obtained from the equipment manufacture. Procedure for paint application should be in accordance with the manufacturers' recommendation.

12. COMMISSIONING, PERFORMANCE TESTING, AND PERFORMANCE GUARANTEE

Additional requirements regarding commissioning and performance testing are included in Exhibit A of this Technical Specification.

Additional requirements regarding the performance guarantee of the System are included in Exhibit B of this Technical Specification.

13. APPROVED SUPPLIERS

Below is a list of preferred and approved equipment suppliers for the System. Should Contractor's proposal include equipment suppliers which deviate from the parties below, Contractor will request approval for the use of such parties from Owner. Owner may request information related to the equipment suppliers experience in the industry, technical specifications of equipment or materials proposed, CVs, and/or other similar background and informational documentation.

13.1 Approved Major Equipment Vendors

13.1.1 Photovoltaic Modules

- JA Solar
- Trina Solar
- Solarworld
- Jinko
- Canadian Solar
- Yingli
- Hanwha Q-Cells
- First Solar
- Sunpower

13.1.2 Inverters

- SMA
- Power Electronics
- TMEIC
- Eaton
- General Electric
- ABB

13.1.3 Module Mounting Systems

- Fixed Tilt:
  - Applied Energy Technologies (AET)
  - RBI Solar
  - GameChange Solar

- Single Axis Tracking:
  - Array Technologies, Inc. (ATI)
  - NexTracker

13.1.4 Combiner Box

- SolarBOS
- Bentek
- Amtec Industries, Inc.
- Shoals Technologies Group

13.1.5 Collector System Cable

- Southwire
- Prysmian Power Cables and Systems
- General Cable
- Okonite

13.1.6 Substation Transformers

- Pauwels (Winnipeg, Manitoba, Canada shop)
- Smit (The Netherlands shop)
- ABB (St Louis, MO shop)
- Fortune Electric
- Siemens (Mexico shop)
- HICO
- Hyundai (Montgomery, AL shop)
- Delta Star
- Waukesha Electric

13.1.7 Protective Relays

- Schweitzer Engineering Laboratories (SEL)

13.1.8 GSU Padmount Transformers

- ABB
- CG Power Systems USA
- General Electric
- Cooper Power Systems
- Siemens

13.1.9 High Voltage Circuit Breakers

- Siemens
- ABB
- Mitsubishi
- Alstom

13.1.10 Instrument Transformers

- ABB

- Trench Ltd
- Alstom

13.1.11 Ground Reference Transformers

- ABB
- Cooper
- GE
- Virginia Transformer
- Pacific Crest Transformers

13.1.12 Transmission Tubular Steel Towers

- Valmont
- Sabre
- Trinity Meyer
- Dis-Tran

13.1.13 Substation Remote Terminal Unit

- Eaton Cooper Power System

13.1.14 Substation Human/Machine Interface

- Schneider Electric

13.1.15 Substation Ethernet Switches and Routers

- RuggedCom

13.1.16 SCADA Input/Output Devices

- Eaton Cooper Power Systems

Portland General Electric Company

SOLAR RESOURCE TECHNICAL SPECIFICATION**

Renewable Energy Resources

Exhibit A – Commissioning and Performance Testing

****NOTE: PGE's final issuance of the 2016 Request for Proposals (RFP) for Renewable Energy Resources is subject to Oregon Public Utility Commission approval of both the draft RFP and the Petition for Partial Waiver of the Competitive Bidding Guidelines, including the expedited RFP timeline.**

May 23, 2016

14. EXHIBIT A – COMMISSIONING AND PERFORMANCE TESTING

Table of Contents

Scope 144
1.0 Applicable Standards and Codes 144
1.1 Government and Jurisdictional Codes and Regulations 144
1.2 Industry Standards and Codes 144
2.0 General Requirements 145
2.1 Commissioning Test Manual 145
2.2 Test Requirements 146
2.3 Test Reports 146
2.4 Test REport Labeling 147
3.0 Commissioning Testing 147
3.2 General Inspections 148
3.3 System Grounding 149
3.4 Cable and Module Testing 149
3.5 Equipment Testing 153
3.6 Systems Testing 158
3.7 Minimum Reporting Requirements for Commissioning 159
4.0 Acceptance Testing 163
4.1 General 163
4.2 Operational Test 164
4.3 Capacity Test 165
4.4 Minimum Reporting Requirements for Acceptance Tests 169
5.0 Appendices 171
5.1 Appendix A: Defined Terms 171
5.2 Appendix B: Acronyms and Abbreviations 173

LIST OF TABLES

Table 1. Monthly Expected Capacity and Reporting Conditions 167

Scope

Unless otherwise stipulated by the Scope of Work, Contractor is responsible for conducting all Commissioning and Acceptance Tests outlined in this System Commissioning and Performance Tests (Protocol). In addition, Contractor shall perform any additional tests or measurements as required by applicable Standards, Codes or the requirements of the Authorities Having Jurisdiction (AHJ) or Local Electric Utility, and equipment manufacturers. All labor, materials, equipment, and tools used to complete Commissioning and Acceptance Testing shall be qualified and suitable for the assigned task.

The tests shall meet the requirements presented in this specification and all referenced industry standards. All tests shall be in accordance with any applicable manufacturer's instructions and/or protocols. Any discrepancy between this specification and the tests conducted in the field shall be reported to the Owner in writing.

1 Applicable Standards and Codes

The current editions of the following standards, codes and regulations (or their specific country, state, or province equivalent) that are applicable to the project at the time of contractual signing shall be complied with. All applicable state or local codes and requirements shall be in addition to the following list.

1.1 GOVERNMENT AND JURISDICTIONAL CODES AND REGULATIONS

1.1.1 Occupational Safety and Health Administration (OSHA) regulations

29CFR 1910: Occupational Safety and Health Standards

1.1.2 State and local codes

State and local codes and regulations enforced by agencies having jurisdiction (AHJ) where the project is located.

1.2 INDUSTRY STANDARDS AND CODES

1.2.1 American Society for Testing and Materials (ASTM)

ASTM E2848-13: Standard Test Method for Reporting Photovoltaic Non-Concentrator System Performance

ASTM E2939-13: Standard Practice for Determining Reporting Conditions and Expected Capacity for Photovoltaic Non-Concentrator Systems

1.2.2 American National Standards Institute (ANSI)

1.2.3 Institute of Electrical and Electronic Engineers (IEEE)

IEEE-81: Guide for Measuring Earth Resistivity, Ground Impedance and Earth Surface Potentials of a Grounding System

IEEE-400/-400.2: Guide for Making High-Direct-Voltage Tests on Power Cable Systems in the Field

1.2.4 International Electrical Testing Association (NETA)

ATS: Acceptance Testing Specifications

ETT: Standard for Certification of Electrical Testing Personnel

1.2.5 National Fire Protection Association (NFPA)

NFPA 70: National Electrical Code (NEC)

NFPA 70E: Standard for Electrical Safety in the Workplace

2 General Requirements

This section discusses the Commissioning and Acceptance Testing documents which are to be prepared by Contractor and submitted to Owner. These include:

Commissioning Test Manual

- General Inspection Plan
- System Grounding
- Cable and Module Testing
- Equipment Testing
- System Testing

Individual Test Reports

Final Commissioning Test Summary

Acceptance Test Report

2.1 COMMISSIONING TEST MANUAL

Contractor shall prepare and submit an initial draft of the Commissioning Test Manual for the Project to Owner for review no later than thirty (30) calendar days before the scheduled start of commissioning. The Commissioning Test Manual shall include all applicable tests set forth in this Protocol, including the General Inspection, and shall comply with all of the requirements set forth by this Protocol. Owner will return comments to Contractor and Contractor will amend and resubmit the Commissioning Test Manual to Owner no more than ten (10) business days after

comments were received. Contractor will be responsible for finalizing the Commissioning Test Manual with Owner.

The test procedures outlined in the Commissioning Test Manual shall include the following information as applicable to the Scope of Work:

Prerequisites to the tests

Make and model of equipment to be used for measuring data

List of the data that will be collected

Test procedures which shall be used

Successful acceptance criteria

Any differences between tests in the Manual and this Protocol

Test report templates

The Commissioning Test Manual shall include a testing schedule which is consistent with the overall project schedule and presents the following in detail:

Expected duration of each test, including start and end dates

Plans for submission of test data and final test report

2.2 TEST REQUIREMENTS

Contractor shall comply with the following test requirements:

Provide at least ten (10) business days notice to Owner prior to the commencement of any inspections and/or tests in this Protocol or the Commissioning Test Manual.

Provide documentation to Owner certifying that inspections or tests have been conducted in accordance with this Protocol.

All testing shall meet the pre-operational requirements set forth by the Local Electric Utility in addition to compliance with the agreed upon Commissioning Test Manual.

All testing equipment shall be calibrated in accordance with to the applicable manufacturer's requirements and industry standards and be conducted by a certified and recognized equipment testing authority.

Provide equipment calibration certificates for all installed instrumentation as part of submission of test documentation.

2.3 TEST REPORTS

Contractor shall submit Test Reports that document the results of each of the tests in the Commissioning Test Manual and this Protocol. Individual Test Reports shall include the following, at a minimum for each test:

Any mutually agreed upon deviations from the Commissioning Test Manual procedures

Instrument calibration sheets and certificates

Test data, including corrected test data

Field notes (weather conditions, observations, etc.)

Test calculations

Any deficiencies or issues identified during, or as a result, of testing

Any corrective actions taken shall be documented, and will include any subsequent retesting results, as applicable.

Conclusions

Signatures of Contractor and Commissioning Manager

A Final Commissioning Test Summary shall be prepared to document the results of all Commissioning Tests in a single document. The Final Commissioning Test Summary shall be submitted to Owner within five (5) business days following the completion of all Commissioning Tests.

An Acceptance Test Report shall be prepared and submitted for Owner review within five (5) business days following completion of the Acceptance Tests.

2.4 TEST REPORT LABELING

All test report files submitted to Owner shall be labeled in accordance with the Commissioning Test Manual or this Protocol.

For Example:

The Open-Circuit Voltage (V_{oc}) String Test found in Section 3.4.1 of this Protocol shall have a corresponding test report labeled "*3.4.1_VocStringTestReport.pdf*" and associated data files labeled "*3.4.1_VocStringTestData.csv"*.

3 Commissioning Testing

3.1.1 Use of Temporary or Remote Instrumentation

With the written permission of Owner, temporary or remote instrumentation may be used to perform the measurements required for Commissioning Testing.

3.1.2 Test Conditions

All Equipment required for the normal operation of the Facility will be operated in as close to normal, automatic, or manual modes, as practicable. During all tests, Contractor and its subcontractors will have free access to the Project and all operating data for purposes of monitoring and calculating performance.

3.1.3 Test Calculations

All calculations prescribed within this Protocol will be carried out by Contractor and submitted to Owner for approval.

3.2 GENERAL INSPECTIONS

A comprehensive General Inspection Plan shall be developed by Contractor and presented to the Owner as a part of the Commissioning Test Manual.

The General Inspection of components shall be performed prior to any Commissioning Tests on those components and include, at a minimum, a Visual & Mechanical inspection and a Grounding System inspection. The visual inspection shall include, but is not limited to, the inspection for possible issues and verification of the Project design. Any issues identified by the General Inspection shall be rectified immediately and reported to the Owner. The General Inspection shall be repeated until all issues are resolved.

3.2.1 Identification of General Issues

The General Inspection shall identify any issues and/or irregularities, including the following:

Physical damage. All readily accessible cables, modules, racking, inverters and other system components shall be visually inspected to be free of physical damage.

Poor wire management. All readily accessible wires and cables shall be visually inspected to ensure that they are installed in a clean and workmanlike manner with no loosely hanging wires.

Corrosion. All readily accessible system components shall be visually inspected to be free of corrosion or oxidation issues such as rusting.

Shading concerns. The Project site shall be visually inspected for unforeseen obstructions which may cause unexpected shading on modules.

Poor welds. All readily accessible welds performed in the field shall be visually inspected for issues.

Missing torque marks. Visual torque marks shall be visually inspected on a sampling of lug and bolt heads. Torque marks shall extend for the center of the bolt head continuously to the surface on which the bolt is secured.

3.2.2 Verification of Design

The General Inspection shall verify the correct installation of system components per the Project design and include a review of the following:

Markings and labels

Equipment ratings

Wire sizing

Module flash test review

Mounting or racking components

Tracker components (if applicable)

3.3 SYSTEM GROUNDING

Contractor shall ensure that all components are properly grounded according to design and specifications. Grounding connections shall be inspected by an AHJ or other independent quality control inspector to verify proper installation of all compression clamps, CAD welds, and mechanical connections. The DC and AC system groundings shall conform to all applicable codes and standards. Visual inspection of the grounding systems shall be documented in a report that includes, but is not limited to, the following verifications:

Racking posts grounded per specifications and connected to system grid

Module grounding components installed correctly (washers, clips, etc.)

All readily accessible connections visually verified

Mechanical attachment

Anti-oxidation coatings applied, as required

Lugs fully seated

Whip installed per manufacturer's requirements

Connections to grounding grid inspected

CAD welds

Compression clamps

Grounding Rods

Rods set to depth per drawings or otherwise verified to provide adequate ground connection as determined by the engineer.

Clamp fully engaged

Whip/cable fully engaged

3.4 CABLE AND MODULE TESTING

3.4.1 Open-Circuit Voltage (Voc) String Test

Open-circuit voltage (V_{oc}) string testing shall be conducted in order to assess overall module and string performance. The test shall be conducted and witnessed by at least two qualified technicians using best practices and the following procedure:

The test shall be conducted during periods of irradiance greater than POA 500 W/m^2 and between the hours of 10:00am and 2:00pm. Expanded hours and lower POA values may be authorized in writing by Owner and/or the engineer.

Inspect string fuses for appropriate use and correct sizing.

Measure and record the following for every string:

String number and combiner box location (or similar relevant string identification)

Time of test and weather conditions

Module back-sheet temperature at a location representative of the strings being tested. Measurements made every 5 minutes using an infrared thermometer or thermocouple affixed to the back side of the module

Plane-of-Array (POA) irradiance measurement for area of strings being tested

Open-circuit voltage (V_{oc}) measurement of every string within each combiner box. Measurement shall be made using a voltmeter with the suitable voltage rating and accuracy of at least 0.5%

Each measured string V_{oc} shall be within 5% from the expected V_{oc} ($V_{oc-expected}$) and within 5% of adjacent strings under identical temperature and irradiance conditions. The expected V_{oc} shall be calculated using the following equation:

$$V_{oc-expected} = \eta \cdot V_{oc-ref} \cdot \left[1 + \beta \cdot \left(T_{mod} - T_{mod-ref}\right)\right]$$

where:

$V_{oc-expected}$ = expected open-circuit voltage of the string

V_{oc-ref} = module open-circuit voltage at reference conditions

η = number of modules in series in tested string

β = module open-circuit temperature coefficient (°C^{-1})

T_{mod} = measured temperature at back of module (°C)

$T_{mod-ref}$ = back of module temperature at reference conditions

Comparisons between all measured and expected V_{oc} shall be analyzed in a spreadsheet which shall include the following PASS/FAIL tests for each string:

String $V_{oc-measured}$ is within 5% of $V_{oc-expected}$

String $V_{oc-measured}$ is within 5% of the $V_{oc-measured}$ of adjacent strings

Strings that fail either test shall be investigated for module defects, loose connections, disconnected modules, or other possible defects.

IV Curve Trace Testing as described in the following section may be used as source for (V_{oc}) upon written approval of Owner or the engineer.

3.4.2 IV Curve Trace Test

Contractor shall perform IV Curve Tracer tests for all strings of modules connected to combiner boxes at each combiner box location. The test shall be conducted and witnessed by at least two qualified technicians using best practices and the following procedure:

1. The test shall be conducted during periods when irradiance is greater than 500 W/m^2 and between the hours of 10:00am and 2:00pm. Expanded hours and lower POA values may be authorized in writing by Owner and/or the engineer.

Verify that the module and IV Curve Tracer are compatible.

Shut down the inverter associated with the string and combiner box being tested.

Disconnect the combiner box (or relevant DC disconnect switch) from the inverter and all other DC systems.

Measure, record and verify the following for every string:

String number and combiner box location (or similar relevant string identification)

Date and time

POA irradiance at precise time of test

Module backsheet temperature (use a string representative of all others being tested)

Ambient temperature

Wind speed

Weather conditions

Correct polarity shall be verified.

Using an IV Curve Tracer, perform the curve trace using the manufacturer's instructions. The Curve Tracer shall be configured to record at least 10 current-voltage data points and record the following values:

Maximum power (P_{max})

Voltage at maximum power (V_{mp})

Current at maximum power (I_{mp})

Open circuit voltage (V_{oc})

Short circuit voltage (I_{sc})

Fill Factor (FF)

Short-circuit current test: Each measured string short-circuit current shall be greater than the expected short-circuit current ($I_{sc-expected}$) derived using the following equation:

$$I_{sc-expected} = \kappa \cdot I_{sc-ref} \cdot \left(\frac{G}{G_{ref}}\right)$$

where:

$I_{sc-expected}$ = expected short-circuit current of the string

I_{sc-ref} = short-circuit current at Standard Test Conditions (STC) as shown on module datasheet

κ = 0.95 (uncertainty and soiling factor)

G = measured irradiance (W/m^2)

G_{ref} = 1000 W/m^2

3.4.3 Low Voltage Insulation Resistance ("Megger") Test

All low voltage (LV) direct current (DC) and alternating current (AC) cables shall be tested for insulation resistance in accordance with the NETA-ATS. Measured insulation resistance values shall be adjusted to a 20°C reference in order to determine acceptance with NETA-ATS Tables 100.1 and 100.14.

All insulation resistance acceptance criteria shall be proposed by Contractor and approved by Owner. Any test results that fail to be in accordance with the NETA-ATS, or do not meet the accepted criteria, shall be documented as a deficiency on the test report. Corrective action shall follow the identification of a failed test, followed by re-testing.

3.4.4 Cable Tests (Low and Medium Voltage)

3.4.4.1 Low Voltage Cables (up to 1000V)

All low voltage cables shall be inspected and tested in accordance with NETA-ATS, Section 7.3.2. Test Values shall be in accordance with NETA-ATS, Section 7.3.2.3.

Note: NETA-ATS states that Section 7.3.2 is for low-voltage cables up to a 600 Volt Maximum. This Section shall also be used for cables with voltages up to 1000 Volts.

Test voltages applied in the field shall not exceed the maximum test voltage of NETA-ATS Table 100.1.

Verify uniform resistance for all parallel conductors.

3.4.4.2 Medium Voltage Cables (2 kV – 35 kV)

Inspection and testing shall be performed after all splices and cable terminations have been installed.

All medium voltage cables shall be inspected and tested in accordance with NETA-ATS, Section 7.3.3. Test Values shall be in accordance with NETA-ATS, Section 7.3.3.3.

The preferred test method for Section 7.3.3.2.4 is by partial discharge analysis with Very Low Frequency (VLF) test devices. Test methods or devices other than those listed in NETA-ATS 7.3.3.2.4 may be used only with approval by Owner.

Test voltages applied in the field shall not exceed 80% of the factory test value, and shall not exceed the maximum test voltage shown in NETA-ATS Table 100.6.

Verify proper installation of faulted-cable indicators as shown in the project drawings, as applicable.

3.4.5 Phase Rotation Test (as applicable)

A test that verifies the proper AC phase rotation at the point of interconnection (Point of Common Connection – PCC) shall be completed and documented.

3.4.6 Polarity Test

Verify that all circuits have the correct polarity according to the design drawings. Verify proper termination of positive (+) and negative (-) cable connections.

3.4.7 Copper Communication line Testing

Test all circuits, with connectors in place, with the appropriate communication tester for the circuit, (CAT5, Coaxial, Paired, RJ45, etc.).

3.4.8 Fiber Optic Line Testing

All fiber optic network assemblies shall be tested per Fiber Optic Association (FOA) standards with appropriate Optical Loss Test Set (OLTS). Optical Time Domain Reflectometer (OTDR) testing may be required by the engineer.

3.5 EQUIPMENT TESTING

3.5.1 Circuit Breaker Tests (Low, Medium, and High Voltage)

3.5.1.1 Low-Voltage Insulated-Case/Molded-Case Air Circuit Breakers

Inspect and test each circuit breaker in accordance with NETA-ATS, Section 7.6.1.1.

Confirm that if a Breaker is being back-fed, it is rated accordingly.

Verify that the Test Values are in accordance with NETA-ATS, Section 7.6.1.1.3.

Proof and documentation of equivalent factory testing, if applicable, may be provided in place of Contractor performing the test described above at Owner discretion.

3.5.1.2 Low-Voltage Power Air Circuit Breakers

Inspect and test circuit breakers in accordance with NETA-ATS, Section 7.6.1.2.

Confirm that if a Breaker is being back-fed, it is rated accordingly.

Verify that Test Values are in accordance with NETA-ATS, Section 7.6.1.2.3.

3.5.1.3 Medium-Voltage Air Circuit Breakers (as applicable)

Inspect and test circuit breakers in accordance with NETA-ATS, Section 7.6.1.3.

Confirm that if a Breaker is being back-fed, it is rated accordingly.

Perform the optional power factor test on each pole and bushing (7.6.1.3.2.7-8)

Verify that the Test Values are in accordance with NETA-ATS, Section 7.6.1.3.3.

3.5.1.4 Medium and High Voltage Oil Circuit Breakers (as applicable)

Inspect and test circuit breakers in accordance with NETA-ATS, Section 7.6.2.

Confirm that if a Breaker is being back-fed, it is rated accordingly.

Verify that the Test Values are in accordance with NETA-ATS, Section 7.6.2.3.

3.5.1.5 Medium-Voltage Vacuum Breakers (as applicable)

Inspect and test each circuit breaker in accordance with NETA-ATS, Section 7.6.3.

Perform the optional power factor test on each pole and bushing (7.6.3.2.8-9).

Verify that the Test Values are in accordance with NETA-ATS, Section 7.6.3.3.

3.5.2 Switch Tests (Low, Medium and High Voltage)

3.5.2.1 DC and AC Switches (Low Voltage)

Inspect and test each low voltage switch in accordance with NETA-ATS, Section 7.5.1.1.

Confirm and document correct electrically-bonded equipment ground.

Confirm and document that metal-enclosed switches are clean and that any debris has been removed.

Verify that switches used in DC applications are rated and installed accordingly.

Verify that warning signs (where provided) are in accordance with the National Electrical Code (NEC), or equivalent electrical code that is applicable to the project.

Verify that Test Values are in accordance with NETA-ATS, Section 7.5.1.1.3.

3.5.2.2 Medium Voltage Switches (Metal-Enclosed) (as applicable)

Inspect and test each medium voltage (MV) metal-enclosed switch in accordance with NETA-ATS, Section 7.5.1.2.

If applicable, include testing of the motorized switch operator device, in accordance with NETA-ATS, Section 7.5.1.2.

Verify that Test Values are in accordance with NETA-ATS, Section 7.5.1.2.3.

3.5.2.3 Medium and High Voltage Air Break Switches (as applicable)

Inspect and test each medium and high voltage (HV) air break switch in accordance with NETA-ATS, Section 7.5.1.3.

If applicable, include testing of the motorized switch operator mechanism, in accordance with NETA-ATS, Section 7.5.1.3.

Verify that Test Values are in accordance with NETA-ATS, Section 7.5.1.3.3.

3.5.3 Switchgear and Switchboard Equipment Inspection (as applicable)

Contractor shall review factory test documentation to confirm that all MV and HV (as applicable) switchgear assemblies have passed all factory tests including, but not limited to:

Insulation Resistance

AC High Voltage Withstand

Main Contact Resistance (Ductor Tests)

Earth Switch Resistance (Ductor Tests)

Oil Dielectric Strength

Functional Tests

Type Tests

Contactor shall review factory test documentation to confirm that all LV switchgear has passed all factory tests including, but not limited to:

Insulation Resistance

Contact Resistance

Functional Tests

Type Tests

3.5.4 Transformer Tests (as applicable)

3.5.4.1 Liquid Filled Transformers

Inspect and test each Transformer in accordance with NETA-ATS, Section 7.2.2.

Inspect and test the sudden pressure relay when applicable.

Verify that Test Values are in accordance with NETA-ATS, Section 7.2.2.3.

If not required by the manufacturer, Contractor has the option to also perform the following tests (if applicable):

Core insulation resistance test (7.2.2.2.8).

Measure the percentage of oxygen in the nitrogen blanket (7.2.2.2.9).

Oil tests for water content, and power-factor (7.2.2.2.10.7-8).

Note: Proof and documentation of equivalent factory testing, if applicable, may be provided in place of Contractor performing the tests described above.

3.5.4.2 Dry-Type Transformers (small and large)

Inspect and test each Transformer in accordance with NETA-ATS, Section 7.2.1.1 or 7.2.1.2 (small or large transformers).

Verify that Test Values are in accordance with NETA-ATS, Section 7.2.1.1.3 or 7.2.1.2.3.

Note: Proof and documentation of equivalent factory testing, if applicable, may be provided in place of Contractor performing the tests described above.

3.5.5 Inverter Commissioning

Inverters shall be commissioned by the inverter manufacturer, or an authorized representative of the manufacturer, using the manufacturer's specified procedures. Commissioning reports shall be in a format provided by the manufacturer.

At a minimum, inverter commissioning shall meet the following requirements:

Inverters shall be fully operational after commissioning completion

All shipping and packing materials shall be removed from inverter cabinets

Fuses and air filters shall be checked, verified as correct and in place

Torque wrench marks shall be recorded

Software updates and data acquisition (DAQ) communication shall be tested and functional

3.5.6 Meteorological (MET) Station Equipment

Meteorological (MET) station equipment shall be commissioned, calibrated and tested using the manufacturer's specified procedures with accuracy being compared to the manufacturer's specifications. Calibration certificates for each installed instrument shall be confirmed. Test reports shall be in a manufacturer provided format if available.

The following instrumentation, if it is part of the metrology equipment specified by Owner, shall be tested, at a minimum:

Solar irradiance measurement device, as applicable, e.g.:

Global horizontal irradiance (GHI)

Plane of array (POA) irradiance

Anemometer (wind speed), as applicable

Module temperature, as applicable

Ambient temperature, as applicable

Rainfall gauge, as applicable

Data-logger and communications equipment, as applicable

3.5.7 Protective Relay Equipment (as applicable)

Protective relay equipment shall be inspected and tested in accordance with NETA-ATS, Section 7.9. Each equipment device shall be programmed with the specified relay settings provided by, or approved by, the local electrical utility. The following shall be performed and documented in a report, at a minimum:

Verify that all grounding pins have been removed from all shorting-type terminal blocks in non-spare current transformer circuits.

Verify that all spare current transformers are properly shorted.

Perform functional testing of each control scheme, including breaker trip tests, close inhibit tests, lockout relays, alarm functions, and breaker-failure schemes.

3.5.8 Surge Arrestors (as applicable)

Surge arrestors shall be inspected and tested in accordance with NETA-ATS, Sections 7.19.1 and 7.19.2. Test Values shall be in accordance with NETA-ATS, Section 7.19.2.3.

3.5.9 Thermographic Survey (Infrared Scans)

Perform a thermographic (infrared) survey in accordance with NETA-ATS, Section 9. All thermo graphic images will be provided to Owner and the survey shall meet the following requirements:

The survey shall be performed after all other commissioning tests are complete and while the Project is operational.

An infrared (IR) camera shall be used to detect areas of non-uniform temperature.

The test shall be conducted during a minimum POA irradiance of 500 W/m^2.

The survey shall include the following equipment:

All combiner and re-combiner boxes

All AC power distribution equipment

All inverters (if infrared test window is available)

All transformers (if infrared test window is available)

Five (5) percent of all PV modules from the front

Five (5) percent of all PV modules from the rear

Any covers, shields, or doors on equipment shall be opened, moved or removed during testing of equipment to ensure the survey is free of obstructions to a clear IR image.

Investigate and comment on the results of the thermographic survey in a report that states either no issues were identified or comments on temperature differences greater than:

Three degrees Celsius (3°C) between similar components in the same enclosure

Fifteen degrees Celsius (15°C) between components and ambient air

3.6 SYSTEMS TESTING

3.6.1 Grounding System Tests

The Grounding System shall be inspected and tested in accordance with NETA-ATS, Section 7.13. Test Values shall be in accordance with NETA-ATS, Section 7.3.2.3. Ground resistance testing shall be by the fall-of-potential method, in accordance with IEEE-81.

3.6.2 SCADA/DAS and Monitoring System Verification

The Supervisory Control and Data Acquisition (SCADA) or Data Acquisition System (DAS) equipment shall be commissioned and tested using the manufacturer's specified procedures. Tests shall verify the correct operation of the SCADA/DAS system, meters, sensors, weather station instruments, and all inverters, while verifying the correct data input logging from trackers, breakers, and other components monitored by the system.

All data points collected by the SCADA shall be verified for consistency from the field device to the SCADA/DAS master device and, if applicable, on the remote monitoring service. This test shall verify that the data collected is correctly received by the SCADA system and can be used to produce any required performance or operation reports.

3.6.3 Security System Testing

Security system equipment shall be commissioned, tested and calibrated by a certified installer of the equipment manufacturer using the manufacturer’s specified procedures. Security system testing shall include testing of all operating modes and alarm conditions. If applicable, camera coverage shall demonstrate the ability to observe any location within the Project area.

If available, security system commissioning reports shall use a reporting format or forms provided by the security system provider.

3.6.4 Mounting System Testing

Mounting systems; fixed or trackers shall be inspected and tested by the manufacturer or authorized manufacturer representative. Trackers shall be operational prior to Acceptance Testing. All aspects of the mounting system shall be inspected and documented including, but not limited to, foundations, verifying tilt angle, fastener torques, module mounting methods, motors, software, global positioning system (GPS), and limits and rotation. All software shall be

updated to the most recent version. Tracker back-tracking, rotation and stow function shall be such that maximizes annual power production. Back-tracking and stow functions to be demonstrated using grid and auxiliary power when applicable.

3.7 MINIMUM REPORTING REQUIREMENTS FOR COMMISSIONING

The following summarizes the minimum data and results that are required to be included in individual commissioning report documentation provided to Owner.

3.7.1 General Requirements

The Commissioning Report shall include:

Test period, test conditions and Contractor's personnel responsible for test

A statement of whether each of the Commissioning inspections and/or tests either passed or failed

If one or more inspections and/or tests failed, a detailed explanation shall be submitted to Owner for review

A signed statement from Contractor that the Project complies with all of the Commissioning requirements set forth in this Specification

3.7.2 Open-Circuit Voltage (Voc) Test for each String

String number and combiner box location(s)

Date and time of test and weather conditions

Module temperature [^{o}C]

POA Irradiance [W/m^2], ≥500 W/m^2], at time of test

Measured open-circuit voltage ($V_{oc-measured}$) [V], for each string

Expected Voc calculation ($V_{oc-expected}$) [V], for each string

Percent difference between $V_{oc-expected}$ and $V_{oc-measured}$

3.7.3 IV Curve Trace Test

String number and combiner box location

Date and time of test and weather conditions

Module temperature [^{o}C]

Module temperature [^{o}C]

POA Irradiance [W/m^2], ≥500 W/m^2], at time of test

Wind speed [^{o}C]

Verification of correct polarity

Measured short-circuit current ($I_{sc-measured}$) [A], for each string tested

Expected short-circuit current calculation ($I_{sc-expected}$) [A], for each string tested

Verification that $I_{sc-measured}$ is larger than $I_{sc-expected}$

3.7.4 Low Voltage Insulation Resistance Test

Measured insulation resistance for each low voltage cable (in Megohms)

Verification that measured resistance exceeds recommended minimum insulation resistances presented in NETA-ATS

Identification of cables that fail the insulation test

3.7.5 Cable Tests (Low Voltage)

Visual and mechanical inspections in accordance with NETA-ATS, Section 7.3.2

Electrical tests in accordance with NETA-ATS, Section 7.3.2

3.7.6 Cable Tests (Medium Voltage)

Visual and mechanical inspections in accordance with NETA-ATS, Section 7.3.3

Electrical tests in accordance with NETA-ATS, Section 7.3.3

3.7.7 Phase Rotation Test

Verification the proper AC phase rotation at the point of interconnection

3.7.8 Polarity Test

Verification that all circuits have the correct polarity according to the design drawings

3.7.9 Copper Communication line Testing

Test report certifying that all circuits were tested and their corresponding plan identification.

Test report shall identify any circuits requiring repair or that were repaired during testing.

Test report shall include a description of test equipment and method.

3.7.10 Fiber Optic Line Testing

- Test report showing the calculated Expected Optical Loss and Actual Optical Loss per FOA standards for each circuit identified on the plans.

3.7.11 Test report shall include a description of the test equipment and method. Circuit Breaker Tests

All reported inspections and tests shall be in accordance with NETA-ATS, Section 7.6

3.7.12 Switch Tests

All reported inspections and tests shall be in accordance with NETA-ATS, Section 7.5.1

3.7.13 Switchgear and Switchboard Equipment Inspections

Verification and documentation confirming passes factory tests of the following for low, medium, and high voltage switchgear assemblies (if applicable):

Insulation resistance

AC High Voltage Withstand

Main Contact Resistance

Earth Switch Resistance

Oil Dielectric Strength

Functional Tests

Type Tests

3.7.14 Transformer Tests

All reported inspections and tests shall be in accordance with NETA-ATS, Section 7.2.2 for liquid filled transformers or Section 7.2.1 for dry-type transformers

3.7.15 Inverter Commissioning

Inverter commissioning report shall be from the manufacturer or authorized manufacturer representative

Commissioning reports shall verify the following:

Inverters are fully functional

Fuses and air filters have been checked and verified as correctly installed

Torque wrench marks have been recorded and mechanically verified

Software is up-to-date and functional

3.7.16 Meteorological (Met) Station Instrumentation

Provision of calibration certificates for all Met station instruments

Verification that all Met station equipment has been tested and verified as functional

3.7.17 Protective Relay Equipment

All reported inspections and tests shall be in accordance with NETA-ATS, Section 7.9

Verification of the following items:

Grounding pins have been removed

Spare current transformers are properly shorted

Functional test verification

3.7.18 Surge Arrestors (as applicable)

All reported inspections and tests shall be in accordance with NETA-ATS, Section 7.19.1 and 7.19.2, and test values be in accordance with Section 7.19.2.3

3.7.19 Thermographic Survey (Infrared Scans)

Submission of infrared scans for:

All combiner boxes

All re-combiner boxes

All AC power distribution equipment

All inverters and transformers (if infrared test window is available)

Five percent (5%) of all PV modules (both front and back scan)

Report shall comment of the results of the thermographic survey and identify any issues identified

3.7.20 Grounding Systems Test

All reported inspections and tests shall be in accordance with NETA-ATS, Section 7.13, and test values be verified to be in accordance with Section 7.3.2.3

3.7.21 SCADA/DAS and Monitoring System Verification

Test report shall verify that data collected by the SCADA system is correctly received by the monitoring system and is sufficient to being used for required performance and operation reports

3.7.22 Security system testing (if Applicable)

Security system installer shall provide verification of the completed commissioning, testing and calibration of the security system

Test reporting shall show that all operating modes and alarm conditions have been tested

3.7.23 Tracker System Testing (If applicable)

Reporting on tracker system commissioning shall be from the manufacturer and verify, at a minimum, that motors, software, limits, rotation, and global positioning systems are operating and functional so that the system maximizes annual power production. Data collected during foundation installation (driving times or torques information) to be reviewed and compared to foundation design.

4 Acceptance Testing

4.1 GENERAL

4.1.1 Acceptance Test Director

Contractor will designate an Acceptance Test Director (ATD) who will have the responsibility for test coordination. The ATD will maintain authority to start and stop the test as required. The ATD will maintain the authority to consider and accept any required deviations from the test procedure as mutually agreed with the Owner or Owner's representative.

4.1.2 Use Temporary or Remote Instrumentation

With the written permission of Owner, temporary or remote instrumentation may be used to perform the measurements required for Acceptance Testing.

4.1.3 Test Conditions

All Equipment required for normal operation of the Facility will be operated in normal, automatic, or manual modes, as applicable. During all tests, Contractor and its subcontractors will have free access to the Project and all operating data for purposes of monitoring and calculating performance.

4.1.4 Test Calculations

All calculations prescribed within this Protocol will be carried out by Contractor and submitted to Owner for approval.

4.1.5 Acceptance Test Data Requirements

Contractor shall provide sufficient data for the Owner to verify the successful completion of Acceptance Testing in addition to Acceptance Test reports. The following data shall be provided by Contractor to the Owner for the Project.

4.1.5.1 Data required for entire Project:

5 minute interval measurements in CSV[1] format for each project:

Energy from revenue meter (at point of grid interconnection)

Ambient Temperature (for each sensor)

Plane-of-Array (POA) Irradiance (for each solar irradiance measurement device)

Wind speed

[1] CSV stands for Comma Separated Value, which is a common file format for data.

DAS/SCADA system access

Energy report taken directly from revenue meter (kWh units, at least 24 hours)

Proof from Operator that an imposed performance alert was acknowledged, e.g. screen shot of monitoring UI, ticket or email creation.

Proof from Operator that DAS/SCADA is integrated with other business systems, i.e. energy invoice consistent with energy metered.

4.1.5.2 Data Required per Inverter:

5 minute interval measurements in CSV format for each inverter:

Real and Reactive Power output at inverter

Any available status indication of reduced real power generation due to reactive power generation (if applicable)

Times when inverter AC and DC disconnect are imposed.

4.2 OPERATIONAL TEST

A two (2) day long Functional Test, as defined below in its entirety, that demonstrates the continuous and uninterrupted operation of the Facility shall document the following:

Inverters. All inverters shall start at wake-up voltage in the morning, operate continuously during periods of sufficient solar irradiance and enter stand-by mode at dusk (sufficient solar irradiance is the amount of solar irradiance necessary for the inverter to operate before entering stand-by mode). Inverter operation shall be autonomous at all times. Inverters shall react properly to remote or automatic AC and DC disconnections. The inverter disconnection mechanism of the grid interconnection shall be functional during grid interconnection faults or failure unless otherwise required by the grid operator. All inverters shall include a communications interface with standard communications protocol to integrate to an external SCADA. Owner reserves the right to observe the inverter display at site to confirm that the Maximum Power Point Tracking (MPPT) is fully functional.

SCADA/DAS and Revenue Meter Verification. The reporting interface shall be functional and shall update with new data within expected time period. The accuracy of energy and power values in the reporting interface shall be validated using energy production data obtained directly from the revenue meter. Performance alerts shall be functional and acknowledged by operations staff. Remote monitoring shall be available at the point of telecommunication connection at the plant.

Trackers (if applicable). All trackers shall operate autonomously at all times. Tracking accuracy shall be verified to comply with manufacturer's specifications. Every tracker shall have an inclinometer installed for each of its tracking axis of movement. Each inclinometer shall be monitored by the SCADA System.

The inclinometer data shall be recorded by the SCADA system at the same rate as the rate of rotation of the axis or more frequently.

The inclinometer data shall be compared to time of the day to ensure that the tracker's movement meets manufacturer's specifications.

Functionality: The test shall demonstrate that the Facility is functioning and capable of operating free of inverter error throughout the specified test period.

Compliance. Contractor shall provide verification that the Facility has the ability to comply with all material safety, system reliability, environmental, and other applicable Laws, Governmental Approvals, the EPC Agreement, the Power Purchase Agreement, and the Interconnection Agreement.

4.3 CAPACITY TEST

4.3.1 Purpose

The purpose of the Capacity Test is to determine the measured AC capacity (Measured Capacity) of the Project system and to compare the Measured Capacity to an Expected Capacity. Both the Measured Capacity and the Expected Capacity will be derived at identical Reporting Conditions (RC). Note: The Operational Test must be passed prior to starting the Capacity Test

4.3.2 Measurement Requirements

The measured data required for the calculation of Measured Capacity for this test include: plane of array (POA) solar irradiance, ambient temperature, wind speed, and AC power.

Ambient Air Temperature: Air temperature measurement equipment shall have a resolution of 0.1 °C or smaller and be accurate to within ±1 °C. The instrument shall include a radiation shield compliant with ASTM D6176. The instrument shall be placed close to the array without interfering with the array's thermal boundary layer.

Irradiance: Irradiance shall be measured with a minimum of two ISO 9060 Secondary Standard heated and ventilated pyranometers installed in the plane of array of the modules. The pyranometers should be located in different areas of the PV array to sample irradiance in multiple locations. The sensors shall be compared and time periods with differences greater than 10% shall be filtered from use to limit test to stable sky conditions.

Wind Speed: The uncertainty of the wind measuring instrument shall be no more than ±0.5 m/s. The instrument shall be placed close the array but away from any wind flow interference caused by the solar PV array or other obstacles. The sensors shall be compared and time periods with differences greater than 5 m/s shall be filtered from use to limit test to stable wind conditions.

Soiling: Soiling shall be assumed to be negligible during the test, modules to be washed prior to testing.

AC Power Output: The AC power output of the system shall be measured at the grid interconnection point using a meter which meets or exceeds the accuracy standards per ANSI C12.1.

Averaging Interval: The averaging interval shall be 5 minute periods. All measured data shall be recorded as the average over the five minute period.

4.3.3 Determine Reporting Conditions (RC)

Use ASTM E2939-13 to create RC based on Owner approved reference energy production model and Owner approved historical meteorological dataset

4.3.3.1 Filtered Measured Data and Minimum Dataset Requirements

Contractor shall filter meteorological data and modeled power output data per ASTM E2939-13 and ASTM E-2848-13, Section 9.1, omitting the filter described in ASTM E2848-13 section 9.1.6 (irradiance outside of range) For clarity, section 9.1.8, "inverter not peak power tracking, shall be considered to occur when any individual inverter is operating above 98% of its AC maximum nameplate or when the entire plant is above 98% of its AC nameplate. In addition, any point when the inverter is limited in its real power generation in order to provide reactive power shall be filtered from the dataset.

Filtered data shall provide a dataset that covers at least 5 days of operation.

4.3.3.2 Calculating the Reporting Conditions

The Reporting Conditions (RC) will be determined for each month by following the procedure outlined below in accordance with the test method outlined in ASTM E2848-13. The Reporting Conditions will be averages of the POA Irradiance, Ambient Temperature, and Wind Speed using the filtered datasets.

Calculate the reference POA Irradiance for each month ($Irr_{RC,j}$)

- $Irr_{RC,j}$ shall be selected from the filtered data for each month and shall be the highest of the following values that contains an equal number of data points in the range 0.8 x reference condition –reference condition and reference condition - 1.2 x reference condition : 500, 600, 700, …1000

Implement the filter described in 9.1.6 of ASTM E-2848-13 on the already filtered dataset based on the reference irradiation chosen in the above bullet

Calculate reference ambient air temperature for each month ($T_{amb,RC,j}$)

- $T_{amb,RC,j}$ shall be the average ambient temperature of the filtered data for the relevant time period.

Calculate reference wind speed each month ($WS_{RC,j}$)

$WS_{RC,j}$ shall be the average wind speed of the filtered data for each month.

4.3.3.3 Reporting Conditions Table

Table 1 shall be filled in prior to Contract signing. The Reporting Conditions presented in Table 1 shall be used to calculate Expected Capacity in Section **Error! Reference source not found.** of this Protocol.

4.3.4 Determine Expected Capacity

Expected Capacity shall be calculated for each month over a complete calendar year (12 months) at the corresponding Reporting Conditions, as determined in Section 4.3.3.2 of this Protocol.

4.3.4.1 Calculate "From Historical" Regression Coefficients and Expected Capacities

Use the filtered modeled power output, filtered plane of array irradiance (Irr_H), filtered ambient temperature ($T_{amb,H}$), and filtered wind speed data (WS_H) to fit the four (4) "from historical" regression coefficients $\{A_H, B_H, C_H, and\ D_H\}$ defined in ASTM E2848-13, and E2939-13 and compute the resulting target capacities for the selected monthly reference conditions

4.3.4.2 Expected Capacity Table

Table 1, below shall be filled in prior to Contract signing. The Expected Capacity recorded in Table 1 shall be used in comparison with the Measured Capacity, as determined per Section 4.3.5 of this Protocol.

Table 1. Monthly Expected Capacity and Reporting Conditions

MONTH (J)	EXPECTED CAPACITY $(C_{exp,j})$ (KW)	REPORTING POA IRRADIANCE $(Irr_{RC,j})$ (W/M^2)	REPORTING AMBIENT TEMPERATURE $(T_{amb,RC,j})$ (°C)	REPORTING WIND SPEED $(WS_{RC,j})$ (M/S)
January				
February				
March				
April				
May				
June				
July				
August				

September				
October				
November				
December				

Note: in the event that the Measurement Test Period (MTP) for the Measured Capacity spans across the boundary between two months, the Reporting Conditions (RC) corresponding to the MTP will be calculated as a weighted average of the RCs from each of the two months, where the weighting coefficients are based on the percentage of filtered measured data that falls within each month.

4.3.5 Measured Capacity

Measured Capacity shall be determined using ASTM E2848-13, Section 4 using data collected over the Measurement Test Period (MTP). Measured Capacity shall be compared to the Expected Capacity for the Test Month in which the test period occurred and meet the test requirements set forth in Section 1.1.1 of this Protocol.

4.3.5.1 Filtered Measured Data

Filter the measured energy production data, measured plane of array irradiance, measured ambient temperature, and measured wind speed in accordance with ASTM E2848, Section 9.1. For clarity, section 9.1.8, inverter not peak power tracking, shall be considered to occur when any individual inverter is operating above 98% of its AC maximum nameplate or when the entire plant is above 98% of its AC nameplate. In addition, any point when the inverter is limited in its real power generation in order to provide reactive power shall be filtered from the dataset.

In addition, data shall be filtered to limit the maximum wind speed to less than 10 m/sec.

4.3.5.2 Minimum Requirements for Filtered Dataset

Post-filtered data shall represent a dataset covering at least 750 minutes of operation.

Therefore, because the test is specified using five (5) minute intervals, a minimum of 150 data points is required.

4.3.5.3 Calculate Measured Capacity

Calculate measured regression coefficients and measured capacity values following the procedure outlined in ASTM E2848-13

1.1.1 Minimum Requirement for Measured Capacity

The Measured Capacity of the Project shall be greater than or equal to ninety-seven percent (97%) of the Expected Capacity for the Reporting Period for an acceptable test result.

4.4 MINIMUM REPORTING REQUIREMENTS FOR ACCEPTANCE TESTS

4.4.1 Operational Test Report

4.4.1.1 General Requirements

The Operational Test Report shall include:

- Test period, test conditions and Contractor's personnel responsible for test
- A statement of whether each of the Operational Test either passed or failed
  - If one or more Operational Tests failed, a detailed explanation shall be submitted to Owner for review
- A signed statement from Contractor that the Project complies with all of the Operational Test requirements set forth in this Specification

4.4.1.2 Required Reporting Data for the Entire Project

The following data for the entire Project, throughout the Operational Test period, shall be included in the Operational Test Report:

- Verification of proper Met Station functionality, for each averaging interval, including:
  - POA Irradiance [W/m2], for each solar irradiance measurement device
  - Ambient Temperature [^{o}C], for each temperature sensor
  - Wind Speed [m/s], for each wind speed sensor
- Verification of proper Tracker functionality
- Verification of proper SCADA/DAS functionality
  - Verification of proper communications functionality
  - Verification that an imposed performance alert was acknowledged
- Verification of proper Revenue Meter functionality

4.4.1.3 Required Reporting Data for each Inverter

The following data for each inverter, throughout the Functional Test period, shall be included in the Functional Test Report:

Verification of proper Inverter functionality

Real and Reactive Power output [kWac and kVar] from each inverter, for each averaging interval

Any time(s) during when either the AC and/or DC disconnect are imposed

Any times(s) during when curtailment was imposed by the utility

Any times(s) during when the plant was effectively curtailed due to adverse grid conditions

4.4.2 Capacity Test Report

The following data and calculations shall be provided to Owner in the Capacity Test Report and associated documents.

4.4.2.1 General Requirements

The Capacity Test Report shall include:

Measurement Test period, test conditions and Contractor's personnel responsible for test

A statement of whether the Capacity Test either passed or failed

If the Capacity Test failed, a detailed explanation shall be submitted to Owner for review

A signed statement from Contractor that the Project complies with all of the Capacity Test requirements set forth in this Specification

4.4.2.2 Data required for entire Project

Mutually agreed upon Historical Meteorological Dataset, including for each hour of a calendar year (8760 hours/year):

POA Irradiance [W/m^2]

Ambient Temperature [^oC]

Wind Speed [m/s]

Mutually agreed upon Reference Energy Production Model

One calendar year of modeling results at hourly resolution (8760 hours/year) from using the Owner-Approved Historical Meteorological Dataset as input into the Owner-Approved Reference Energy Production Model, including:

Energy [kWh]

Calculations and results used to determine the "From Historical" fitting coefficients, for each month: $\{A_H, B_H, C_H, and\ D_H\}$

Calculations and results used to determine the Reporting Conditions, for each month: $\{Irr_{RC,j}, T_{amb,RC,j}, WS_{RC,j}\}$

Calculations and results used to determine the Expected Capacity, for each month: $Expected\ Capacity_j$

A completed version of Table 1, above

Unfiltered measurements for the entire project, for each averaging interval:

Energy [kWh] from revenue meter

POA Irradiance [W/m^2], for each solar irradiance measurement device

Ambient Temperature [^{o}C], for each temperature sensor

Wind Speed [m/s], for each wind speed sensor

Real and Reactive Power output [kWac and kVAr] from each inverter, for each averaging interval

Any time(s) during when either the AC and/or DC disconnect are imposed

Any times(s) during when curtailment was imposed by the utility

Any times(s) during when the plant was effectively curtailed due to adverse grid conditions

Filtered measurements for the entire project, for each averaging interval:

Energy [kWh] from revenue meter

POA Irradiance [W/m^2], for each solar irradiance measurement device

Ambient Temperature [^{o}C], for each temperature sensor

Wind Speed [m/s], for each wind speed sensor

Calculations used to determine the "From-Measured" regression coefficients: $\{A_M, B_M, C_M, and\ D_M\}$

Calculations used to determine the Measured Capacity: $Measured\ Capacity$

Calculations and results used to compare Measured Capacity to Expected Capacity

5 Appendices

5.1 APPENDIX A: DEFINED TERMS

Table 2. Defined Terms

Note: "The defined terms, acronyms and abbreviations contained in this appendix are limited in application to this section/exhibit of the Agreement"

TERM	DEFINITION

TERM	DEFINITION
Acceptance Tests	The Acceptance Tests are tests specified to determine the functionality and performance of the Facility prior to Substantial Completion (SC). These tests must pass the test requirements prior to declaration of SC.
Array	A collection of solar PV modules wired together to enable the collection of DC power for conversion into AC power by an inverter. An array may consist of several sub-arrays (also known as blocks) that make up the larger solar array.
CAD Weld	An exothermic weld that melts a metal around a joint to electrically connect two electrical components such as a ground wire to a ground rod.
Capacity Test	A test that determines the measured AC capacity of a system and compares it to the expected AC capacity using measured data and the Reference Energy Production Model.
Commissioning	Inspections and tests designed to assess the proper function and correct installation of system components prior to system interconnection.
Reference Energy Production Model	A model used to calculate the expected annual energy production by a specific system design. Typically, the Reference Energy Production Model is the same model that was used to estimate the performance of the Project for the project pro forma (financial model).
Expected Capacity	The expected power output (kW) for a facility, calculated using measured conditions and the Reference Energy Production Model.
Facility	The entire system, system related components, and associated land, roof, or structure on which the system is installed.
Functional Test	A test that determines whether the Facility is capable of operating without error or disconnection for a required duration of days.
Grounding System	A system that consists of all wires, rods, plates or lugs used to safely ground system components such as modules, combiner boxes, inverters, transformers and racking.
Inclinometer	An instrument (also known as a clinometer) used for measuring tilt angles of modules in a tracking system.
IV Curve	Plot of current (I) versus voltage (V) for solar cells, modules, or strings. IV curves are used to determine the performance of modules or strings in relation to the module manufacturer's nameplate values.
Measured Capacity	Measured Capacity is the measured power output in kilowatts (kW) of the Facility, which is corrected using measured data and regression coefficients derived from following the ASTM E2848 standard.
Measured Power Output	The Measured Power Output is the power output in kilowatts (kW) of the Facility as reported by the revenue-grade meter on the DAS.

TERM	DEFINITION
Met Station	A meteorological measurement station that consists of all weather and solar irradiance measurement instrumentation such as pyranometers, anemometers, ambient temperature sensor, and module temperature sensors; and the communication interface thereto.
Modeled Power Output	The power output of the Facility as determined by the Reference Energy Production Model, and used in the regression analysis in the Capacity Test to determine the Expected Capacity.
Regression Coefficient(s)	Values derived by a regression tool in Microsoft Excel and represent the weighting and relationship of the explanatory variables (POA irradiance, ambient temperature, and wind speed) to the dependent variable (power output).
Revenue Meter	A revenue meter is a revenue-grade meter that measures the energy [kWh] production of the Project. Revenue-grade meters must have at least a ±2% accuracy per the American National Standards Institute (ANSI) rule C12.1-2008.
Thermographic	Thermographic cameras can detect radiation in the infrared range of the electromagnetic spectrum and help identify loose wire connections, overheating, and other issues at solar facilities that cause comparatively high temperatures.

5.2APPENDIX B: ACRONYMS AND ABBREVIATIONS

Table 3. Acronyms and Abbreviations

ACRONYM	WRITTEN OUT
AHJ	Authority(ies) Having Jurisdiction
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
ATD	Acceptance Test Director
ATS	NETA Acceptance Testing Specifications
CSV	Comma Separated Value (a common data file format)
CD	Commissioning Director
DAQ	Data Acquisition
DAS	Data Acquisition System
ETT	NETA Standard for Certification of Electrical Testing Personnel
FF	Fill Factor

ACRONYM	WRITTEN OUT
GHI	Global Horizontal Irradiance
HV	High Voltage
IEEE	Institute of Electrical and Electronic Engineers
Imp	Current at Maximum Power
IR	Infrared
Isc	Short Circuit Current
ISO	International Standards Organization
LV	Low Voltage
MV	Medium Voltage
NEC	National Electric Code
NETA	International Electrical Testing Association
NFPA	National Fire Prevention Association
OSHA	Occupational Safety and Health Administration
PCC	Point of Common Connection
Pmax	Maximum Power
POA	Plane of Array
RC	Reporting Conditions
SCADA	Supervisory Control and Data Acquisition
Vmp	Voltage at Maximum Power
Voc	Open Circuit Voltage

Portland General Electric Company

SOLAR RESOURCE TECHNICAL SPECIFICATION**

Renewable Energy Resources

Exhibit B – Performance Guarantee

****NOTE: PGE's final issuance of the 2016 Request for Proposals (RFP) for Renewable Energy Resources is subject to Oregon Public Utility Commission approval of both the draft RFP and the Petition for Partial Waiver of the Competitive Bidding Guidelines, including the expedited RFP timeline.**

May 23, 2016

15. EXHIBIT B – PERFORMANCE GUARANTEE

6 Table of Contents

Table of Contents 176

PERFORMANCE GUARANTEE 177

- Actual Performance Ratio 177
- Acceptance Criteria 178
- Underperformance Calculation for Performance Liquidated Damages 178
- Performance Liquidated Damages 178
- Buydown Liquidated Damages 179
- General Performance Conditions 180
- Data Collection 180
- Force Majeure 180
- Financial Security 180
- Test Report 180

7 PERFORMANCE GUARANTEE

Commencing on the Project Substantial Completion Certificate Date, Contractor guarantees an annual performance ratio (Guaranteed Performance Ratio) during the Warranty Period based on the Agreement PVsyst report. Specifically, the Guaranteed Performance Ratio is [GUARANTEED PERCENTAGE]. For avoidance of doubt, the Warranty Period shall be deemed to commence at 12:00 a.m. on the date following the Project Substantial Completion Date, and each year of the Warranty Period shall end on the anniversary of the Project Substantial Completion Date and be comprised of 8760 hours of data. The successful achievement of the Guaranteed Performance Ratio will be verified annually after each anniversary of the Project Substantial Completion Date according to the procedure defined herein.

8 Actual Performance Ratio

The Actual Performance Ratio (APR) will be calculated annually as follows:

$$APR_{Year} = \frac{Actual\ Energy_{Year}}{\frac{POA_{Year}}{G_{STC}} \times Power_{DC} \times (1 - d) \times T_{CORR}}$$

Where:

APR_{Year} (%) is the Actual Performance Ratio for the specific year.

$Actual\ Energy_{Year}$ (kWh) is the actual accumulated energy measured during the annual period considered[2] at the billing meter.

POA_{Year} (kWh/m2) is the accumulated plane of array irradiation for the corresponding year, measured at the weather station installed at the System[3].

G_{STC} (kW/m2) is the irradiance in Standard Test Conditions with a value of 1kW/m^2.

$Power_{DC}$ (kW) is the aggregated DC power of the System according to the flash tests provided by the module manufacturer.

d (%) is the degradation factor with a value of 0.7% per year.

T_{CORR} (°C) = 1 + T_C x (T_{AVG} - T)

[2] From one Substantial Completion anniversary to the following Substantial Completion anniversary.

[3] The pyranometer to be used will be the one that recorded the higher annual plane of array irradiation for the corresponding year.

T_C (%/°C) is the voltage temperature correction factor for the module, from the module manufacturer's spec sheet.

T_{AVG} (°C) is the weighted average of the measured back of module temperature for each month of the year.

T (°C) is the weighted average of the predicted ambient temperature, from the PVSYST model, as it relates to the POA Irradiance.

9 Acceptance Criteria

The Guaranteed Performance Ratio will be successfully achieved if:

$$APR_{Year} \geq GPR$$

Where:

APR_{Year} (%) is the Actual Performance Ratio for the specific year.

GPR (%) is the Guaranteed Performance Ratio and its value is based on the Agreement PVsyst report. ([GUARANTEED PERCENTAGE]).

10 Underperformance Calculation for Performance Liquidated Damages

In the event that the Guaranteed Performance Ratio is not achieved for a given year, the Underperformance for that year or U_{Year} will be calculated as follows:

$$U_{Year} = GPR - APR_{Year}$$

Where:

U_{Year} (%) is the underperformance for the corresponding year.

APR_{Year} (%) is the Actual Performance Ratio for the specific year.

GPR (%) is the Guaranteed Performance Ratio and its value is based on the applicable PVsyst report included below ([GUARANTEED PERCENTAGE]).

11 Performance Liquidated Damages

If Actual Production is less than the Expected Production for a given year, annual Performance Liquidated Damages will be paid by Contractor to Owner based on such year's shortfall at the end of each year. Contractor shall pay Owner annual performance liquidated damages in the amount corresponding to the following formula:

$$PLD_{Year} = \frac{POA_{Year}}{G_{STC}} \times Power_{DC} \times (1 - d) \times U_{Year} \times PPA_{Year}$$

Where:

PLD_{Year} (USD) are the Performance Liquidated Damages for the specific year.

POA_{Year} (kWh/m2) is the accumulated plane of array irradiation for the corresponding year, measured at the weather station installed at the System[4].

G_{STC} (kW/m2) is the irradiance in Standard Test Conditions with a value of 1kW/m^2.

$Power_{DC}$ (kW) is the aggregated DC power of the System according to the flash tests provided by the module manufacturer.

U_{Year} (%) is the underperformance for the corresponding year, calculated applying the method defined above.

d (%) is the degradation factor with a value of [0.7%] per year.

PPA_{Year} (USD/kWh) is the price per kWh generated by the System for the corresponding year, with a value of [$0.18]/kWh and considering applicable escalation rates.

12 Buydown Liquidated Damages

After the end of year 2, if Contractor fails to achieve 100% or greater of the last year of Expected Production, Buydown Liquidated Damages will be paid by Contractor to Owner according to the following formula:

$$BLD = \sum_{n=1}^{N} \frac{Power_{DC} \times \frac{POA_{TMY}}{G_{STC}} \times (1-d) \times U \times PPA_{Year}}{(1+i)^n}$$

Where:

BLD(USD) are the Buydown Liquidated Damages.

N (years) is the remaining lifetime of the System, considering that the total lifetime of the System is 25 years.

n (dimensionless) from 1 to N.

$Power_{DC}$ (kW) is the aggregated DC power of the System according to the flash tests provided by the module manufacturer.

POA_{TMY} (kWh/m2) is the accumulated plane of array irradiation for the typical meteorological year, which is [ANNUAL IRRADIATION] kWh/m^2.

G_{STC} (kW/m2) is the irradiance in Standard Test Conditions with a value of 1kW/m^2.

[4] The pyranometer to be used will be the one that recorded the higher annual plane of array irradiation for the corresponding year.

U (%) is the underperformance for the last year Guaranteed Performance Ratio, calculated applying the method defined above.

d (%) is the degradation factor with a value of [0.7%] per year.

PPA_{Year} (USD/kWh) is the price per kWh generated by the System for the corresponding year, with a value of [$0.18/kWh] and considering applicable escalation rates.

i (%) is the discount rate which value is [6%.]

Buydown Liquidated Damages are applicable to the total lifetime of the System which is 25 years.

13 General Performance Conditions

Equipment required for normal operation of the System will be operated in automatic or manual modes, as applicable. Pyranometer domes are to be routinely cleaned to maintain accurate plane of array irradiance measurements. During the Warranty Period, Contractor and its Subcontractors will have access to operating data for purposes of monitoring and calculating performance.

14 Data Collection

Performance data may be logged by the System data acquisition system or by the control systems supplied with the equipment. All performance data will be maintained for future analysis. The following data is required to be recorded and maintained for each project:

1. 5 min interval measurements in *.csv format for each project:
    a. Energy from billing meter (at point of grid interconnection)
    b. Plane of array irradiance (for each pyranometer)
2. Records logged in the Data Acquisition System including operation data and event logs.
3. Billing meter invoices and reports.
4. Proof that Data Acquisition System is integrated with other business systems, e.g., billing invoices are consistent with energy metered.

15 Force Majeure

In the event of a Force Majeure Event as defined in the Agreement, the Actual Performance Ratio will be modified by removing the affected hours from the accumulated plane of array irradiation for the corresponding year.

16 Financial Security

Contractor shall post financial security for the Performance Guarantee in the form of a letter of credit.

17 Test Report

A written test report will document performance guarantee data, calculations, and results. The report will include the following items:

- Date and time of performance period start and finish

- Description of the operating conditions
- Weather station instrument calibration data
- Raw performance data from the data acquisition system
- Performance calculations
- Performance guarantee results
- Conclusions

21. Appendix K – Confidentiality and Non-Disclosure Agreement

CONFIDENTIALITY
AND NON-DISCLOSURE AGREEMENT

THIS CONFIDENTIALITY AND NON-DISCLOSURE AGREEMENT ("Agreement") is made effective as of the ___day of _____ 2016 by and between PORTLAND GENERAL ELECTRIC COMPANY ("PGE"), having its principal office at 121 SW Salmon Street, Portland, Oregon 97204 and _____("Counterparty"), having its principal office at

_____.

Throughout this Agreement PGE and Counterparty may sometimes be individually referred to as a "Party" and collectively as the "Parties."

WHEREAS, PGE is in the process of acquiring electricity resources to fulfill certain electricity resource needs; and

WHEREAS, PGE will issue a Request For Proposals ("RFP") to fulfill those resource needs; and

WHEREAS, the Parties desire to investigate the possibility of executing a transaction (the "Transaction") to meet some of those resource needs; and

WHEREAS, in order to pursue that possibility, PGE and Counterparty will provide to each other certain information which the providing Party considers to be proprietary and confidential.

NOW THEREFORE, the Parties agree as follows:

The disclosure of confidential information pursuant to this Agreement is subject to the following conditions and limitations:

1. As used herein, "Confidential Information" means all oral or written non-public, confidential or proprietary information given or otherwise delivered by one Party (hereinafter the "Disclosing Party") to the other Party (hereinafter the "Receiving Party"), designated in writing or stamped as "confidential" at the time of delivery to the Receiving Party or its directors, officers, employees, representatives, advisors, contractors or agents (collectively, "Representatives"), by the Disclosing Party or its Representatives, together with analyses, compilations, studies, notes or other documents prepared by the Receiving Party or its Representatives which contain or reflect Confidential Information. Confidential Information does not include information which (a) is, or becomes, publicly available, other than through the wrongful act of the Receiving Party; (b) was in the possession of the Receiving Party prior to receipt from the Disclosing Party, (c) is independently developed by the Receiving Party, provided that it was not derived from any Confidential Information received from the Disclosing Party, or (d) information that

was obtained by the Receiving Party from a third party who, insofar as is known to the Receiving Party, is not prohibited from transmitting the information by a contractual, legal or fiduciary obligation.

2. The term "person" as used in this Agreement, shall be interpreted broadly to include, without limitation, any corporation, company, entity, partnership, group, regulatory agency, or other governmental entity, or individual.

3. Except as otherwise required by law, rules or regulations, the Receiving Party agrees that it will, in the same manner as it protects its own confidential information, hold in trust and confidence and not disclose any Confidential Information to any person not authorized by this Agreement.

4. The Receiving Party will restrict access to Confidential Information to such of its Representatives who have a need to know as is reasonably necessary for the purposes described herein. Each such recipient of Confidential Information shall be informed by the Receiving Party of its confidential nature, and shall be directed to treat such information confidentially and shall agree to abide by the provisions of this Agreement. In any event, the Receiving Party shall be responsible for any breach of this Agreement by any person to whom it discloses Confidential Information, other than disclosures pursuant to paragraph 5 of this Agreement. PGE shall not be required to return any bids or exhibits supplied to PGE during the RFP process.

5. In the event that the Receiving Party is required by subpoena, oral deposition, interrogatories, request for production of documents, administrative order, process or otherwise, to disclose any Confidential Information, the Receiving Party shall give the Disclosing Party notice of same as soon as reasonably practicable so that the Disclosing Party may seek an appropriate protective order or waive compliance with the terms of this Agreement. If, in the absence of a protective order or waiver, the Receiving Party is compelled to disclose any Confidential Information, the Receiving Party may make such disclosure without any liability under this Agreement, and to the extent permissible, will give the Disclosing Party prior notice of such disclosure. Notwithstanding the foregoing, PGE may disclose Confidential Information pursuant to the following Protective Order (or other Protective Order(s) that may be issued by the OPUC in connection with the RFP or related proceedings): Order No. _____ dated _____ (as such Orders may be modified by the OPUC) under this paragraph 5. In addition, PGE may disclose Confidential Information to the Independent Evaluator retained by PGE for the RFP.

6. Counterparty agrees that PGE Confidential Information may not be used for any purpose other than in connection with the Transaction or as otherwise permitted by this Agreement. Counterparty acknowledges and agrees that PGE may, subject to the confidentiality provisions contained in this Agreement and the terms of any RFP documentation delivered by PGE to Counterparty, use its Confidential Information generally in the RFP process or related proceedings and in connection with the Transaction.

7. Receiving Party will maintain and comply with administrative, technical and physical safeguards that are designed to protect the security and integrity of the Confidential Information, including in connection with any transfer, communication, remote access or storage of the Confidential Information as permitted or required under this Agreement. Receiving Party will immediately notify the Disclosing Party of any unauthorized disclosure or use of the Disclosing Party's Confidential Information.

8. Neither Party is obligated by this Agreement to enter into any negotiations or any transaction. Each Party will bear its own costs and expenses, including legal fees and fees of any advisors and the costs incurred by it in the development of appropriate documentation with respect thereto. The Parties agree that no joint venture, partnership or other fiduciary relationship shall be deemed to exist or arise between them as a result of this Agreement.

9. Neither the Disclosing Party nor any of its Representatives make any representation or warranty, expressed or implied, as to the accuracy or completeness of the Confidential Information disclosed to the Receiving Party.

10. The Receiving Party understands and agrees that money damages would not be a sufficient remedy for any breach of this Agreement and that the Disclosing Party shall be entitled to injunctive relief as well as reimbursement by the Receiving Party for legal and other expenses as a remedy for any such breach, including expenses for any appeal therefrom or review thereof so long as the Disclosing Party prevails. Such remedy shall not be deemed to be the exclusive remedy for the breach of this Agreement but shall be in addition to all other remedies provided for hereunder.

11. **IN NO EVENT SHALL EITHER PARTY'S LIABILITY UNDER THIS AGREEMENT EXCEED ONE HUNDRED THOUSAND DOLLARS ($100,000), AND NEITHER PARTY SHALL BE LIABLE FOR UNDER THIS AGREEMENT FOR ANY SPECIAL, INCIDENTAL, INDIRECT OR CONSEQUENTIAL DAMAGES.**

12. In the event that any party institutes any legal suit, action or proceeding, including arbitration, against the other party to enforce the covenants contained in this Agreement, the prevailing party in the suit, action or proceeding shall be entitled to receive in addition to all other damages to which it may be entitled, the costs incurred by such party in conducting the suit, action or proceeding, including reasonable and actual attorneys' fees and expenses and court costs.

13. It is understood and agreed that no failure or delay in exercising any right, power or privilege hereunder shall operate as a waiver thereof, nor shall any single or partial exercise thereof preclude any other or further exercise thereof or the exercise of any right, power or privilege hereunder.

14. This Agreement constitutes the entire agreement of the Parties with respect to the matters contained herein, and supersedes all prior understandings or agreements, written

or oral, on these matters. No waiver or amendment of this Agreement shall be effective unless it is in writing and signed by both Parties.

15. The confidentiality obligations of this Agreement shall remain in effect for two (2) years from the date hereof.

16. This Agreement shall be governed by and construed under the laws of the State of Oregon without regard to its conflicts-of-laws or principles. With respect to any suit, action or proceedings relating to this Agreement (the "Proceedings"), each Party irrevocably submits to the exclusive jurisdiction of the courts of the State of Oregon and the United States District Court located in Multnomah County, Oregon and irrevocably waives any objection which it may have at any time to the laying of venue of any Proceedings brought in any such court, waives any claim that such Proceedings have been brought in an inconvenient forum and further waives the right to object, with respect to such Proceedings, that such court does not have jurisdiction over such Party. Nothing in this Agreement precludes either Party from enforcing in any jurisdiction any judgment, order or award obtained in any such court.

17. PGE AND COUNTERPARTY WAIVE ANY RIGHT TO TRIAL BY JURY OR TO HAVE A JURY PARTICIPATE IN RESOLVING ANY DISPUTE, WHETHER SOUNDING IN CONTRACT, TORT, OR OTHERWISE, BETWEEN PGE AND COUNTERPARTY ARISING OUT OF THIS AGREEMENT OR OTHER INSTRUMENT, DOCUMENT, OR AGREEMENT EXECUTED OR DELIVERED IN CONNECTION HEREWITH.

IN WITNESS WHEREOF, the Parties have executed this Agreement by and through their duly authorized representatives, effective as of the day first above written.

PORTLAND GENERAL ELECTRIC COMPANY	(COUNTERPARTY)
By:_____	By:_____
Name:_____	Name:_____
Title:_____	Title:_____

22. Appendix L – Credit Guidance

A Bidder must provide reasonable assurance to PGE that PGE will be able to readily recover its actual damages in the event of any default by the Bidder. PGE's customers should not be at risk for the cost of replacement power as a result of counterparty default during the life of the contract.

All transactions are contingent upon the Bidder meeting and maintaining the credit requirements established by PGE's Credit Risk Management Department:

- Bidder's or Bidder's credit support provider's (if any) long-term, senior unsecured debt, that is not supported by third-party credit enhancement, must be rated by one or more of the following agencies as follows: BBB- or higher by Standard & Poor's and Fitch, BBB (low) by DBRS, or Baa3 or higher by Moody's Investor Services, Inc. If the Bidder or Bidder's credit support provider is rated by more than one agency, PGE will consider the lowest rating.
- All Bidders will be subject to review under PGE's internal guidelines by PGE's Credit Risk Management Department for qualification.

In addition the Bidder must provide performance assurance in a form and amount acceptable to PGE based on PGE's assessment of the Bidder's and/or Guarantor's credit profile and the amount of expected financial exposure related to the bid. Power purchase agreement (PPA) options also include credit requirements.

Performance Assurance

The performance assurance will be held throughout the term of the contract. The performance assurance will take the form of one or more of the following:

a) Cash;

b) an irrevocable, transferable, standby letter of credit issued by a Qualified Institution in a form and substance acceptable to PGE;

c) payment and performance bond in a penal sum equal to 100% of the contract price issued by a Qualified Institution in a form and substance acceptable to PGE; and/or

d) a guaranty of the Bidder's payment and performance obligations from an entity with a credit rating on long-term, senior unsecured debt by one or more of the following agencies: BBB- or higher by Standard & Poor's and Fitch, BBB (low) by DBRS, or Baa3 or higher by Moody's Investor Services, Inc.

PGE may consider alternative forms of performance assurance if requested.

Any entity acting as a guarantor for the Bidder will be required to provide PGE with audited financial statements for the previous three years as well as its credit ratings. "Qualified Institution" means a major U.S. commercial bank or a U.S. branch office of a major foreign commercial bank which is acceptable to PGE, a trust company (which is not an affiliate of the Bidder) organized under the laws of the United States (or any state or political subdivision thereof) with such bank having shareholders' equity of at least $10 billion (U.S. Dollars) and a Credit Rating of at least A- by S&P or A1 by Moody's, or an insurance company with assets of $2 billion or greater, an A.M. Best financial strength rating of an A or greater and authorized to issue surety bonds in the state in which the project resides.

In the event the Bidder or its guarantor experiences a material adverse change (i.e., is no longer creditworthy as defined above or as defined in the negotiated contract) during the life of the contract, Bidder may be required to provide additional eligible performance assurance as defined above.

In the event the Bidder or its credit support provider is no longer creditworthy at any time prior to execution of a contract, a new credit support provider will be required to provide a replacement commitment as defined above.

Credit Requirements for Power Purchase Agreements

For long-term Power Purchase Agreements (PPA), PGE will require pre-COD (for facilities not yet constructed) and post-COD performance assurance to provide adequate protection if a default occurs after execution of the PPA, but prior to COD or after COD, during the PPA term. PGE requests that Bidders include the cost of adequate, acceptable performance assurance as part of their bid proposal as shown below and any departures from this credit amount need to be explicitly stated in the PPA term sheet at minimum with a mark-up of the Form PPA also strongly encouraged.

Timing	Performance Assurance
Pre-COD Amount	$25 / kW*
Post-COD Amount	18 months of estimated Facility revenue**

* The kW amount referred to is based on Expected Capacity.

**The estimated Facility revenue will be based on the Expected Facility Output and the Contract Price.

In the event of an alternate structure for long-term sale of energy and Renewable Energy Credits (RECs), PGE may consider implementing fluctuating performance assurance that represents an estimate of its exposure to rising energy prices and feasibly to the market cost of compliant RECs. This would be calculated by taking the difference of the current market forward price for power and RECs versus the contract price for both for the prompt three years, and multiplying this difference by the forecasted or firm megawatt hours for delivery over the same prompt three year period. The performance assurance requirement may be reduced by any credit threshold (see below) granted to Bidder by PGE. PGE calculates these exposures at least once a week. Below are three examples of calculated exposures showing just a forward price rise on an energy contract (RECs not shown; assuming 16 hours per day):

Annual MWa	Contract Days/Year	Contract Price $MWh	Market Forward Price $MWh	Performance Assurance Required (PAR)
PAR = MWa X Contract Days/Year X 16 hrs X (Mkt Price - Contract Price) X 3				
100	365	$ 29.40	$ 29.40	$ -
100	365	$ 29.40	$ 33.60	$ 7,358,400
100	365	$ 29.40	$ 37.80	$ 14,716,800

Potential Credit Threshold Provided by PGE

For some energy and REC sale structures (as mentioned above), Bidders may be eligible for a credit threshold amount. A Bidder that has a credit rating on long-term, senior unsecured debt by one or more of the following agencies: BBB- or higher by Standard & Poor's and Fitch, BBB (low) by DBRS, or Baa3 or higher by Moody's Investor Services, Inc. may be eligible for a credit threshold to be applied against the performance assurance. The table below provides a range of potential thresholds for which a Bidder may be eligible. These amounts may be increased or decreased by PGE Credit Risk Management based on other factors such as financial analyses, bid type and overall risk assessment.

	Credit Threshold (Estimated) Matrix			
	Range of Moody's Credit Rating			
Tangible Net Worth	**Aaa - A1**	**A2 - A3**	**Baa1 - Baa2**	**Baa3**
Up to $250M	1,000,000	500,000	250,000	125,000
$251M to $500M	1,650,000	825,000	412,500	206,250
$501M to $750M	2,500,000	1,250,000	625,000	312,500
$750M to $1B	7,500,000	3,750,000	1,875,000	937,500
$1B to $25B	10,000,000	5,000,000	2,500,000	1,250,000
$25 to $50B	15,000,000	7,500,000	3,750,000	1,875,000
Over $50B	20,000,000	10,000,000	5,000,000	2,500,000

If the Bidder or guarantor is an established counterparty of PGE, then the combined amounts of existing thresholds and the additional threshold will not exceed the above amounts, after any adjustments made by PGE Credit Risk Management.

Credit Threshold Provided to PGE

Any determination of credit threshold will consider (but is not limited to) factors such as company size, credit rating, bid type, and payment history.

Attachment 1

GUARANTY COMMITMENT LETTER

(Must be on letterhead of Bidder's credit support provider)

Portland General Electric Company
121 SW Salmon Street
3 World Trade Center - 0306
Portland, Oregon 97204
Attn: Credit Dept.

Dear Sirs:

_____, ("Bidder") (insert Bidder name) plans to submit a bid in response to the Portland General Electric Company's 2016 Renewable Resources Request For Proposals ("RFP"). Bidder is the _____ (insert nature of relationship, e.g., wholly owned subsidiary, affiliate, etc.) of the undersigned. The undersigned will directly benefit from the bid submitted by Bidder into the RFP. And the undersigned and Bidder have their own, separate legally enforceable arrangement with respect to the undersigned's promise set forth in this letter.

The undersigned promises and agrees that, should you enter into a transaction with Bidder arising out of any bid submitted by Bidder in the RFP, with terms and conditions mutually acceptable to you and Bidder, 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, plus expenses of enforcing the guaranty.

We understand that said guaranty is a required element in evaluating the Bidder's bid and that the execution and delivery of the guaranty is a condition precedent to you entering into an agreement with Bidder. We also understand that you are under no obligation to enter into any agreement with Bidder, under the RFP or otherwise.

Yours truly,

(Name of guarantor)
(Name of authorized officer)
Attachment 2

LETTER OF CREDIT COMMITMENT LETTER

(Must be on letterhead of Bidder's letter of credit issuer)

Portland General Electric Company
121 SW Salmon Street
3 World Trade Center - 0306
Portland, Oregon 97204
Attn: Credit Dept.

Dear Sirs:

_____, ("Bidder") (insert Bidder name) plans to submit a bid in response to the Portland General Electric Company's 2016 Renewable Resources Request For Proposals ("RFP"). The undersigned promises 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 said letter of credit is a required element in evaluating the Bidder's bid and that the execution and delivery of the letter of credit is a condition precedent to you entering into an agreement with Bidder. We also understand that you are under no obligation to enter into any agreement with Bidder, under the RFP or otherwise.

Yours truly,
(Name of letter of credit issuer)

23. Appendix M – Detailed Scoring Criteria

Bid Scoring Categories:	Max Score	% of Total Score	Description	Individual Categories	Maximum Scoring	
1. Price Score	600	60%	Includes fixed and variable bid costs compared to a market price. Will include integration service based on PGE wind integration study for those who do not provide integration services	The price score will be calculated as the ratio of the bid's projected total cost per MWh to forecast market prices using real-levelized or annuity methods (per Guideline 9a. of the Competitive Bidding Guidelines). See also 'Price Factor' in PGE's 2016 Request for Proposals - Renewable Energy Resources	600	
2. Project Development Criteria	150	15%	Includes development team experience, permitting	Project already in service	150	Projects in Service
				Permitting status (emissions, makeup water, waste discharge, land use, zoning, aviation, telecommunication)	50	Projects in Development
				Experience of Project Team	35	
				Project Financing	15	
				Site Control: Including all rights required for project including access to the project site, easements and resources rights appropriate for the project	50	
				Federal Tax Credit Eligibility & Capture Risk	-50	
3. Project Characteristics	120	12%	Interconnection, Transmission rights, Diversity	Resource Location	4	
				Interconnection Rights	30	
				Transmission Rights: Long Term Firm Transmission to PGE Load	30	
				Projects Subject to Curtailment and Dispatch Limitation	-10	
				Capacity Value of Project	20	
				Project and Geographic Diversity	-10	
				Value of extension (PPA/equity)	15	
				O&M Reliability Characteristics	12	For Biomass and Biogas
				Project Fuel Supply	9	
				O&M Reliability Characteristics	12	For Wind Geothermal Hydroelec
				Resource Risk (quality and amount of data for proposed project)	9	
4. Power Product Characteristics	80	8%	Quality of power, guarantees, length of contract	Quality of Power	10	
				Performance Guarantee / Liquidated Damages	15	
				Length of contract commitment	25	
				Contract/Resource start Date	15	
				Amount (in MWa) of contract commitment	15	
				Variability of Bid Cost	-30	
				Technological Maturity	-100	
5. Credit Evaluation (PPA)	50	5%	Collateral requirement, credit threshold, cross default	PGE proprietary financial scoring based on liquidity ratios, profitability ratios, leverage ratios and financial statement audit quality. The scores and weight given to each of the input will be consistent with PGE Credit Risk Management internal procedures.	50	Credit Evaluation will be based on proposed structure
6. Credit Evaluation (Equity)			This is only used for equity bids for projects still in construction. Score is based on counterparty's ratio and debt rating (mutually exclusive with 5. Credit Evaluation (PPA))	PGE ratio analysis score	17.5	
				Bond Rating	17.5	
				Net Tangible Worth	10	
				Liquidity	2.5	
				Corporate Structure	2.5	
Total Score	1,000	100%			1,000	

Note: Score weights for score deductions are shown at the maximum negative amount possible.

Summary
5/23/2016 4:16:54 PM

Differences exist between documents.

New Document:
PGE 2016 Renewable FINAL RFP Draft with appendices-20160523
583 pages (8.18 MB)
5/23/2016 4:14:54 PM
Used to display results.

Old Document:
PGE_2016 Renewable Full RFP OPUC 20160513
426 pages (3.86 MB)
5/23/2016 4:14:47 PM

Get started: first change is on page 1.

No pages were deleted

How to read this report

Highlight indicates a change.
~~**Deleted**~~ indicates deleted content.
 indicates pages were changed.
 indicates pages were moved.

Portland General Electric Company

REQUEST FOR PROPOSALS – DRAFT**

Renewable Energy Resources

****NOTE: PGE's final issuance of the 2016 Request for Proposals (RFP) for Renewable Energy Resources is subject to Oregon Public Utility Commission approval of both the draft RFP and the Petition for Partial Waiver of the Competitive Bidding Guidelines, including the expedited RFP timeline.**

May 23, 2016

Table of Contents

1. Purpose and Scope 1
2. RFP Schedule 4
3. Guidelines for Submitting Proposals 6
4. Bid Evaluation Process 10
5. Requested Power Products 11
6. Contract Terms and Conditions 15
7. Bid Pre-Qualifications 17
8. Criteria Used for Scoring Qualified Bids 21
9. Final Short List Determination 28
10. Post-Bid Negotiations 29
11. Appendix A – Power Purchase Agreement Term Sheet 30
12. Appendix B – 1 Engineering, Procurement and Construction (EPC) Term Sheet 38
13. Appendix B – 2 Asset Purchase Agreement (APA) Term Sheet 43
14. Appendix C – Wholesale Renewable Power Purchase Agreement 52
15. Appendix D – Asset Purchase Agreement 53
16. Appendix E – Engineering, Procurement and Construction Agreement 54
17. Appendix F – Required Bidder Profile 55
18. Appendix G – Required Bid Information 56
19. Appendix H – 1 Technical Specifications for Owned Wind Resources 75
20. Appendix H - 2 Technical Specifications for Owned Solar Resource 76
21. Appendix K – Confidentiality and Non-Disclosure Agreement 77
22. Appendix L – Credit Guidance 82
23. Appendix M – Detailed Scoring Criteria 89

Tables

Table 1: Summary of Requested Renewable Energy Products 11
Table 2. Evaluation Criteria for Renewable Energy Products 21

Figures

Figure 1. PGE Service Territory 3
Figure 2. Resource Selection Process 10

1 Purpose and Scope

Portland General Electric Company (PGE), an investor-owned electric utility in Oregon, is soliciting bids through this Request for Proposals (RFP) for the renewable electric energy products described below.

The timing of the RFP is intended to enable resources to capture the full value of the federal renewable electricity Production Tax Credit (PTC). However, PGE will accept proposals for all renewable energy resources that comply with Oregon's Renewable Portfolio Standard (RPS).

1.1 Resource Targets

PGE is seeking to acquire approximately 175 average megawatts (MWa)[1] of long-term utility-scale renewable energy supply, bundled with the associated renewable energy credits (RECs). PGE desires resources that provide the best combination of lowest cost and lowest risk for its customers. PGE will consider proposals based on a variety of structures and commercially viable resource types. Acceptable bids for renewable resources include power purchase agreements (PPA), as well as a range of ownership structures, including sales of existing assets, acquisition of project development or natural resource rights and options, and build-own-transfer agreements. PGE will not submit a benchmark proposal for the renewable RFP. PGE will evaluate and select new renewable energy supplies consistent with the criteria and methodology contained herein.

Renewable resources must meet the requirements of Oregon's RPS, as defined in Oregon Revised Statutes (ORS) Section 469A. These requirements are described in further detail in the Requested Power Products section below. Prospective Bidders are required to notify the IE no later than May 27, 2016 if they plan on bidding something other than wind, solar, biomass/biogas, geothermal or hydro. PGE will review any such proposals as to their suitability for meeting our renewable requirements. The Independent Evaluator (IE) can be contacted through the RFP website. Refer to the Technology section for additional information.

Notwithstanding the above preferred target, PGE reserves the right to vary from this target energy quantity based on evaluation of price and risk factors of received bids.

This competitive RFP is being conducted in accordance with the OPUC Competitive Bidding Guidelines set forth in Appendix A of OPUC Order 14-149 (Docket UM-1182), dated April 30, 2014. PGE has obtained a partial waiver of

[1] An average megawatt is a unit of energy equal to 8,760 MWh during a common year.

two of the Competitive Bidding Guidelines to support the timeline required for this RFP.[2]

Bidders are required to complete and sign a non-negotiable confidentiality agreement prior to the bid submission. This requirement is discussed further in the Submitting Confidentiality and Non-Disclosure Agreements section below.

1.2 About PGE

Headquartered in Portland, Oregon, PGE serves approximately 856,000 retail customers within a 4,000 square mile service territory (see Figure 1).

- Service territory population 1.8 million, about 46% of the state's population.
- Serves 52 cities, the largest being Portland and Salem.
- 27,000 miles of transmission and distribution lines.
- Net plant-in-service, $6.2 billion.
- Forecast average annual demand in 2015, approximately 2,500 MWa.
- One-in-two peak load in 2015, 3,914 MW.
- Generation assets including eight hydro generation facilities, five gas-fired thermal plants, the Biglow Canyon and Tucannon River wind farms, majority ownership of one coal-fired thermal plant, and joint ownership in two units of another coal plant facility. PGE also holds long-term contracts for energy from the Mid-Columbia hydroelectric projects on the Columbia River, two wind farms, and regularly enter into short and mid-term wholesale power supply contracts.

[2] As of May 13th, the Oregon Public Utility Commission had not approved PGE's request for a partial waiver of the Competitive Bidding Guidelines. The final RFP will reference the OPUC's order approving PGE's request. If the Commission does not approve PGE's request for partial waiver and the subsequent final RFP, PGE will not proceed with the proposed RFP.

Figure 1. PGE Service Territory

For more information, see PGE's Internet site: www.portlandgeneral.com.

1.3 Independent Evaluator

PGE has selected Accion Group as an independent, third-party evaluator (IE), to help ensure the RFP is conducted in accordance with the applicable OPUC Competitive Bidding Guidelines and that all bids are evaluated consistently and impartially. Accion Group will:

- Consult with PGE in preparing the RFP and submit its assessment of the final draft RFP to the OPUC when PGE files for RFP approval.
- Review final scoring and evaluation criteria that are consistent with the OPUC Competitive Bidding Guidelines and PGE's waiver request including review of "mock bids" to test the integrity of the evaluation models.
- IE will confer with OPUC staff in accordance with the Competitive Bidding Guidelines and any waivers thereof that may be granted by the OPUC.
- Independently score a sample of the bids to determine whether the selections for the initial and final short-lists are consistent with the bid evaluation criteria.
- Compare the results of the IE's scoring with PGE's scoring and work with PGE to reconcile and resolve scoring differences, if any.
- Prepare a Closing Report for the OPUC after PGE has selected the final short-list.
- In its Closing Report, provide its assessment of all aspects of the solicitation process and the IE's involvement, including detailed bid scoring and evaluation results, to PGE, non-bidding parties and the OPUC subject to the terms of the Protective Order.

2 RFP Schedule

The tentative schedule listed below may be revised as the RFP process unfolds:

- May 4, 2016 — Provide draft Renewable RFP to IE.
- By May 13, 2016 — Provide draft Renewable RFP to all interested parties.
- May 18, 2016 — Stakeholder and Bidder RFP workshop.
- May 23, 2016 — PGE submits final draft renewable RFP to OPUC for approval.
- May 23, 2016 — IE submits assessment of the final draft renewable RFP to OPUC.
- June 7, 2016 — OPUC to approve PGE draft RFP and Petition for Partial Waiver.
- June 8, 2016 — PGE issues final RFP.
- June 10, 2016 – Bidder workshop on final RFP.
- June 24, 2016 — RFP proposals from bidders due.
- July 15, 2016* — PGE selects final short list of bids.

- July 29, 2016* — IE issues final closing report to OPUC.
- July 29, 2016* — PGE submits application of shortlist to OPUC.
- September 16, 2016* – OPUC rules on acknowledgment of shortlist
- October 10, 2016* – Final contracts with winning bidders.
- November-December 2016 – PGE issues notice to proceed (if necessary).

** These dates are subject to change depending on the quantity and complexity of bids received. However, given the time-sensitive nature of this RFP, PGE will use best efforts in working with Bidders, stakeholders, the IE and the OPUC to achieve the milestones in this timeline.*

3 Guidelines for Submitting Proposals

This section describes the guidelines that parties submitting bids under this RFP (Bidders) must follow when submitting proposals.

3.1 Registration on PGE's RFP Website

PGE's RFP website, managed by the IE, is intended to be the platform for communication and bid materials between Bidders and PGE. All prospective Bidders, stakeholders, and other interested parties may register on PGE's RFP website at PortlandGeneralRFP.accionpower.com. The website is secure and password protected so that confidential information can be posted and exchanged via the site.

Other features of the site include:

- The ability to download all public RFP documents, including copies of this document and all related contracts, term sheets and appendices.
- An announcement board for posting of information for the public and Bidders.
- The capability for Bidders to anonymously post questions and comments that can be seen by all users.
- The ability to anonymously post comments regarding PGE's draft RFP documents.
- Confidential bid folders for each bid, for the retention and exchange of bid-specific data.
- Confidential evaluation folders for bid evaluation and retention of data for use during regulatory review.

3.2 Procedural and Commercial Questions

All correspondence regarding procedural questions, bid submissions and questions related to product characteristics, terms and conditions should be submitted to PGE's RFP website at PortlandGeneralRFP.accionpower.com. PGE, in consultation with the IE, as needed, will post answers to questions from Bidders, stakeholders, and other interested parties on the site. Registered users will be notified by e-mail when the "Q&A" section of this website is updated, and answers are posted to questions.

3.3 Submitting Bids

Bidders may submit bids responding to one or more of the renewable energy products (see the Requested Power Products section below). All bids must be submitted online using the bid form provided on the RFP website,

PortlandGeneralRFP.accionpower.com, no later than 12:00 p.m. Pacific Time on June 24, 2016.

Bidders may edit their online bid form until the bid submission deadline. At 12:00 p.m. Pacific Time on June 24, 2016, bid forms will be closed to edits, and will be considered to be final submissions. After this time, any bid forms not submitted will be de-activated, and the corresponding bid books will be closed.

3.4 Bid Fee

To help defray costs of the IE and encourage high quality proposals and qualified Bidders, each Bidder in this RFP must pay a non-refundable bid fee. The fee will be based on nameplate capacity at a cost of $100 per MW. Projects at, or in excess of 100 MW will pay $10,000. A bid 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, in-service date, and/or pricing structure for the same resource at the same location.

A proposal for a different resource, at a different site or using a different technology, will be considered a separate proposal and will be subject to a separate bid fee. If different bid sizes are proposed, the maximum size will be used in calculating the bid fee.

Fees are to be remitted via electronic funds transfer to PGE through the IE website. For purposes of assessing bid fees, the IE, in consultation with PGE, shall confirm whether a Bidder's submission constitutes one or more proposals based on the criteria described above.

3.5 Submitting a Confidentiality and Non-Disclosure Agreement

The Confidentiality and Non-Disclosure Agreement is available for completion at PortlandGeneralRFP.accionpower.com (and are included as Appendix K to this RFP). Bidders are required to complete and sign the confidentiality agreement prior to the bid submission deadline (12:00 PM on June 24, 2016). The confidentiality agreement is to be submitted to PGE through the IE website. Due to the need to establish uniform procedures that safeguard all confidential information, PGE will not be able to accept changes to the Confidentiality and Non-Disclosure Agreement.

PGE will treat any proprietary and confidential information contained in a bid, in a manner consistent with the terms of the Confidentiality and Nondisclosure Agreement and any Protective Orders issued by the OPUC, provided that such information is clearly identified by the Bidder on each confidential page as "Confidential" or "Confidential Information." Each Bidder must execute and return a copy of the Confidentiality and Nondisclosure Agreement, as soon as possible, but no later than the time of the submission of its bid or bids. *It is the*

Bidder's responsibility to indicate clearly in its proposal what materials and what pages it deems to be proprietary and confidential.

3.6 Validity of Price and Offer

By submitting a bid, the Bidder acknowledges and agrees that the terms of its proposal shall remain irrevocable for the earlier of 140 days after the bid responses are due or when PGE issues a written release of the bid at or before the time the short list is issued.

3.7 Bid Evaluation Criteria

Price comprises 60 percent of our evaluation criteria, reflecting PGE's desire and commitment to obtain the best possible value for our customers. Non-price factors comprise the other 40 percent and primarily reflect various performance risks and operational attributes of the bid proposals. Additional evaluation description is provided in the Criteria Used for Scoring Qualified Bids section of this document.

3.8 Reservation of Rights

This RFP is not, and shall not be construed to be, an offer by PGE. PGE is not bound to enter into negotiations or execute an agreement with, or purchase any products from, any Bidder as a result of this RFP. No rights shall be vested in any Bidder, individual or entity by virtue of its preparation to participate in, or its participation in, this RFP. No binding commitment shall arise on the part of PGE to any Bidder under this RFP until and unless the parties execute definitive agreements that become effective in accordance with their terms.

Each Bidder shall be solely responsible for all costs it incurs in preparing to participate in, participating in, or responding to this RFP.

The bids received will be evaluated and selected based on the information supplied by each Bidder pursuant to this RFP. PGE reserves the right to modify or withdraw from this RFP process, or modify the schedule and any provisions contained herein, for any reason. As part of our normal course of business, PGE conducts bilateral discussions with developers and other electric energy providers. PGE also reserves the right, consistent with the Competitive Bidding Guidelines, to make purchase commitments at any time to suppliers not participating in this RFP process.

PGE reserves to itself:

- The selection of final short-listed bids and the awarding of contracts, if any, in the exercise of its sole discretion.
- The right to short-list project capacity in excess of its anticipated final contractual amount to ensure sufficient back-up proposals are available should other bidders materially depart from their bid during the negotiation

phase. PGE anticipates short-listing a minimum of 150% of anticipated final contracted capacity.

- The right to reject any and all bids, and any portion of a specific bid for any reason.
- The right to waive any immaterial non-conformity in any bid received.
- The right to award a contract to a Bidder based on a combination of price and non-price factors, a quantitative and qualitative assessment of portfolio fit, and post-bid negotiations.

PGE shall have no obligation to provide a reason for rejecting a bid.

3.9 Document Retention

All bids and exhibits supplied to PGE during the RFP process will become the property of PGE. PGE will retain all bid materials supplied to it and pertinent information generated internally by it in connection with the RFP process in accordance with PGE's document retention policies.

4 Bid Evaluation Process

This section describes PGE's process for evaluating bids received in response to this RFP. For details about our scoring criteria, see the sections, "Bid Pre-Qualifications," and "Criteria Used for Scoring Qualified Bids," below.

4.1 Reviewing, Ranking and Selecting Bids

In selecting the RFP short list, PGE will use a first-price, sealed-bid format. Under this format, Bidders may not update pricing during the scoring and evaluation period. We will use the first prices provided by Bidders, in conjunction with the non-price factors to select our short list of candidates, as stated in more detail below, and then negotiate contract terms and conditions during post-bid negotiations. PGE will not submit a self-build proposal (Benchmark resource) for the renewable RFP. The scoring process is illustrated in Figure 2, below.

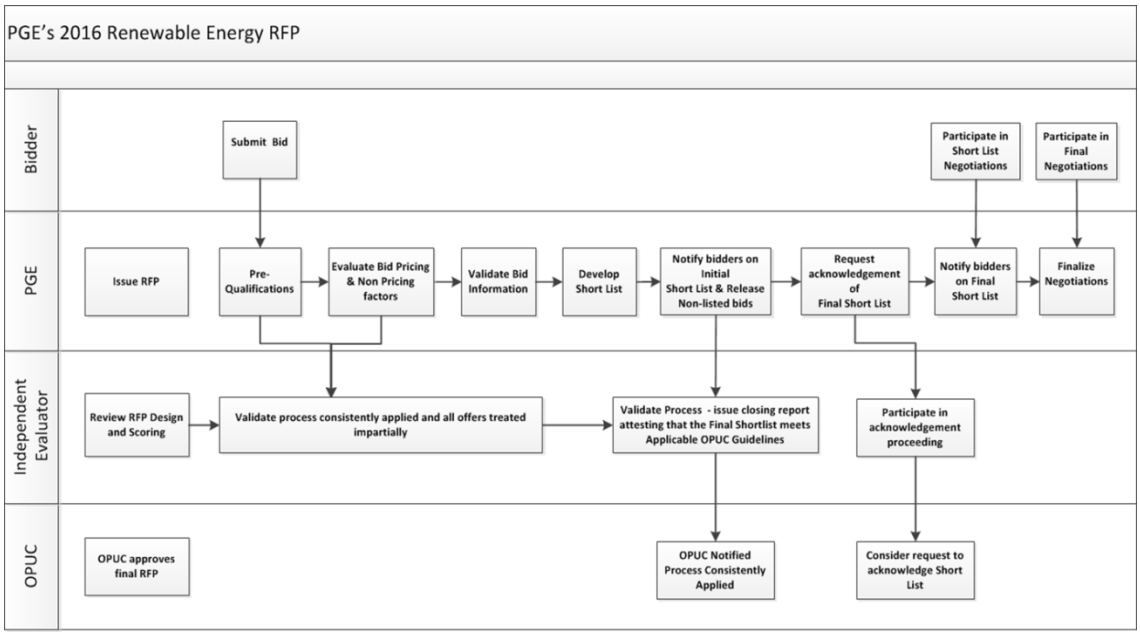

Figure 2. Resource Selection Process

Bids will be evaluated using a two-step process.

- *Assessment of Pre-Qualifications* – First, PGE will screen bids according to pre-established qualifying criteria, *i.e.*, minimum quantity and term, quality of credit, technology, and Bidder qualifications.
- *Evaluation of Scoring Factors* – Next, PGE will score bids that meet the pre-qualification standards. Overall scores will be comprised of price and non-price factors.

PGE reserves the right to request additional information regarding any proposal received.

5 Requested Power Products

PGE requests proposals for renewable electricity products, as described in this section, and this RFP.

Renewable resources must meet the requirements of Oregon's RPS, as defined in ORS 469A. In addition, renewable bids must include all environmental attributes, including Renewable Energy Certificates (RECs). Bidders will be responsible for ensuring RECs from projects are bundled as defined in ORS 469A.005. Owner will also be responsible to assure RECs are established through Western Renewable Energy Generation Information System (WREGIS) consistent with OAR 330-160-0020.

PGE is targeting approximately 175 MWa of renewable energy resources in this RFP, however, depending on bids received, we may also transact for more or less than the 175 MWa target. PGE recognizes that renewable resources can be developed in phases and will consider these proposals. PGE has expedited the RFP to enable capture of the PTC given its imminent planned decline. Preference will be given to RFP resources and bids that offer the ability to maximize cost savings to customers.

Table 1: Summary of Requested Renewable Energy Products

Product	**Capacity**	**Construction Start Date**		**Term**	
	Minimum	Preferred - No later than	No later than	Minimum	Target
Power Purchase Agreement	10 MW	Dec 2016	Dec 2018	10 years	20+ years
Ownership	10 MW	Dec 2016	Dec 2018	NA	NA

5.1 Renewable Electric Energy Products Requested

Physical Energy Purchase – PGE will consider proposals for the long-term purchase of renewable energy from an existing or to-be-constructed qualified renewable facility, with energy to be delivered to PGE's System (or load if the project is located within PGE's System). Renewable energy sold to PGE via a long-term agreement must be firm for the 15-minute scheduling intervals. Alternate firm proposals (i.e. hour ahead, day ahead, firm blocks, etc.) will also be considered if proposed. The minimum bid capacity under this RFP is 10 MW, and the minimum term duration is ten years. PGE will impute its cost for firming[3], regulation, or other ancillary services for integrating the power product beyond the 15-minute interval for purposes of bid evaluation.

For the purposes of this RFP, "firm" delivery means the only excuse for failure to deliver or receive is force majeure, as defined in the purchase agreement. Firm energy includes reserves and ancillary services to ensure that energy schedules are certain and delivered intact throughout the 15-minute interval.

Ownership Position in a Renewable Energy Resource – PGE will consider acquiring ownership positions in long-term renewable energy resources. Ownership proposals may include (but are not limited to) the sale of existing plants, acquisition of project development or natural resource rights and options, part ownership, and build-own-transfer agreements. We will also consider hybrid structures that include both an ownership component and a power purchase agreement (e.g. the sale of a phase or portion of a project with an off-take agreement for the remaining balance).

5.2 Point of Delivery and Transmission

PGE is electrically connected to both Bonneville Power Administration (BPA) and PacifiCorp. For Bidders with a project outside of PGE's System, it is the Bidders' responsibility to provide as part of the bid submittal a plan to obtain firm transmission from the resource to PGE's System. PGE's evaluation process will determine if there are additional costs or risks to deliver the resource from PGE System to PGE load.

Bidders proposing to interconnect a resource within PGE's system will need to include all incremental costs to deliver, or sink, energy from the resource to PGE's load. Bidders can determine these costs by requesting Network Resource Interconnection Service under PGE's Open Access Transmission Tariff (OATT) from PGE's Transmission and Reliability Services Department (T&RS) or a Bidder can request Energy Resource Interconnection Service and Point-to-Point Transmission Service under PGE's OATT from T&RS. Either process will enable T&RS to study whether any system upgrades are needed to accommodate transmission service for the bid. Questions concerning the

[3] Firming is provided to ensure that any deficiencies (or excesses) in the hourly actual generation compared to the scheduled energy will be made whole. For instance, if a project schedules 100 MWh but the actual production is 75 MWh, firming services will supply the 25 MWh not generated by the project.

various types of interconnection and transmission service available under PGE's OATT should be directed to T&RS. For price-scoring purposes PGE will assume no additional costs for system upgrades for bids delivering energy from outside of PGE's system to the BPAT.PGE POD with PGE Contiguous as the sink.

Secured transmission will not be a threshold determinant (submitting, at minimum a transmission plan, is a threshold requirement); however, if during the evaluation, PGE determines that the transmission proposal will be unable to achieve firm delivery to PGE's System, the proposal may be rejected. In addition, the status of firm delivery capability or rights to transmit the proposed energy supply to PGE's System, including status of participation in a BPA Transmission Service Expansion Project or satisfactory evidence of steps taken to perfect the rights to use firm transmission rights for delivery to PGE's System, will be the subject of negotiation and confirmation prior to execution of any contracts in connection with this RFP.

For the purposes of scoring bids in the RFP, "PGE System" shall be interpreted as the edge of the PGE Balancing Authority Area[4], excluding the PGE Balancing Authority Area boundaries surrounding PGE's Remote Resources.

"PGE System" includes the following:

- If a project is interconnected to BPA, PODs to PGE System may include:
- BPAT.PGE
  - PGE Contiguous
    - Pearl 230 kV (Sherwood)
    - McLoughlin 230 kV
    - Keeler 230 kV (St. Marys)
    - Rivergate 230 kV
  - Bethel 230 kV
  - Troutdale 230 kV (Blue Lake)
- If a project is interconnected to PAC, and delivering to PACW.PGE, PGE System PODs may include:
  - Bethel 230 kV
  - Gresham 230 kV
  - Linneman 230 kV

5.3 About the Term Sheets[5]

The term sheets in the appendices include material terms and conditions of the draft contracts. **Bidders are required to provide a complete and accurate mark up of these term sheets**.

[5] The term sheets attached in the appendices are drafts subject to revision before the final issuance of the RFP.

The term sheets are not intended to exclude alternative proposals for meeting PGE's renewable needs. If Bidders desire to propose an alternate structure, then a complete term sheet that mimics the formats provided must be submitted. Bids must include sufficient information for PGE to make a thorough evaluation of the proposals.

Failure to provide the term sheet as part of the proposal may result in PGE's rejection of the bid. As noted later, PGE strongly encourages submitting a redline mark-up of the applicable form agreement(s) in addition to the term sheet submittal.

6 Contract Terms and Conditions

6.1 Energy Purchase Agreement

The contract template for power purchases is included in Appendix C – Wholesale Renewable Power Purchase Agreement ("Form PPA"). The PPA term sheet is included in Appendix A. Bidders must review the Form PPA and PPA term sheet included in this RFP, and are required to include any proposed revisions to major contract terms by providing a redline mark up to the PPA term sheet. The full Form PPA has been provided as further reference for the term sheet and to provide the full and complete form contract associated with this transaction structure. To the extent Bidders have changes to the Form PPA, they are strongly encouraged as part of their response package to this RFP to submit a redline to the Form PPA in Appendix C as well. PGE will evaluate all proposed revisions, but is under no obligation to accept any revisions or adopt any changes. Changes, if any, to the terms and conditions of the term sheet and the Form PPA will be discussed with Bidders selected for final short list negotiations. PGE recognizes that alternative firm energy sale structures may be viable and Bidders proposing such alternatives must offer revisions to the PPA term sheet or propose a new term sheet. Bidders are also encouraged to mark up the Form PPA with the proposed changes.

6.2 Ownership Position in a Renewable Energy Resource

PGE invites Bidders to submit proposals for various types of asset sale and ownership transfer agreements. The contract templates are included in Appendix D and E – Asset Purchase Agreement ("Form APA") and Engineering Procurement and Construction Agreement ("Form EPC"). The APA and EPC term sheets are included in Appendix B. If Bidders have changes or detailed items to add to terms, they are required to redline the APA and EPC term sheets as part of their bid submittal. The Form APA and Form EPC have been provided as further reference for the term sheets and to provide the full and complete form contracts. To the extent Bidders have changes to the Form APA and/or Form EPC, they are strongly encouraged as part of their response package to provide redline changes to the Form APA and Form EPC. PGE recognizes that alternative ownership structures may be viable and invites Bidders proposing such alternatives to offer revisions of the terms or offer alternative terms and conditions to the extent necessary to reflect such alternative structures. Changes to terms and conditions and/or new terms and conditions will be discussed with Bidders selected for final short list negotiations.

Ownership proposals may include (but are not limited to) sales of existing assets, acquisition of project development or natural resource rights, build-own-transfer agreements or joint ownership. We will also consider hybrid structures that

include both an ownership component and a power purchase agreement (e.g. the sale of a phase or portion of a project with an off-take agreement for the remaining output).

Bidders submitting a proposal for either PGE ownership position or PPA will be required to provide, as part of their response package to this RFP, supporting information and documentation about the project.

7 Bid Pre-Qualifications

To be considered for evaluation, all proposals must meet the requirements specified below.

7.1 General

General pre-qualifications include minimum bid quantity, minimum bid bond, minimum bid term, Bidder credit qualifications and commercially viable technology.

7.1.1 Minimum Bid Quantity

The minimum bid amount is 10 MW. PGE has specified a low minimum bid size to encourage the submission of a variety of renewable bid technologies in this RFP. Renewable projects 10 MW or under may be eligible for PGE's Schedule 201 Qualifying Facilities Standard Contract Power Purchase Agreement. PGE is not accepting Schedule 201 Standard Contracts in this RFP. Entities wishing to enter into Schedule 201 Standard Contracts with PGE should contact Bruce True at 503-464-7491.

Qualifying Facilities (QFs) under the Public Utility Regulatory Policies Act of 1978, as amended, (PURPA) of 10 MW and above are welcome to bid into this RFP. However it should be noted that for this process, PGE's Schedule 202 will not apply to bidding QFs. Thus, QF bids in this RFP must include all associated environmental attributes, including but not limited to RECs; price will be based on the QF bid price, not PGE's Avoided Cost rates; and other Schedule 202 provisions, such as those concerning credit or transmission and scheduling will not apply. QFs, however, may still offer to sell to PGE outside the context of this RFP pursuant to Schedule 202.

7.1.2 Minimum Bid Bond

Upon bid submission, bidders that are of investment grade do not require a bid bond. Bidders who are not investment grade will need to show their ability to obtain a bid bond. A non-investment grade bidder can rely on a Qualified Institution to provide a Guaranty Commitment Letter, or, for PPAs, Letter of Credit Commitment Letter for ten percent of the project or PPA contract amount at the time of bid submission. Alternatively, Bidders may provide a bid bond or provide a cash deposit equal to 10 percent of the project, or PPA contract value upon bid submission.

Upon notification of final short list selection bidders are required to submit a bid bond executed by an entity acceptable to PGE and

authorized to issue such bond for not less than ten percent of the total bid price or total PPA contract value.

7.1.3 Minimum Bid Term

The minimum bid term is ten years.

7.1.4 Credit and Bidder Qualifications

All transactions are contingent upon the Bidder meeting and maintaining the credit requirements established by PGE's Credit Risk Management Department:

- Bidder's or Bidder's credit support provider's (if any) long-term, senior unsecured debt, that is not supported by third-party credit enhancement, must be rated by one or more of the following agencies as follows: BBB- or higher by Standard & Poor's and Fitch, BBB (low) by DBRS, or Baa3 or higher by Moody's Investor Services, Inc.
- If the Bidder or Bidder's credit support provider is rated by more than one agency, PGE will consider the lowest rating.
- All Bidders will be subject to review under PGE's internal guidelines by PGE's Credit Risk Management Department for qualification.

In addition, the Bidder must provide performance assurance in a form and amount acceptable to PGE based on PGE's assessment of the Bidder's and/or Guarantor's credit profile and the amount of expected financial exposure related to the bid (whether PPA or ownership), which may include one or more of the following: cash, a letter of credit, surety bond (payment and performance bond) or parental guarantee. Guidelines on PGE credit requirements are included in Appendix L.

7.1.5 Other Bidder Pre-qualification

As applicable, the Bidder must provide documentation, satisfactory to PGE, that it is authorized under the law to sell power, and able to schedule power and operate under industry standards established by the Federal Energy Regulatory Commission (FERC), Western Electricity Coordinating Council (WECC), and the North American Energy Reliability Council (NERC), or other applicable regulatory body or government agency.

7.2 For New Projects

7.2.1 Site Control and Commencement of Construction

Bidders must show site control (or clear evidence of ability to achieve site control) and other contractual terms that support the bids' Commercial Operation Date and, if considered in the pricing, a timeline to achieve the

associated federal tax benefit. Due to recently published Internal Revenue Service (IRS) guidance, preference is given to projects that can clearly demonstrate an ability to commence construction on or before December 31, 2016 but no later than December 31, 2018.

7.2.2 Technology

Proposals shall use utility-scale, commercially viable generation technology currently deployed in the western United States. For generation technologies that are not in common use by electric utilities, the Bidder shall identify utility-scale electric projects where the technology is already being used or provide documents describing the technology in reasonable detail. PGE will only consider bids that use widely deployed units with proven records of reliability and will provide its preferred equipment manufacturers as part of its technical specifications that will be attached as Appendix H to the RFP. PGE will not accept generation technology shown to have serial defects. Serial defects are considered to be a design or manufacturing problem that has affected 10% or more of the fleet. The Bidder shall specify the generation technology it proposes to use and provide preliminary design studies – completed in sufficient detail to identify all major equipment and components. Generation technology must comply with all current applicable Codes and Standards for a USA-based resource.

Bidders may contact the IE in the event that they are uncertain whether their choice of specific generation technology is acceptable to PGE. Such requests need to be received by the IE no later than May 27, 2016. PGE will review any such proposals as to their suitability for meeting our renewable energy requirements. The IE can be contacted through the RFP website. The notification should identify the manufacturer and model the Bidder intends to include in a bid.

The Bidder must provide a site layout plan and a project milestone schedule indicating critical path elements.

7.2.3 Suitability of Site

The Bidder must identify the project site location, show site control, and provide satisfactory evidence that the site is not otherwise committed or encumbered and is available for the full term of the proposed bid. The Bidder must have identified all required site-specific permits and have prepared a plan or schedule for obtaining all permits and licenses. For proposals to sell project development rights or lease options, the Bidder should identify any required permits and licenses that the Bidder has acquired or intends to acquire and those that PGE would be responsible to obtain. Although PGE will not make a threshold requirement to have

permits in-hand before signing a definitive agreement, PGE will assess the probability of successfully completing the permitting process as part of its evaluation. If at any point it is determined that a project cannot obtain the required permits as designed, PGE reserves the right to reject the bid.

Bidders must also provide enough information for PGE to assess the suitability of their site for the proposed project. The information should address permitting, annual and monthly energy projections (preferably from an independent source), site proposed layout, cost estimate from equipment manufacturer, and Engineering Procurement and Construction cost estimates.

For purposes of this RFP, PGE will not accept proposals that rely on PGE's assets (such as land and/or transmission rights). For example, Bidders must provide their own transmission rights as part of the bid package.

7.2.4 Fuel Supply (where applicable)

Bidder must demonstrate physical and commercial access to fuel supplies and fuel transportation for the term of the contract proposed in its bid. PGE will not accept bids for biomass or biogas projects that pass fuel risk to PGE because, among other things, unlike other fuel types (such as coal or natural gas), PGE does not have the ability to reasonably hedge biomass or biogas fuel costs.

8 Criteria Used for Scoring Qualified Bids

This section summarizes the criteria PGE will use to evaluate bids submitted in response to the RFP. The detailed scoring matrix will be disclosed to Bidders and other interested parties on the IE website. The following tables summarize these criteria. For details about information that should accompany each bid, see "Appendix F, Required Bidder Profile," and "Appendix G, Required Bidder Information."

Table 2. Evaluation Criteria for Renewable Energy Products

Factors	*Descriptions*	*Sub Total*	*Total*
Price Factors	Base prices adjusted for considerations described in the Price Factors section below.		60%
Non-Price Factors			
	Project Development ▪ Project financing ▪ Site control ▪ Developer experience ▪ Permitting status ▪ Environmental Factors ▪ Federal tax credit eligibility and capture risk	15%	
	Project Characteristics ▪ Fuel supply diversity ▪ Resource risk ▪ O&M reliability ▪ Project location ▪ Project and geographic diversity ▪ Curtailment and dispatch limitations ▪ Extension option or equity position	12%	
	Power Product Characteristics ▪ Performance guarantee and liquidated damages ▪ Amount (MW/h) ▪ Contract term ▪ Contract/Resource start date ▪ Variability of bid cost ▪ Technological Maturity	8%	
	Credit Factors	5%	
	Total Non-Price Factors:		40%
Total:			100%

8.1 Price Factors

Price represents a significant portion of the overall score. To evaluate bids containing different product characteristics on a comparable basis, prices submitted by the Bidder will be subject to adjustment for the following considerations:

- *Ancillary services, if not included in product pricing* – see discussion below.
- *Quality and firmness of energy.* – If the bid does not include integration for intermittent and non-dispatchable resources, we will estimate the cost and include it in our price analysis.
- *Generation output profile – i.e.* variable energy production vs. flat hourly market prices, etc.
- *Any other factor necessary to ensure bids are evaluated on a comparable basis.*

The price score will be calculated as the ratio of the bid's projected total cost per MWh to forecast market prices using real-levelized or annuity methods (per Guideline 9a. of the Competitive Bidding Guidelines).

PGE may require performance assurances in support of the Bidder's obligations, which may include one or more subordinate liens in combination with corporate guarantees, escrow accounts, cross-default thresholds, cash deposits, surety bond or letters of credit. Lower levels of performance assurances may be acceptable, if there are other compensating factors as determined by PGE in its sole discretion. PGE retains the right to adjust the bid price to include the cost to PGE of performance assurances, if the Bidder does not provide adequate performance assurance.

Point of Delivery (POD) – Applicable transmission service costs will be applied in order to capture the incremental cost of delivering energy to PGE's load. These costs include wheeling, losses, and required ancillary services as prescribed in applicable tariffs, as well as any incremental costs for transmission or distribution system improvements necessary to deliver the energy to PGE's load. However, for bids wherein the Bidder has the responsibility of securing and paying for point-to-point transmission services for delivery from the generation facility to the POD on PGE's system, no costs for those point-to-point services to PGE's system will be applied.

Ancillary Services – If ancillary services are not included in product pricing, power product bids for delivery to PGE System will, at a minimum, be adjusted to account for the following ancillary services (where applicable) to meet control area operations and transmission provider requirements:

- Operating and supplemental reserves
- Generation and energy imbalance
- Scheduling, system control and dispatch

- Reactive support and voltage control

Bidders shall provide a comprehensive list of all ancillary services they are planning to provide in delivering the power product to the point-of-delivery. To the extent that any of these required ancillary services are not being supplied by the Bidder, PGE will, for scoring purposes, adjust the price provided by the Bidder to reflect the cost of acquiring additional ancillary services required. We will use a cost estimate based on verifiable prices or regional standards whenever possible.

8.2 Non-Price Factors

8.2.1 Project Development

This category scores the likelihood that a project supporting a bid will be placed in commercial service. The evaluation criteria for this category generally address construction and development risks associated with the completion of projects that are not yet in commercial operation, and which are necessary to support bids. Plants that are already operating or are sufficiently advanced in construction may be deemed to earn the maximum possible score in this category.

For projects that are less advanced, we will consider the following criteria for scoring:

- Method and status of project financing
- Level of site control by developer
- Project team experience
- Status of required permits, licenses and environmental studies
- Status of equipment supply and engineering, procurement and construction (EPC) agreements
- Federal Tax Credit Eligibility and Capture Risk

8.2.2 Point of Delivery

Point-of-delivery (POD) is both a price and non-price factor. This category scores the risks associated with potential transmission constraints or curtailments in delivering the power from external PODs to PGE's load. When scoring for non-price factors, we will factor in the risks of transmission congestion.

The Pacific Northwest (PNW) transmission system currently has numerous constraints that can limit the firm delivery of power products for extended periods of time. The scoring process for this RFP assumes continuation of the status quo; however, PGE retains the right to adjust the delivery risk based upon the progress of any potential BPA Transmission System Expansion Project, other BPA transmission

expansion process, long term power transmission distribution factors, and available long term transfer capacity evaluations.

Interconnection and transmission service for projects using PGE's transmission system will be provided under the terms and conditions of PGE's federal Open Access Transmission Tariff (OATT), PGE's Generator Interconnection Guidelines, and all applicable orders and rules. Bidders should contact PGE's Transmission and Reliability Services Department at 503-464-7155 to discuss interconnection and transmission arrangements. Confirmation of firm delivery capability or rights to transmit the proposed energy supply to PGE's load will be required prior to execution of any contracts in connection with this RFP. Interconnection for QFs shall be governed by PURPA, applicable PGE tariffs, and applicable state orders and rules.

PGE's federal Open Access Transmission Tariff (OATT) is available at: https://www.oatioasis.com/PGE/PGEdocs/PGE-8_OATT.pdf

PGE's Generator Interconnection Guidelines are available at: https://www.oatioasis.com/PGE/PGEdocs/PGE_Gen_Requirements_(07-12-2013).pdf.

8.2.3 Physical Project Characteristics

This category captures the physical characteristic risks of the bid products. The evaluation criteria for this category generally address physical and operational risks associated with the production and delivery of power to PGE. Some of the characteristics that we will consider in our scoring are:

- Resource technological diversity– focused on the potential capacity value the project brings. This characteristic is intended to capture benefits offered by any diversity that the technology brings to PGE's supply portfolio.
- Point of delivery (as discussed above).
- Project location.
- Fuel supply diversity, resource risk and O&M reliability characteristics.
- Risk that the resource will not perform as expected (for variable and intermittent resources).
- Project life and extension options. Rights that allow PGE to extend the life of a resource beyond the initial term provide potential future risk mitigation. As a result, proposals that provide rights to long-

term access to the resource or energy supply will be scored higher than proposals that do not provide similar rights.
- Compliance with all applicable Codes & Standards.
- Fuel delivery.

Our non-price scoring criteria also values projects that provide benefits to Oregon and our local economy. The criteria include a benefit for location within Oregon, and a somewhat higher benefit for location within our service territory.

8.2.4 Power Product Characteristics

This category scores how well the bid product matches PGE's system operating needs. The evaluation criteria for this category generally address price risk, performance and supply portfolio concentration risks, along with the benefits of operational flexibility. Some of the characteristics that we will consider in our scoring are:

- Performance guarantees and compensation for failure to achieve them.
- Dispatchability
- Product flexibility
- Contract term
- Amount (MW per hour)
- Deviations from product term sheet.

8.2.5 Credit Evaluation

This category scores the creditworthiness of the Bidder. We will take into account the following credit considerations in our scoring:

- Debt and equity ratings
- Performance assurance
- Financial ratio analysis
- Default risk
- Credit concentration and liquidity
- Enforceability of contractual credit terms
- Evaluation of lawsuits and/or liens
- Bidder revisions to contract templates that may affect credit requirements

8.3 Additional Considerations for Renewable Resources

Physical Energy Purchases from Non-dispatchable, Variable Energy Resources – Integration costs represents the forecast error and generation firming services associated with a Variable Energy Resource (VER). Bids for energy from resources, such as wind, require integration services to ensure that the actual

minute-to-minute output of the resource throughout the 15-minute interval remains equal to its fixed, non-dynamic scheduled output for that same time period. Bidders have been asked to acquire integration services on their own behalf for the 15-minute interval. Details about these integration services and the cost of such services will be required as part of the bid. PGE may reject bids that do not include at minimum a 15-minute integration plan and the associated costs as part of the bid. PGE will impute its cost for firming, regulation, or other ancillary services for integrating the resource beyond the 15-minute interval for purposes of bid evaluation.

PGE will quantify the costs and benefits of the variability of each project separately. Price scoring will quantify the total energy of the project as bid and the value of the project's energy shape if the energy has not already been shaped to a flat output. Non-Price scoring will take into account annual availability and other variation in output of each project. Bidders may, in the interest of optimizing their bid, elect to provide pricing separately for optional components, such as shaping[6] and scheduling notice.

Another important element of integration services is the scheduling notice period. Longer notice periods provide load-serving entities higher supply certainty and reduced exposure to market risk by limiting reliance upon spot markets to absorb fluctuations in energy production. For the Non-Price scoring component, PGE prefers to know as far in advance as possible the amount of energy to be supplied in any given hour.

For clarity, a wind or other renewable resource directly interconnected into PGE's System will be assessed PGE's full integration cost (with current costs to be applied).

Additional weighting will be awarded as part of the Non-Price score to dispatchable products. Products which, after integration, provide a flat volume of power for all hours will be ranked second (when compared to dispatchable products) for non-price scoring purposes. However, we recognize that such certainty has an associated cost, and will score that as part of the price factor scoring. For example, we would expect the price of a product that is flat for all hours, *i.e.*, no variability, to be more expensive than a variable product provided with a 168-hour scheduling notice. Both of these products would likely be more expensive than one provided with a 24-hour scheduling notice. We expect the product with the combination of lowest price and the longest scheduling notice to achieve the highest overall score.

[6] Shaping is a service where actual generation is 'stored' either physically or financially and returned in a specific, predetermined shape.

Finally, PGE may consider bids proposing to deliver intermittent resources via dynamic transfer.

Production Tax Credit and Investment Tax Credit – Bidders should submit proposals that meet the most recent guidance to achieve the federal Production Tax Credit (PTC) and Investment Tax Credit for Solar (ITC) or advise of any exceptions. Bidders should make their assumptions for PTC and ITC clear.

9 Final Short List Determination

For the short list, PGE intends to include bids representing a minimum of 150% of the renewable energy requested in this RFP, subject to receipt of a sufficient quantity and quality of bids. Once the short list has been developed pursuant to the scoring criteria outlined above, PGE will refine bid evaluations in the following areas to determine the final short list:

Transmission - Explanations of transmission evaluations can be found in the section "Criteria Used for Scoring Qualified Bids". As stated above, PGE may adjust the delivery risk of external PODs based upon the progress of BPA's Transmission Service Expansion Process as may be appropriate at the time of the determination of the short list. PGE will perform a more detailed analysis of transmission for bids on the initial shortlist. Bids which do not provide for firm delivery capability or rights to transmit the proposed energy supply to PGE's load may be excluded from the final short list.

Review of capacity factor assumptions – PGE will contract with an independent third party expert to review capacity factor assumptions for intermittent resources.

Security for Performance Requirements – PGE will perform a detailed credit risk evaluation of all Bidders in the shortlist, and will refine performance assurance requirements during this stage. However, performance assurance will only be required at the execution of a definitive agreement with a successful Bidder.

Integration Costs – PGE will conduct further evaluation of integration and shaping costs. As stated earlier, PGE will input applicable costs from its wind integration study to all bids not providing integration services.

Impact to portfolio – PGE will also take overall system costs and risks into account in its selection of final short list bids.

10 Post-Bid Negotiations

PGE's goal is to conduct an efficient post-bid negotiation process. As part of this process, PGE requires comprehensive response to terms. A number of factors will be considered in the post-bid process to ensure an appropriate fit with our overall energy portfolio. These include performance risks, concentrations of risk, credit, response to contract terms, firmness of delivery, and fuel risk exposure. PGE will initiate negotiations with a short list of Bidders whose proposals rank highest in the evaluation process and whose proposed transactions, PGE believes in its sole discretion, offer value to PGE's energy supply portfolio for customers, and have a reasonable likelihood of being executed and performed.

The number of Bidders with whom negotiations will be held will depend upon the bids received, the size or quantity of the highest ranked bids as compared to our resource needs, the results of the scoring process, ability to access federal tax benefits and other factors described more fully in the sections "Bid Evaluation Process", "Criteria Used for Scoring Qualified Bids", and "Final Short List Determination." Selection for the final short-list and initiation of negotiations do not constitute a winning bid.

PGE shall have no obligation to enter into a definitive agreement with any Bidder to this RFP and, at its sole discretion, may terminate negotiations with any Bidder at any time without liability or obligation to any Bidder. Whether or not, and until, negotiations with Bidders produce final and fully executed contracts satisfactory to PGE for its resource targets under the RFP, PGE reserves the right to pursue any and all other resource options available to it.

11 Appendix A – Power Purchase Agreement Term Sheet

Term Sheet Mark Up Required for Bid

Wholesale Renewable Power Purchase Agreement (PPA) Term Sheet

Bidders are required as part of their RFP submission to review, comment upon and upload applicable term sheets for their transaction structures. Bidders are strongly encouraged to also upload a redline markup of the full PPA as part of their bid submissions. To the extent a Bidder fails to submit a redline of the Form PPA, PGE will deem the terms of the Form PPA to be accepted by the Bidder unless commented upon in the term sheet submission. Responses to the term sheets and applicable agreements will be considered as part of PGE's scoring process and evaluation of bids. This term sheet summarizes key terms of the PPA, but is not intended to provide an exhaustive summary of all contract provisions. Bidders should review the complete form of PPA, the terms of which shall control over this term sheet in the event of discrepancy.

Information shown as blank in the description area is where the Bidder is to provide exceptions to the terms in the Form PPA, if any, as part of its bid submission or in some cases the relevant information (i.e. Scheduled Commercial Operation Date, Expected Capacity) to support PGE's evaluation of the bid. If there is any difference between the submission on the Independent Evaluator [IE] website and this term sheet, the IE website will govern.

Term	Description (and area for Bidder Mark-Up)
Buyer (referred to as "PGE") (Introduction)	Portland General Electric Company (PGE)
Seller (Introduction)	
Commercial Operation (Section 1.1.12)	Commercial Operation is achieved when not less than the Required Capacity is fully operational and reliable and the Facility is fully interconnected, fully integrated, and synchronized with the Transmission System and certain specified events have occurred (see full description in 1.1.12): - Certificate from Licensed Professional Engineer - Start-up Testing complete; - Interconnection Facilities complete; certificate from Licensed Professional Engineer; - Transmission Provider confirmation of network resource interconnection service and required network upgrades are paid; - Transmission Provider confirmation of long-term, firm, point-to-point transmission service agreement with roll over rights for Energy delivery to the Delivery Point at no less than the Maximum Facility Delivery Rate; - Authorized officer certificate that Seller has obtained or entered into all Facility Documents (confidential or commercial terms may be redacted or omitted); - Opinion regarding Site provided;

	- All required Performance Assurance provided.
Contract Price (Section 1.1.14)	Please input proposal and any comments to term. Clarify if pricing is flat or escalating or if both options are presented. If escalating, please provide the annual escalation factor.
Expected Capacity (MW) (Section 1.1.38)	Please input proposal and comments to term (if any).
Expected Facility Output (MWh) (Section 1.1.39)	Please input proposal and comments to term (if any).
Required Capacity (Section 1.1.104)	Please input proposal and comments to term (if any).
Scheduled Commercial Operation Date (Section 1.1.109)	Please input proposal and comments to term (if any).
Term; Conditions Precedent (Section 2.1)	Please input any Seller Condition Precedents if applicable.
Test Energy (Definition and Section 2.2)	Test Energy is Energy from the Facility delivered to the Delivery Point before the Commercial Operation Date; it includes RECs and Capacity Rights associated with Facility Output. PGE will purchase Test Energy at 50% of the Contract Price.
Delivery Period (Section 2.3)	If Facility Output is equal to or greater than the Energy Scheduled and delivered to PGE at the Delivery Point, PGE will pay (i) the Contract Price for the quantity of Energy so Scheduled and delivered, and (ii) the REC Price Component only for RECs associated with Facility Output not Scheduled and delivered as Energy at the Delivery Point. If the Facility Output is less than the Energy Scheduled and delivered to PGE at the Delivery Point, PGE will pay to Seller (i) the Contract Price for the quantity of MWh equal to the Facility Output, and (ii) the relevant Transmission Provider's real time imbalance energy price index for the remaining MWh Scheduled and delivered at the Delivery Point.
Price Adjustment for Excess Output (Section 2.3.3)	In any Contract Year in which Facility Output exceeds 110% of Expected Output, the Contract Price for each MWh in excess of the Expected Output for the balance of such Contract Year will be [75%] of the price otherwise payable
Notice of Sale of Facility (Section 2.4)	If Seller or an Affiliate of Seller desire to sell the Facility during the Term, Seller will first notify PGE of its desire to sell the Facility. If PGE notifies Seller that it is interested in acquiring the Facility, the Parties shall engage in exclusive good faith negotiations to reach agreement for a period of 90 days thereafter.

[Option to Purchase/Option to Extend Term] (Section 2.5)	If a Bidder wishes to propose an end of Term or during Term option for PGE to purchase the Facility, or an option for PGE to extend the Term of the PPA, it should include its proposal here in its mark up of the Term Sheet.
Development and Construction of Facility (Section 3.1)	Seller is responsible for permitting, financing, construction of the Facility. *[Note: this provision will be deleted for an existing Facility.]*
Milestones (Section 3.1.7)	Seller is responsible for achieving each Milestone as of a specified date. Each Milestone will be extended on a day for day basis for any delay due solely to (i) PGE's delay in taking, or failure to take, any action required of it hereunder in breach of this Agreement, or (ii) an event of Force Majeure. If Seller fails to achieve a Milestone by the date specified, it is required to submit and implement a remedial action plan. If Seller fails to submit or timely implement the remedial plan, PGE reasonably concludes based on the report and proposed remedial action plan that the Facility is unlikely to achieve Commercial Operation on or before the Guaranteed Commercial Operation Date, a Seller Event of Default will be deemed to have occurred.
Delay Damages and Deficit Damages (Section 3.1.10)	If Commercial Operation is not achieved on or before the Scheduled Commercial Operation Date, Seller will pay Delay Damages from and after the Scheduled Commercial Operation Date up to the date that the Facility achieves Commercial Operation. If the Facility's Actual Capacity at Final Completion is less than the Expected Capacity, Seller will pay Deficit Damages.
Contract Termination Damages (Section 3.1.11)	If Seller does not achieve Commercial Operation on or before the Guaranteed Commercial Operation Date, PGE may terminate the PPA upon ten (10) Days notice to Seller, and Seller will pay Contract Termination Damages of $25 per kW of Expected Capacity in addition to all Delay Damages paid or payable.
Right of First Offer (Section 3.1.14)	If the PPA is terminated before the Commercial Operation Date, neither Seller nor Seller's Affiliates may sell, market or deliver any Product from the Facility to a party other than PGE for a period of two (2) years following the termination date the PPA, unless before selling or entering into an agreement to sell, Seller or Seller's Affiliates provides PGE with a written offer to sell the Product on terms and conditions materially similar to the terms and conditions contained in the PPA, and PGE fails to accept the offer within 45 days. With respect to any Expected Capacity that is not included in Actual Capacity upon Final Completion, neither Seller nor

	Seller's Affiliates may sell, market or deliver any Product from the Deficit Capacity to a party other than PGE for a period of two (2) years following Final Completion, unless before selling or agreeing to sell such Product , Seller or Seller's Affiliates provides PGE with a written offer to sell the Product on terms and conditions materially similar to the terms and conditions contained in the PPA, and PGE fails to accept the offer within 45 days.
Seller to Designate Third Party Forecasting and Scheduling Agents (Section 3.3.1)	At least 10 days before it begins to Schedule Test Energy, Seller will engage at its expense a third-party Scheduling Agent and a third-party forecasting agent (the "Forecasting Agent"), subject in each case to PGE's prior approval. The Scheduling Agent will perform Seller's pre-scheduling and Scheduling obligations based exclusively on forecasts supplied by the Forecasting Agent.
Transmission and Scheduling of Energy (Section 3.3)	Seller will arrange for, pay all costs of, and be responsible for Transmission Services relating to the transmission of the Facility Output generated by the Facility to and at the Delivery Point. Seller will designate at its expense a third-party entity reasonably acceptable to PGE to Schedule all Facility Output to the Delivery Point as firm energy in 15-minute intervals (firm at T-39) in accordance with applicable protocols, procedures and deadlines. Seller will obtain at its expense all integration and other services required to Schedule such Energy as firm in each 15-minute interval.
Measurement and Transfer of RECs (Section 3.4)	RECs will be deemed sold and delivered to PGE as they are produced and measured by the Facility Meter.
Output Guarantee (Section 3.5)	Seller will deliver an average quantity of Facility Output during each two-Contract Year Rolling Period equal to the sum of (i) 85% of the Expected Facility Output for the Rolling Period, less (ii) any quantities of Facility Output that were not delivered to the Facility Meter during periods constituting Seller Excused Minutes. If the average quantity of Facility Output delivered by the Facility during any Rolling Period is less than 50% of Expected Output, Seller will be in default under Section 5.1.8.
Curtailment (Section 3.7)	PGE will not be obligated to purchase, receive, pay for, or pay any damages associated with, Facility Output (or associated production tax credits or RECs) if such Facility Output (or associated production tax credits or RECs) is not delivered to the Delivery Point for any reason.
Force Majeure (Article 4)	Force Majeure means an event or circumstance that prevents one Party from performing its obligations to deliver or receive the Product under this Agreement, which event or circumstance was not anticipated as of the

	Effective Date, which is not within the reasonable control of, or the result of the negligence of, the Claiming Party, and which, by the exercise of due diligence, the Claiming Party is unable to overcome or avoid or cause to be avoided. If a Force Majeure event prevents a Party from performing its material obligations under the PPA for a period exceeding 180 consecutive days before the Commercial Operation Date or, after the Commercial Operation Date, for a period exceeding 240 consecutive days, then the Party not affected by the Force Majeure event may terminate the PPA.
Events of Default (Section 5.1)	
Declaration of an Early Termination Date and Calculation of Settlement Amounts (Section 5.2); Settlement Amount (Section 1.1.107)	The Gains or Losses resulting from the termination of this Agreement will be determined by calculating the amount that would be incurred or realized to replace or to provide the economic equivalent of the remaining payments or deliveries in respect of this Agreement. The Gains or Losses shall be calculated for a period equal to the remaining Term. Settlement Amount means the Losses or Gains, and Costs, that the Non-Defaulting Party incurs as a result of the termination of the PPA. If the Non-Defaulting Party's Costs and Losses exceed its Gains, then the Settlement Amount sis an amount owing to the Non-Defaulting Party. If the Non-Defaulting Party's Gains exceed its Costs and Losses, then the Settlement Amount is zero dollars ($0).
Post-Termination PURPA Status (Section 5.8)	If the PPA is terminated for Seller's default, neither Seller nor any Affiliate or successor may thereafter require or seek to require PGE to make any purchases from the Facility or any electric generation facility constructed on the Site under PURPA, or any other Law, for any periods that would have been within the Term had the PPA remained in effect.
Remedy for Seller's Failure to Deliver (Section 6.1)	If Seller fails to Schedule and/or deliver all or part of the Product, and such failure is not excused under the PPA, Seller will pay PGE within five (5) Business Days of invoice, an amount for such deficiency equal to the positive difference, if any, obtained by subtracting the Contract Price from the Replacement Price. Persistent or repeated failure to deliver is a default under Section 5.1.4.
Remedy for PGE's Failure to Receive (Section 6.2)	If PGE fails to receive all or part of the Product Scheduled and such failure is not excused, then PGE swill pay Seller an amount for such deficiency equal to the positive difference,

	if any, obtained by subtracting the Sales Price from the Contract Price associated with the amount of such Product. Persistent or repeated failure to receive is a default under Section 5.1.4.
Pre-COD Security (Section 9.1)	Seller will post and maintain Performance Assurance (guaranty, letter of credit or cash) in favor of PGE, equal in each case to $25 per kW of Expected Capacity. Amount is equivalent to $_____. Please input proposal and any comments to term (if any).
Delivery Period Security (Section 9.2)	Seller will post and maintain Performance Assurance as Delivery Period Security in an amount sufficient to provide replacement power and corresponding RECs for the next 18 calendar months of revenue. Amount is equivalent to $_____. Please input proposal and any comments to term (if any).
Representations and Warranties; Indemnity (Article 12)	
Dispute Resolution [Article 18]	In the event of a dispute related to the PPA, the parties will first address the dispute through mediation by their senior officers. If the dispute is not resolved by the senior officers, it will be submitted for mediation before a single mediator in accordance with the Commercial Mediation Procedures of the American Arbitration Association. All mediation will take place in Portland, Oregon. All aspects of the mediation will be treated as confidential information. Each party is responsible for its own expenses and 50% of any mediation expenses. If the dispute is not resolved through mediation, the parties consent to the exclusive jurisdiction of the courts of Oregon located in Portland or the courts of the U.S. for the District of Oregon having subject matter jurisdiction. Each party waives all rights to trial by jury. The prevailing party in any proceeding is entitled to receive the costs and expenses incurred by the prevailing party. The above provisions survive termination of the PPA.
Governing Law [Article 16]	State of Oregon

ADDITIONAL TERMS THAT BIDDER WOULD LIKE TO COMMENT UPON (IF NOT LISTED ABOVE)	
Term	**Description (and area for Bidder Mark-Up)**

12 Appendix B-1 – Engineering, Procurement and Construction (EPC) Term Sheet

Term Sheet Mark Up Required for Bid

Engineering, Procurement and Construction Agreement (EPC) Term Sheet

Bidders are required as part of their RFP submission to review, comment upon and upload applicable term sheets for their transaction structures. Bidders are strongly encouraged to also upload a redline markup of the full EPC as part of their bid submissions. Responses to the term sheets and applicable agreements will be considered as part of PGE's scoring process and evaluation of bids. This term sheet summarizes key terms of the EPC, but is not intended to provide an exhaustive summary of all contract provisions. Bidders should review the complete form of agreement, the terms of which shall control over this term sheet in the event of discrepancy.

Information shown as blank in the description area is to be provided by Bidder as part of its bid submission. It can also be entered here. If any difference between the submission on the Independent Evaluator (IE) website and this term sheet, the IE website shall govern.

Term	Description (and area for Bidder Mark-Up)
Contractor Scope of Work ["Scope of Work" and Exhibit A]	Exhibit A to be developed based on bidder's proposal with major equipment to be specified by manufacturer and model and a detailed explanation of engineering concepts, design and operational requirements. Work to include start-up and testing with performance test requirements and guaranteed performance to be specified in exhibits to be developed based on selected technology. Equipment delivery schedules, transportation and logistical details, and warranty provisions for major equipment to be developed and approved. Real property requirements to be identified and complied with.
Project Schedule [Section 2.5.2]	Contractor to submit a project schedule as an exhibit and update monthly in progress reports. Contractor to conduct weekly project meetings.
Credit Support [Section 2.12]	Contractor to provide adequate credit support for contractual obligations by way of a combination of payment and performance bonds, letter of credit and corporate guarantee.
Subcontractors [Article III]	Major Subcontractors to be pre-approved; subcontracts to contain certain provisions, including PGE's right to take assignment by written notice upon contractor termination.
Contract Price [Article IV]	To be expressed in a milestone payment schedule and paid based on project progress. Contract Price to include all applicable taxes. Ten percent retainage to be released after substantial completion, subject

	to punch list holdback. Undisputed amounts to be paid within 45 days after receipt of monthly invoices with proper documentation. Overdue amounts accrue interest at the rate of prime plus 2.0%.
Owner Responsibilities [Article V]	Owner to secure site access in accordance with real estate rights and shall be responsible for permits as listed that are required to be in Owner's name (but Contractor to provide assistance reasonably requested by Owner in connection with Owner's efforts to obtain and maintain permits).
Mechanical and Substantial Completion Requirements [Sections 6.2 and 6.3]	Mechanical Completion requirements to be established based on selected technology. Substantial Completion requirements to include completion of all work, other than punch list work, correction of known defects, achievement of all performance guarantees or payment of applicable performance LDs, payment of any delay LDs, delivery of spare parts, furnishing of permits, lien waivers, and other required submittals.
Liquidated Damages [Sections 6.1.1, 6.1.2 and 6.6.1]	Commencement of Construction Liquidated Damages to be in an amount and with timing as needed to support bidder's tax credit assumptions and Owner's risk of loss of tax credits back-to-back. Performance testing and Performance LDs to be established based on selected technology and in an amount as necessary to make Owner whole for economic consequences of performance shortfalls. Delay LDs at Substantial Completion to be established in an amount as necessary to make Owner whole for late completion, subject to a cap equal to a specified percentage of the Purchase Price.
Warranty [Article VII]	Bidders to specify the length of the warranty period, which should be no less than two years. Warranty to cover all Work defects, non-conformance with requirements, workmanlike services, compliance with law, standards and specifications, and non-infringement. Contractor to bear all costs and expenses associated with warranty services, including costs of transportation, disassembly, removal, replacement, reassembly, reinstallation, and retesting. Contractor to enforce subcontractor and equipment warranties during the warranty term and assign any unexpired equipment and subcontractor warranties to Owner at end of warranty period. Major equipment to be covered with long-term warranties consistent with best market terms for selected technology.
Force Majeure and Owner Caused Delay	Schedule and specified cost relief for Force Majeure Events affecting the Contractor's Work, subject to mitigation, notice, and

[Article VIII]	documentation requirements. Schedule and specified cost relief for Owner Caused Delay affecting the Contractor's Work, subject to mitigation, notice, and documentation requirements.
Changes [Article IX]	Process for owner-initiated, contractor-initiated and required changes. Schedule and specified cost relief for required changes (events of force majeure, Owner's suspension of the Work, Owner-caused delays, Unforeseen Site Conditions and pre-existing hazardous materials).
Indemnification [Article X]	Mutual indemnification with provisions for claims arising out of negligence and to the extent caused by comparative negligence. Contractor responsible to indemnify for claims and damages including those arising out of personal injury and property damages caused by Contractor, violations of law, defective work and warranty claims, liens and claims from subcontractors, intellectual property claims, and cancellation and invalidation of insurance.
Insurance [Article XI]	Insurance program to be established based on project specifics, as necessary to protect Owner's insurable interests. To be included as an exhibit.
Default, Termination, Suspension [Article XII]	Contractor events of default include bankruptcy, insolvency, failure to pay amounts due to Owner, breach of representations, failure to adhere to recovery plan, hitting LD caps, unapproved transfer or assignment, and failure to obtain and maintain insurance and credit support. Owner default event for non-payment of undisputed amounts following notice. Owner may terminate for cause upon contractor default or for convenience. Contractor may terminate for Owner default. Termination payment to include all amounts due to Contractor and for termination damages. Owner has a "cover" remedy in the event of Contractor default termination with option to take over and complete the project. Owner may suspend Work, subject to change order for additional costs and delay.
Title and Risk of Loss [Article XIII]	Title passes at earlier of payment or delivery of equipment to Project Site.

	Risk of Loss passes at substantial completion.
Disputes [Article XIV]	Three step process; negotiation, mediation, litigation. Oregon law applies with hearings to be conducted in Portland. Attorneys' fees recoverable by the prevailing party.
Reps and Warranties [Article XV]	Typical reciprocal representations and warranties.
Confidentiality [Article XVI]	Five year confidentiality requirement, subject to standard permitted disclosures. Publicity and press releases to be coordinated and mutually approved.
Limits of Liability [Sections 16.2 and 16.2]	Consequential damages waived. Contractor's liability capped at 100% of the contract price, except with respect to liability arising out of negligence, fraud, willful misconduct, illegal acts, indemnification obligations, warranty claims, taxes, project substantial completion and no cap on insurance.
Post-COD Operation and Maintenance and Performance Assurance	Bidders should outline a proposed long term service strategy that is appropriate to the technology and addresses PGE's need for performance assurances after the facility is placed in operation
ADDITIONAL TERMS THAT BIDDER WOULD LIKE TO COMMENT UPON (IF NOT LISTED ABOVE)	
Term	**Description (and area for Bidder Mark-Up)**

13 Appendix B-2 Asset Purchase Agreement (APA) Term Sheet

Term Sheet Mark Up Required for Bid

Asset Purchase Agreement [APA] Term Sheet

Bidders are required as part of their RFP submission to review, comment upon and upload applicable term sheets for their transaction structures. Bidders are strongly encouraged to also upload a redline markup of the full APA as part of their bid submissions. To the extent a Bidder fails to submit a redline of the Form APA, PGE will deem the terms of the Form APA to be accepted by the Bidder unless commented upon in the term sheet submission. Responses to the term sheets and applicable agreements will be considered as part of PGE's scoring process and evaluation of bids. This term sheet summarizes key terms of the APA, but is not intended to provide an exhaustive summary of all contract provisions. Bidders should review the complete form of APA, the terms of which shall control over this term sheet in the event of discrepancy.

Information shown as blank in the description area is to be provided by Bidder as part of its bid submission (see also required information on the website). If there is any difference between the submission on the Independent Evaluator [IE] website and this term sheet, the IE website will govern.

Term	Description and Area for Bidder Proposals
Buyer (referred to as "PGE") [Introduction]	Portland General Electric Company
Seller [Introduction]	
Project Description and Assets ["Project" and "Project Assets"]	Note: Bidders are advised that this form of APA was drafted contemplating the purchase of a development stage project that would not be constructed as of the effective date of the APA.
Purchase Price & Payment Terms [Section 2.3]	
PGE Conditions Precedent [Section 3.2]	PGE will not be obligated to close the transaction unless each of the following conditions has been met: 1. Receipt of all third-party consents required in connection with the transaction, and all required regulatory approvals.

	2. Receipt of Seller's officer's certificate, FIRPTA certificate, UCC search reports, assignment to PGE of each contract and real property interest, and an estoppel letter from each counterparty to each contract. 3. Seller's representations and warranties are true and correct as of the effective date and the closing date, and Seller has performed all of its obligations under the APA. 4. There is no current or threatened litigation that could (a) affect the closing, Seller, the project, or the project assets, or (b) challenge any permit. 5. There is no material adverse effect with respect to Seller, the project, or the project assets. 6. PGE has completed its due diligence review to its satisfaction. Note: PGE may require additional project-specific conditions precedent based on the nature and state of development of the project. Such conditions may include, but are not limited to, delivery of a title insurance policy, survey, permits, and environmental reports.
Seller Conditions Precedent [Section 3.3]	Seller will not be obligated to close the transaction unless each of the following conditions has been met: 1. PGE's representations and warranties are true and correct as of the effective date and the closing date, and PGE has performed its obligations under the APA. 2. There is no current or threatened litigation that could affect the closing. 3. Receipt of all required regulatory approvals.
Termination [Section 3.4]	Note: This section can be omitted for any transaction that contemplates a simultaneous signing and closing. The APA may be terminated by (a) mutual written consent, (b) PGE if the closing has not occurred by [_____], or (c) either party for breach or default with a 30-day cure period. The parties' obligations under Article 7 (Confidential Information) will survive for two years from and after the date of termination.
Representations and Warranties of Seller [Article 5]	Seller will represent and warrant the following are true and correct as of the effective date and as of the closing date, as applicable: 1. Seller is validly organized and has the authority to consummate the transaction. 2. There is no current or threatened litigation against Seller. 3. There are no conflicts or violations caused by Seller's consummation of the transaction. 4. No third-party consents are required to consummate the

	transaction other than those listed by Seller. 5. Seller has valid title to all project assets, free of liens. 6. The project assets transferred by Seller to PGE will constitute a complete project, other than as listed on a schedule of exceptions. 7. The real property scheduled by Seller comprises all property interests and rights necessary to own, operate, and maintain the project, and provide legal and practical ingress and egress rights. Each real property agreement is valid and binding and in full force and effect and will continue to be so after the closing. There is no breach or default under the agreements, disputes or repudiations of the agreements, or transfers of the agreements by Seller. No other payments are required for real property interests. 8. All tax returns have been filed, taxes paid, and tax liabilities recorded. There are no tax-related disputes pending or threatened. No tax return has been subject to examination or audit. Neither the project nor project assets constitute tax-exempt bond financed property or tax-exempt use property. None of Seller or its affiliates have applied for, claimed, or received a cash grant, production tax credit, or investment tax credit. At least 80% of the project assets constitute "new Section 38 property." Neither the project nor the project assets have been placed in service. Either (a) the project is a "qualified facility" that produces electricity using "qualified energy resources," (b) the project assets are "energy property," (c) the project assets are "qualified property" or a "qualified investment credit facility," or (d) the project assets are "specific energy property." Financial projections for the amount of depreciation deductions, tax credit, or grants are fair representations. Seller is not a "foreign person." There are no liens for unpaid taxes. 9. Seller has scheduled all project contracts, and each such contract is valid and binding and in full force and effect, and will remain so after the closing. There is no breach or default under any contract. 10. Neither Seller nor its affiliates have transferred, agreed to transfer, or granted rights to purchase energy or environmental attributes related to the electric power to be generated by the project after the closing. 11. Seller is in compliance with all applicable laws, including environmental laws, and there is no action pending or threatened against Seller for failure to comply. 12. All analyses in relation to the site, project assets, and real property interests have been delivered to PGE. 13. Seller has obtained all permits required for PGE to own, operate, and maintain the project. 14. Seller is solvent and has sufficient assets and capital to carry

	on its business as now conducted and to perform its obligations under the APA. 15. Seller has the right to use and transfer to PGE all intellectual property rights used in connection with the project assets. 16. Seller's representations and warranties contain no untrue statement of material fact, and omit no material fact necessary to make the representations and warranties not materially misleading. Note: PGE may require additional representations and warranties based on the nature and state of development of the project.
Confidential Information [Article 7]	Seller will not use, publish, disseminate, describe, or otherwise disclose any PGE confidential information without PGE's prior written consent. PGE confidential information includes all information provided by PGE to Seller and identified by PGE as confidential, and all information provided by PGE to Seller with respect to the project or the transaction. After the closing, PGE confidential information will include any information that is a project asset. PGE confidential information may be disclosed if required by a governmental authority, court, or law, but such information must be submitted under all applicable provision for confidential treatment and Seller must give PGE written notice promptly after such disclosure is required to allow PGE to take whatever action appropriate to prohibit such disclosure. Seller will not use any PGE confidential Information except in connection with the transaction. For breach, PGE is entitled to injunctive relief, in addition to any other remedy available at law or in equity. PGE will not use, publish, disseminate, describe, or otherwise disclose any Seller confidential information without Seller's prior written consent. Seller confidential information includes all information provided by Seller to PGE and identified by Seller as confidential, and all information provided by Seller to PGE with respect to the project or the transaction. Seller confidential information may be disclosed if required by a governmental authority, court, or law, or to the OPUC or independent evaluator retained by PGE and approved by OPUC, but such information must be submitted under all applicable provision for confidential treatment and PGE must give Seller written notice promptly after such disclosure is required to allow Seller to take whatever action appropriate to prohibit such disclosure. PGE will not use any Seller confidential Information except in connection with the transaction. For breach, Seller is entitled to injunctive relief, in addition to any other remedy available at law or in equity.
Covenants of PGE and Seller [Article 8]	Note: This section can be omitted for any transaction that contemplates a simultaneous signing and closing.

	During the period between the execution of the APA and the closing of the transaction, Seller will do the following: 1. Seller will continue to operate the project and conduct its business in the ordinary course of business. 2. Seller will maintain and keep the project and project assets in a condition as good as at the effective date. 3. Seller will maintain relationships with landowners and suppliers. 4. Seller will maintain the permits and comply with applicable law. 5. Seller will perform and comply with all contracts, real property agreements, and permits, and Seller will not amend any of the above, and Seller will not enter into any new contracts, real property agreements, or permits. 6. Seller will continue development of the project with the approval of PGE. 7. Seller will not transfer or lease any project assets. 8. Seller will not place in service the project or project assets. 9. Seller will not claim any tax credit or grant. 10. Seller will not permit the project or project assets to become tax-exempt bond financed property or tax-exempt use property. 11. Seller will not take any action that would preclude the project or project assets from being classified in the hands of PGE as "qualified energy resources" and "qualified facilities," "energy property," "qualified property" or a "qualified investment credit facility," or "specified energy property." 12. Seller will not solicit, initiate, encourage, entertain, make, or accept offers with respect to the sale of the project or project assets. 13. Seller will grant PGE reasonable access to the site, project, personnel, and books and records to allow PGE to perform its due diligence review. 14. Seller will promptly amend the schedules to the APA if necessary and notify PGE of any conditions that could have a material adverse effect.
Survival Periods [Sections 9.1 and 9.2]	All representations, warranties, and related indemnification obligations survive the closing for 24 months, with the following exceptions: 1. Sections 5.1 and 6.1 (Organization and Authority) and Section 5.7 (Project Assets) survive termination of the APA indefinitely. 2. Section 5.9 (Tax Matters) and Section 5.12 (Environmental Laws) survive the closing until the expiration of the applicable statute of limitations.

	3. Sections 9.3.1(d) and (e), and Sections 9.4.1(c) and (d): Indemnifications by Seller or PGE for fraud, intentional misrepresentation, willful misconduct by, or gross negligence of Seller or PGE in connection with the APA or the transaction, and any claims, actions, or suits made by third parties against PGE or Seller arising from the acts or omissions of PGE or Seller in connection with the development, ownership, or operation of the project or project assets, as applicable, survive the closing indefinitely. All claims for indemnification must be made no later than 90 days after the applicable survival period.
Indemnification by Seller [Section 9.3]	Seller will indemnify PGE for all losses arising from: (a) the failure of any representation or warranty or other Seller statement to be true and correct; (b) a material breach of a covenant or agreement of Seller; (c) a retained liability; (d) fraud, intentional misrepresentation, willful misconduct by, or gross negligence of Seller in connection with the APA or the transaction; (e) a third-party claim arising from Seller's acts or omissions in connection with the development, ownership, or operation of the project or project assets; and (d) liability for taxes imposed on PGE relating to a taxable period or portion thereof on or before the closing related to the project or project assets.
Indemnification by PGE [Section 9.4]	PGE will indemnify Seller for all losses arising from: (a) the failure of any representation or warranty or other PGE statement to be true and correct; (b) a material breach of a covenant or agreement of Seller; (c) a third-party claim arising from PGE's acts or omissions in connection with the ownership or operation of the project or project assets; (d) fraud, intentional misrepresentation, willful misconduct by, or gross negligence of PGE in connection with the APA or the transaction; (e) liability for taxes imposed on Seller relating to a taxable period or portion thereof on or after the closing related to the project or project assets; and (f) assumed liabilities.
Limitations on Liability [Section 9.7]	Seller's aggregate maximum liability for indemnity under the APA will not exceed 100% of the purchase price, but such cap will not apply to any breach by Seller of Sections 5.1 (Organization and Authority), 5.7 (Project Assets), 5.15 (Solvency), or 5.17 (Investment Company), any third-party claim, or any claim based on fraud or willful misconduct of Seller. PGE's aggregate maximum liability for indemnity under the APA will not exceed 100% of the purchase price, but such cap will not apply to any breach by PGE of Section 6.1 (Organization and Authority), any third-party claim, or any claim based on fraud or willful misconduct of PGE.

	No indemnified party is entitled to indemnification for losses to the extent caused by the willful misconduct, fraud, or negligent act of such indemnified party, or a breach by such indemnified party of any representation, warranty, covenant, or other agreement in the APA. An indemnified party making an indemnification claim must take commercially reasonable steps to mitigate its losses. Any claim or loss will be reduced to the extent the indemnified party recovers any insurance proceeds with respect to such claim or loss.
Tax Matters [Article 10]	The allocation of the purchase price will be agreed between Seller and PGE no later than 60 days after the closing date. Seller is responsible for all federal, state, and local sales, documentary, and other transfer taxes due as a result of the purchase, sale, or transfer of the project assets. All payments made under any indemnity provision of the APA will be treated as adjustments to the purchase price.
Assignment [Section 11.1]	Neither PGE nor Seller may assign their respective obligations under the APA without the prior written consent of the other party.
Dispute Resolution [Section 11.4]	In the event of a dispute related to the APA, the parties will first address the dispute through mediation by their senior officers. If the dispute is not resolved by the senior officers, it will be submitted for mediation before a single mediator in accordance with the Commercial Mediation Procedures of the American Arbitration Association. All mediation will take place in Portland, Oregon. All aspects of the mediation will be treated as confidential information. Each party is responsible for its own expenses and 50% of any mediation expenses. If the dispute is not resolved through mediation, the parties consent to the exclusive jurisdiction of the courts of Oregon located in Portland or the courts of the U.S. for the District of Oregon having subject matter jurisdiction. Each party waives all rights to trial by jury. The prevailing party in any proceeding is entitled to receive the costs and expenses incurred by the prevailing party. The above provisions survive termination of the APA.
Governing Law [Section 11.6]	State of Oregon

ADDITIONAL TERMS THAT BIDDER WOULD LIKE TO COMMENT UPON [IF NOT LISTED ABOVE]	
Term	**Description [and area for Bidder mark-up]**

14 Appendix C – Wholesale Renewable Power Purchase Agreement

Template provided in a separate document available for download on PortlandGeneralRFP.accionpower.com.

WHOLESALE RENEWABLE POWER PURCHASE AGREEMENT

Between

Portland General Electric Company

And

[*Seller*]

Table of Contents

Page

Article 1 DEFINITIONS AND INTERPRETATION 1

1.1 Definitions 1

1.2 Rules of Interpretation 15

1.3 Technical Meanings 16

Article 2 CONTRACT TERM; DELIVERY PERIOD; PRICE; SALE OF FACILITY 16

2.1 Term; [Conditions Precedent] 16

2.2 Test Energy 16

2.3 Delivery Period 17

2.4 Notice of Sale of Facility 17

2.5 [Option to Purchase/Option to Extend Term] 18

Article 3 FACILITY DEVELOPMENT, CONSTRUCTION AND OPERATION 18

3.1 Development and Construction of Facility 18

3.2 Facility Operations 22

3.3 Transmission and Scheduling of Energy 23

3.4 Measurement and Transfer of RECs 24

3.5 Output Guarantee 25

3.6 Access 26

3.7 Curtailment 27

Article 4 FORCE MAJEURE 27

4.1 Definition 27

4.2 Occurrence and Notice 27

4.3 Obligations 28

4.4 Right to Terminate. 28

Article 5 EVENTS OF DEFAULT; REMEDIES 28

5.1 Events of Default 28

5.2 Declaration of an Early Termination Date and Calculation of Settlement Amounts 29

5.3 Termination Payment 30

5.4 Notice of Payment of Termination Payment 30

5.5 Disputes with Respect to Termination Payment 30
5.6 Closeout Setoffs 31
5.7 Suspension of Performance 31
5.8 Post-Termination PURPA Status 31
Article 6 REMEDIES FOR FAILURE TO DELIVER/RECEIVE 32
6.1 Remedy for Seller's Failure to Deliver 32
6.2 PGE's Failure to Receive 32
6.3 Duty to Mitigate 33
6.4 Acknowledgement of the Parties 33
6.5 Survival 34
Article 7 PAYMENT AND NETTING 34
7.1 Billing Period 34
7.2 Timeliness of Payment 34
7.3 Disputes and Adjustments of Invoices 34
7.4 Netting of Payments 35
7.5 Payment Obligation Absent Netting 35
Article 8 LIMITATIONS 35
8.1 Essential Purposes 35
8.2 Exclusive Remedies 35
8.3 Direct Damages 35
8.4 No Consequential Damages 35
8.5 Causes Disregarded 35
8.6 Liquidated Damages 36
Article 9 CREDIT AND COLLATERAL REQUIREMENTS 36
9.1 Pre-COD Security 36
9.2 Delivery Period Security 36
9.3 Grant of Security Interest/Remedies 37
9.4 Holding Performance Assurance 38
9.5 Interest Rate on Cash Collateral 38
9.6 Performance Assurance is Not a Limit on Seller's Liability 38
9.7 Waiver 38
Article 10 GOVERNMENTAL CHARGES 39
10.1 Cooperation 39

10.2 Non-Sale Related Governmental Charges and Taxes 39
10.3 Sale-related Governmental Charges and Taxes 39
10.4 Indemnification 39
Article 11 RATES AND TERMS BINDING; FERC STANDARD OF REVIEW 39
11.1 Mobile-Sierra Doctrine 39
Article 12 REPRESENTATIONS AND WARRANTIES; INDEMNITY 40
12.1 Representations and Warranties 40
12.2 Indemnity 41
12.3 Additional Representations and Warranties of Seller 41
12.4 No Other Representations or Warranties 42
Article 13 Insurance 42
13.1 Insurance 42
13.2 Seller to Provide Certificate of Insurance 43
13.3 Seller to Notify PGE of Loss of Coverage 43
Article 14 TITLE AND RISK OF LOSS 43
Article 15 ASSIGNMENT; BINDING EFFECT 44
15.1 Assignment 44
15.2 Change in Control 44
15.3 Binding Effect 44
Article 16 GOVERNING LAW 44
Article 17 RECORDS AND AUDIT 44
17.1 Records 44
17.2 Audit Rights 45
Article 18 DISPUTE RESOLUTION 45
18.1 Referral to Senior Management 45
18.2 Mediation 45
18.3 Legal Action 46
18.4 Waiver of Jury Trial 46
18.5 Attorneys' Fees 46
18.6 Survival 46
Article 19 GENERAL PROVISIONS 46
19.1 Entire Agreement 46
19.2 Joint Efforts 47

19.3 Amendments in Writing 47
19.4 No Third Party Beneficiaries 47
19.5 Non-Waiver 47
19.6 Severability 47
19.7 Survival 47
19.8 Bankruptcy Matters 48
19.9 Relationships of Parties 48
19.10 Headings 48
19.11 Consolidation of Variable Interest Entities 48
Article 20 CONFIDENTIALITY 49
Article 21 NOTICES AND COUNTERPARTS 49
21.1 Notices 49
21.2 Counterparts 50

This WHOLESALE RENEWABLE POWER PURCHASE AGREEMENT for Energy ("Agreement") is entered into effective as of the _____ day of _____, 201_ ("Effective Date"), by and between [*Seller*], a [*STATE*] limited liability ("Seller"), and Portland General Electric Company, an Oregon corporation ("PGE"). PGE and Seller are also referred to in this Agreement individually as a "Party" and collectively as the "Parties."

ARTICLE 1
DEFINITIONS AND INTERPRETATION

1.1 Definitions.

As used in this Agreement, the following terms, when initially capitalized, shall have the meanings specified in this Section 1.1.

1.1.1 "AAA Procedures" has the meaning set forth in Section 18.2

1.1.2 "Actual Capacity" means the instantaneous generation capacity of the Facility, stated in MW, that has achieved Commercial Operation.

1.1.3 "Affiliate" means, with respect to a Party, any Person that, directly or indirectly, through one or more intermediaries, controls, or is controlled by, or is under common control with, such Party. For this purpose, "control" means the direct or indirect ownership of fifty percent (50%) or more of the outstanding capital stock or other equity interests having ordinary voting power.

1.1.4 "Agreement" means this Wholesale Renewable Power Purchase Agreement entered into between Seller and PGE and all incorporated appendices, exhibits, schedules and attachments to this Agreement, as the same may be amended by the Parties from time to time.

1.1.5 "Ancillary Services" means all ancillary products associated, in accordance with Prudent Electric Industry Practice, with the generation of electrical Energy, including, without limitation, spinning reserves, non-spinning reserves, reactive power and voltage control.

1.1.6 "Balancing Authority Area" means an electric power system or combination of electric power systems under the control of an operator who acts to (i) match, at all times, the power output of the electric generators within the electric power system(s) and the capacity and energy purchased from entities outside the electric power system(s), with the load within the electric power system(s), (ii) maintain scheduled interchange with other control areas, within the limits of Prudent Electric Utility Practice, (iii) maintain the frequency of the electric power system(s) within reasonable limits in accordance with Prudent Electric Utility Practice and (iv) provide sufficient generating capacity to maintain operating reserves in accordance with Prudent Electric Utility Practice.

1.1.7 "Bankrupt" means with respect to any entity, such entity (i) files a petition or otherwise commences, authorizes or acquiesces in the commencement of a proceeding

or cause of action under any bankruptcy, insolvency, reorganization or similar law, or has any such petition filed or commenced against it and such petition filed or commenced against it is not dismissed after one hundred and eighty (180) days, (ii) makes an assignment or any general arrangement for the benefit of creditors, (iii) otherwise becomes bankrupt or insolvent (however evidenced), (iv) has a liquidator, administrator, receiver, trustee, conservator or similar official appointed with respect to it or any substantial portion of its property or assets, or (v) is generally unable to pay its debts as they fall due.

1.1.8 "Business Day" means any day except a Saturday, Sunday, or a Federal Reserve Bank holiday. A Business Day shall open at 8:00 a.m. and close at 5:00 p.m. local time for the relevant Party's principal place of business. The relevant Party, in each instance unless otherwise specified, shall be the Party by whom the notice or payment or delivery is to be received.

1.1.9 "CAMD" means the Clean Air Markets Division of the Environmental Protection Agency or successor administrator, or any state or federal entity given jurisdiction over a program involving transferability of RECs.

1.1.10 "Capacity Attributes" means any current or future defined characteristic, certificate, tag credit, ancillary service or attribute thereof, or accounting construct, including any of the same counted towards any current or future resource adequacy or reserve requirements, associated with the electric generation capability and capacity of the Facility or the Facility's capability and ability to produce energy. Capacity Rights are measured in MW. Notwithstanding any other provision of this Agreement, "Capacity Attributes" do not include: (i) any PTCs, ITCs, or any other tax credits, deductions, or tax benefits associated with the Facility, or (ii) any state, federal, local, or private cash payments or grants relating in any way to the Facility or the electric power output of the Facility.

1.1.11 "Claiming Party" has the meaning set forth in Section 4.2.

1.1.12 "Commercial Operation" means that not less than the Required Capacity is fully operational and reliable and the Facility is fully interconnected, fully integrated, and synchronized with the Transmission System, all of which shall be Seller's responsibility to receive or obtain. Without limiting Seller's other obligations under this Agreement, Commercial Operation occurs when all of the following events (a) have occurred, and (b) remain simultaneously true and accurate as of the time at which Seller gives PGE notice that Commercial Operation has occurred:

(i) PGE has received a certificate addressed to PGE from a Licensed Professional Engineer stating: (1) the Actual Capacity of the Facility at the time of Commercial Operation, and (2) that the Facility is able to generate electric power reliably in amounts expected by this Agreement and in accordance with all other terms and conditions hereof;

(ii) Start-Up Testing of the Facility shall have been completed;

(iii) PGE has received a certificate addressed to PGE from a Licensed Professional Engineer stating that, in accordance with the Interconnection Agreement, all required Interconnection Facilities have been constructed, all required interconnection tests have been completed and the Facility is physically interconnected with the applicable Transmission System in conformance with the Interconnection Agreement and is able to deliver energy at no less than the Maximum Facility Delivery Rate.

(v) PGE has received confirmation from the Transmission Provider(s) that (a) Seller has obtained network resource interconnection service for the Facility, and (b) Seller has paid for any required network upgrades. ***[Note to bidders: Bidders may propose energy resource interconnection service. The quality of the proposed service will be considered in PGE's evaluation of the bid.]***

(vi) PGE has received confirmation from Seller and the applicable Transmission Provider(s) that Seller has obtained long-term, firm, point-to-point transmission service agreement with roll over rights, sufficient to enable Energy to be transmitted from the Facility and delivered to the Delivery Point at no less than the Maximum Facility Delivery Rate. ***[Note to bidders: Bidders may propose alternative transmission service arrangements. The quality of the proposed transmission service will be considered in PGE's evaluation of the bid.]***

(iv) PGE has received (1) a certificate addressed to PGE from an authorized officer of Seller stating that Seller has obtained or entered into all Facility Documents, and (2) copies of any Facility Documents requested by PGE; provided, however, that Seller may redact or omit confidential or commercial terms from non-public Facility Documents.

(v) PGE has received an opinion from a Licensed Professional Engineer, or an attorney, licensed to practice in the state in which the Site is situated stating that Seller has all Permits and all other rights and agreements required to operate the Facility as contemplated by this Agreement in accordance with Law.

(vi) PGE shall have received all Performance Assurance required by this Agreement.

Seller shall provide written notice to PGE stating when Seller believes that the Facility has achieved Commercial Operation accompanied by the certificates described above. PGE shall have 10 days after receipt of Seller's notice either to confirm to Seller that all of the conditions to Commercial Operation have been satisfied or have occurred, or to state with specificity what PGE reasonably believes has not been satisfied. If, within such 10 day period, PGE does not respond or notifies Seller confirming that the Facility has achieved Commercial Operation, the original date of receipt of Seller's notice shall be the Commercial Operation Date. If PGE notifies Seller within such 10 day period that

PGE reasonably believes the Facility has not achieved Commercial Operation, Seller shall address the concerns stated in PGE's notice to the mutual satisfaction of both Parties.

1.1.13 "Commercial Operation Date" means the date on which the Facility achieves Commercial Operation.

1.1.14 "Contract Price" means the price, expressed in USD per MWh, set forth on Exhibit B.

1.1.15 "Contract Termination Damages" has the meaning set forth in Section 3.1.11.

1.1.16 "Contract Year" means any consecutive 12-month period during the Term, commencing at 00:00 hours on the Commercial Operation Date or any of its anniversaries and ending at 24:00 hours on the last day of such 12-month period.

1.1.17 "Costs" means, with respect to a Party, brokerage fees, commissions and other similar third party transaction costs and expenses reasonably incurred by such Party in entering into new arrangements which replace this Agreement and all reasonable attorneys' fees and expenses incurred by a Party in connection with enforcing its rights under this Agreement. Costs shall not include any expenses incurred by such Party in either entering or terminating any arrangement pursuant to which it has hedged its obligations.

1.1.18 "Credit Rating" means (i) with respect to any entity other than a financial institution, the (a) current ratings issued or maintained by S&P or Moody's with respect to such entity's long-term senior, unsecured, unsubordinated debt obligations (not supported by third party credit enhancements) or (b) corporate credit rating or long-term issuer rating issued or maintained with respect to such entity by S&P or Moody's, or (ii) if such entity is a financial institution, the ratings issued or maintained by S&P or Moody's with respect to such entity's long-term, unsecured, unsubordinated deposits.

1.1.19 "Credit Requirements" means a senior, unsecured long term debt rating (or corporate rating if such debt rating is unavailable) of (a) BBB or greater from S&P, or (b) Baa2 or greater from Moody's, and if such ratings are split, the lower of the two ratings must be at least 'BBB' or 'Baa2' from S&P or Moody's, respectively.

1.1.20 "Critical Milestone" has the meaning set forth in Section Section 3.1.7.

1.1.21 "Daily" means any 24-Hour period commencing at 0000 Hours.

1.1.22 "Deficit Capacity" has the meaning set forth in Section 3.1.14(b).

1.1.23 "Deficit Damages" means a one-time payment equal to (a) the difference between (i) Expected Capacity and (ii) the Actual Capacity of the Facility on the 120th day after the Guaranteed Commercial Operation Date, stated in MWs, multiplied by (b) $25,000.

1.1.24 "Defaulting Party" has the meaning set forth in Section 5.1.

1.1.25 "Delay Damages" for any given day are equal to (a) the Expected Facility Output, expressed in MWhs per year, divided by 365, multiplied by (b) Replacement Price, but in no event less than [$___] per day.

1.1.26 "Delivery Period" has the meaning set forth in Section 2.3.

1.1.27 "Delivery Period Security" has the meaning set forth in Section 9.2.1.

1.1.28 "Delivery Point" means the following point of delivery on the PGE System: ***[bidder to propose]***.

1.1.29 "Dispute" has the meaning set forth in 18.1.

1.1.30 "Early Termination Date" has the meaning set forth in Section 5.2.1.

1.1.31 "Effective Date" has the meaning set forth in the first paragraph of this Agreement.

1.1.32 "Emissions Reduction Credit" is any credit, allowance or instrument issued or issuable pursuant to a state implementation plan under the Clean Power Plan promulgated by the Environmental Protection Agency under the Clean Air Act.

1.1.33 "Energy" means all electric energy, expressed in MWh, generated by the Facility and scheduled to PGE at the Delivery Point as required by this Agreement.

1.1.34 "Environmental Attributes" means any and all claims, credits, benefits, emissions reductions, offsets and allowances, however named, resulting from the avoidance of the emission of any gas, chemical, or other substance to the air, soil or water or otherwise arising as a result of the generation of electricity from the Facility, regardless of whether or not (i) such environmental attributes have been verified or certified, (ii) such environmental attributes are creditable under any applicable legislative or regulatory program, or (iii) such environmental attributes are recognized as of the Effective Date or at any time during the Term. Environmental Attributes include but are not limited to: (a) any avoided emissions of pollutants to the air, soil, or water such as (subject to the foregoing) sulfur oxides (SOx), nitrogen oxides (NOx), carbon monoxide (CO), and other pollutants; (b) all Emissions Reduction Credits; and (c) any avoided emissions of carbon dioxide (CO2), methane (CH4), and other greenhouse gases (GHGs) that have been determined by the United Nations Intergovernmental Panel on Climate Change to contribute to the actual or potential threat of altering the Earth's climate by trapping heat in the atmosphere. Notwithstanding any other provision of this Agreement, the term "Environmental Attributes" does not include: (i) any PTCs, ITCs, or any other tax credits, deductions, or tax benefits associated with the Facility, or (ii) any state, federal, local, or private cash payments or grants relating in any way to the Facility or the electric power output of the Facility.

1.1.35 "Equitable Defenses" means any bankruptcy, insolvency, reorganization and other laws affecting creditors' rights generally, and with regard to equitable remedies, the discretion of the court before which proceedings to obtain same may be pending.

1.1.36 "EWG" means an "exempt wholesale generator," as defined under PUHCA.

1.1.37 "Event of Default" has the meaning set forth in Section 5.1.

1.1.38 "Expected Capacity" means [__] MW, the instantaneous generation capacity that the Facility is expected to have at Final Completion.

1.1.39 "Expected Facility Output" means [__] MWh of Product expected to be generated by the Facility and measured at the Facility Meter during each Contract Year, as set forth in Exhibit C. Seller estimates that the Facility will generate Facility Output during each Contract Year according to the estimates of monthly Facility Output set forth in Exhibit C. If at Final Completion the Facility's Actual Capacity is less than the Expected Capacity, Expected Facility Output shall be reduced by [___] MWh per Contract Year for each full MW of Actual Capacity below Expected Capacity.

1.1.40 "Facility" means the ***[describe renewable energy technology]*** facility more fully described in attached Exhibit D, and includes all generators, equipment, devices and associated appurtenances owned, controlled, operated and managed by Seller in connection with, or to facilitate, the production, generation, transmission, delivery, or furnishing of Product to PGE in accordance with this Agreement (including the Interconnection Facilities).

1.1.41 "Facility Documents" means the Permits and other authorizations, rights and agreements now or hereafter necessary for (i) construction, ownership, operation, and maintenance of the Facility in accordance with Prudent Electric Industry Practices, and (ii) transmission of Energy from the Facility to the PGE System, including those documents listed in Exhibit E; provided, however, that nothing set forth in Exhibit E limits the obligations of Seller to obtain all Facility Documents required to enable Seller to perform this Agreement in accordance with its terms.

1.1.42 "Facility Meter" means the metering equipment designed, furnished, installed, owned, inspected, tested, maintained and replaced as provided in the Interconnection Agreement.

1.1.43 "Facility Output" means all electric energy, RECs and Capacity produced by the Facility, less station use, if any, all as measured at the Facility Meter.

1.1.44 "FERC" means the Federal Energy Regulatory Commission or any successor government agency.

1.1.45 "FIN 46" has the meaning set forth in Section 19.11.

1.1.46 "Final Completion" means the Facility is fully operational and reliable, at or greater than the Required Capacity, and fully interconnected, fully integrated, and synchronized with the Transmission Provider's System, as evidenced (to the reasonable satisfaction of PGE) by the completion of all items set forth on the Final Completion Punch List, modified if necessary to reflect the Actual Capacity.

1.1.47 "Final Completion Punch List" means, as of Commercial Operation, a list of all items to be completed in order to achieve Final Completion.

1.1.48 "Forecasting Agent" shall have the meaning set forth in Section 3.3.1.

1.1.49 "Force Majeure" is defined in Section 4.1.

1.1.50 "Gains" means, with respect to a Party, an amount equal to the present value of the economic benefit to it, if any (exclusive of Costs), resulting from the termination of its obligations with respect to this Agreement determined in a commercially reasonable manner.

1.1.51 "Governmental Authority" means any national, state, provincial or local government, any political subdivision thereof or any other governmental, regulatory, quasi-governmental, judicial, public or statutory instrumentality, authority, body, agency, department, bureau, or entity with authority to bind a Party at law; provided, however, that "Governmental Authority" shall not in any event include either Party.

1.1.52 "Governmental Charges" means any charges or costs that are assessed or levied by any entity, including local, state or federal regulatory or taxing authorities that would affect sale and purchase of a Product contemplated by this Agreement, either directly or indirectly.

1.1.53 "Guaranteed Commercial Operation Date" means the date that is 90 days after the Scheduled Commercial Operation Date.

1.1.54 "Guarantor" means, with respect to Seller, [_____].

1.1.55 "Guaranty" means an instrument or agreement pursuant to which the Guarantor guarantees the performance of each and all of the obligations of Seller, which instrument or agreement is reasonably acceptable in form and substance to PGE.

1.1.56 "Guaranty Default" means with respect to a Guaranty or the Guarantor thereunder, the occurrence of any of the following events: (i) any representation or warranty made or deemed to be made or repeated by such Guarantor in connection with such Guaranty shall be false or misleading in any material respect when made or when deemed made or repeated; (ii) such Guarantor fails to pay, when due, any amount required pursuant to such Guaranty; (iii) the failure of such Guarantor to comply with or timely perform any other material covenant or obligation set forth in such Guaranty if such failure is not capable of remedy or shall not be remedied in accordance with the terms and conditions of such Guaranty; (iv) a Merger Event occurs with respect to such Guarantor; (v) such Guaranty shall expire or terminate, or shall fail or cease to be in full

force and effect and enforceable in accordance with its terms against such Guarantor, prior to the satisfaction of all obligations of the guaranteed Party under this Agreement, in any such case without replacement; (vi) such Guarantor shall repudiate, disaffirm, disclaim, or reject, in whole or in part, or challenge the validity of, its Guaranty, or (vii) such Guarantor becomes Bankrupt; provided, however, that no Guaranty Default shall occur or be continuing in any event with respect to a Guaranty after the time such Guaranty is required to be canceled or returned to Seller in accordance with the terms of this Agreement.

1.1.57 "Indemnitee" has the meaning set forth in Section 12.2.

1.1.58 "Indemnitor" has the meaning set forth in Section 12.2.

1.1.59 "Indemnity Claims" means all third party claims or actions, threatened or filed, whether groundless, false, fraudulent or otherwise, that directly or indirectly relate to the subject matter of an indemnity, and the resulting losses, damages, expenses, attorneys' fees and court costs, whether resulting from a settlement or otherwise, and whether such claims or actions are threatened or filed prior to or after the termination of this Agreement.

1.1.60 "Interconnection Agreement" means the generator interconnection agreement between Seller and ***[identify applicable Transmission Provider*] [*if already executed:*** dated [_____, 20__]***.]***

1.1.61 "Interest Rate" means, for any date, the lesser of (a) the per annum rate of interest equal to the prime lending rate as may from time to time be published in The Wall Street Journal under "Money Rates" on such day (or if not published on such day on the most recent preceding day on which published), plus 200 basis points, and (b) the maximum rate permitted by applicable law.

1.1.62 "Interconnection Facilities" means all the facilities installed, or to be installed, for the purpose of interconnecting the Facility to the Transmission System, including electrical transmission lines, upgrades, transformers and associated equipment, substations, relay and switching equipment, and safety equipment.

1.1.63 "ITCs" means the investment tax credits established pursuant to Section 48 of the Internal Revenue Code, as such law may be amended or superseded.

1.1.64 "Law" means any law, rule, regulation, order, writ, judgment, rulings or orders by or before any court or any governmental authority.

1.1.65 "Letter(s) of Credit" means one or more irrevocable, transferable, standby letters of credit issued by a major U.S. commercial bank or a U.S. branch office of a major foreign commercial bank with such bank having shareholders' equity of at least $10 billion USD and a Credit Rating of at least A1 from Moody's or A+ from S&P, in a form and substance reasonably acceptable to PGE. The costs of a Letter of Credit shall be borne by Seller.

1.1.66 "Letter of Credit Default" means with respect to a Letter of Credit, the occurrence of any of the following events: (i) the issuer of such Letter of Credit shall fail to be a major U.S. commercial bank or a U.S. branch office of a major foreign commercial bank with such bank having shareholders' equity of at least $10 billion USD and a Credit Rating of at least A1 from Moody's or A+ from S&P; (ii) the issuer of the Letter of Credit shall fail to comply with or perform its obligations under such Letter of Credit; (iii) the issuer of such Letter of Credit shall disaffirm, disclaim, repudiate or reject, in whole or in part, or challenge the validity of, such Letter of Credit; (iv) such Letter of Credit shall be within 15 Business Days of expiration or terminate, or shall fail or cease to be in full force and effect at any time during the Term, in any such case without replacement; (v) the issuer of such Letter of Credit shall become Bankrupt; or (vi) a Merger Event occurs with respect to the issuer of such Letter of Credit; provided, however, that no Letter of Credit Default shall occur or be continuing in any event with respect to a Letter of Credit after the time such Letter of Credit is required to be canceled or returned in accordance with the terms of this Agreement.

1.1.67 "Licensed Professional Engineer" means a Person proposed by Seller and acceptable to PGE in its reasonable judgment who (a) to the extent mandated by Law is licensed to practice engineering in the appropriate engineering discipline for the required certification being made, in the United States, and in all states for which the person is providing a certification, evaluation or opinion with respect to matters or Law specific to such state, (b) has training and experience in the engineering disciplines relevant to the matters with respect to which such person is called upon to provide a certification, evaluation or opinion, (c) has no economic relationship, association, or nexus with Seller or its members or Affiliates, other than with the prior written consent of PGE, services previously or currently being rendered to Seller or its members or Affiliates, and (d) 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 Seller of any equipment installed in the Facility.

1.1.68 "Losses" means, with respect to a Party, an amount equal to the present value of the economic loss to it, if any (exclusive of Costs), resulting from termination of its obligations with respect to this Agreement determined in a commercially reasonable manner.

1.1.69 "Market Price Index" means (a) the average price reported on the Intercontinental Exchange ("ICE") Day-Ahead Mid-Columbia ("Mid-C") On-Peak Index, for On-Peak Hours, and (b) the average price reported on the ICE Day-Ahead Mid-C Off-Peak Index, for Off-Peak Hours.

1.1.70 "Material Adverse Change" means (i) with respect to PGE, PGE shall have a Credit Rating below BBB- by S&P and below Baa3 by Moody's or both ratings are withdrawn or terminated on a voluntary basis by the rating agencies, (ii) with respect to Seller, Seller or Seller's Guarantor, if applicable, shall have a Credit Rating below BBB- by S&P and below Baa3 by Moody's or both ratings are withdrawn or terminated on a voluntary basis by the rating agencies, if rated by both services. If Seller or Seller's Guarantor is rated by only one service, a Material Adverse Change shall occur if the

rating falls below the pertinent level specified above or if such rating is withdrawn or terminated on a voluntary basis by the rating agency.

1.1.71 "Maximum Delivery Rate" means the maximum hourly rate of delivery of Energy in MWh from the Facility to the applicable Transmission System measured at the Facility Meter, calculated on the basis of the Energy delivered in an hour accruing at an average rate equivalent to the Actual Capacity.

1.1.72 "Merger Event" means, with respect to a Party or an Affiliate of a Party that such Party or Affiliate consolidates or amalgamates with, or merges into or with, or transfers all or substantially all of its assets to another entity, and (i) the resulting, surviving or transferee entity fails, at the time of such consolidation, amalgamation, merger or transfer, to assume each and all of the obligations of such Party or Affiliate under this Agreement or under any Guaranty, Letter of Credit or other Performance Assurance, either by operation of law or pursuant to an agreement reasonably satisfactory to the other Party, or (ii) the benefits of any Guaranty, Letter of Credit, or other Performance Assurance or credit support provided pursuant to this Agreement fail, at any time following such consolidation, amalgamation, merger or transfer, to extend to the performance by such Party or such resulting, surviving or transferee entity of its obligations under this Agreement, or (iii) the Credit Rating (from any of S&P or Moody's) of the resulting, surviving or transferee entity is not equal to or higher than that of such Party or Affiliate immediately prior to such consolidation, amalgamation, merger, or transfer.

1.1.73 "Mid-Columbia" means an area which includes points at any of the switchyards associated with the following four hydro projects: Rocky Reach, Rock Island, Wanapum and Priest Rapids. These switchyards include: Rocky Reach, Rock Island, Wanapum, McKenzie, Valhalla, Columbia, Midway and Vantage. Mid-Columbia shall also include points in the "Northwest Hub," as defined by BPA. For scheduling purposes, the footprint described above shall dictate the delivery point name for the then current WECC scheduling protocols. If the footprint changes during the Term, a mutually agreed upon footprint that describes an area containing the most liquidity for trading purposes shall apply.

1.1.74 "Milestone" and "Milestones" have the meaning assigned to those terms in Section 3.1.7(a)(i).

1.1.75 "Month" means a calendar month commencing at hour ending 0100 PPT on the first day of such month through hour ending 2400 PPT on the last day of such month.

1.1.76 "Moody's" means Moody's Investor Services, Inc. or its successor.

1.1.77 "MW" means megawatt.

1.1.78 "MWh" means megawatt hour.

1.1.79 "NERC" means the North American Electric Reliability Corporation.

1.1.80 "Non-Defaulting Party" has the meaning set forth in Section 5.2.1.

1.1.81 "Off-Peak Hours" shall mean all hours ending 01:00:00 through 06:00:00 and hours ending 23:00:00 through 24:00:00, PPT, Monday through Saturday and hours ending 01:00:00 through 24:00:00, PPT, on Sundays and NERC designated holidays, as such definition may be changed by [NAESB] from time to time.

1.1.82 "On-Peak Hours" shall mean all hours ending 07:00:00 through 22:00:00 PPT, Monday through Saturday, excluding NERC designated holidays, as such definition may be changed by [NAESB] from time to time.

1.1.83 "Output Guarantee" has the meaning given to that term in Section 3.5.1.

1.1.84 "Output Shortfall" has the meaning given to that term in Section 3.5.2(b).

1.1.85 "Party" or "Parties" are defined in the preamble of this Agreement.

1.1.86 "Performance Assurance" means collateral in the form of cash, Letter(s) of Credit, or a Guaranty.

1.1.87 "Permits" means the permits, licenses, approvals, certificates, entitlements and other authorizations issued by Governmental Authorities required for the construction, ownership or operation of the Facility or occupancy or use of the Site, including those specified in Exhibit E, and all amendments, modifications, supplements, general conditions and addenda thereto.

1.1.88 "Person" means an individual, partnership, corporation, limited liability company, joint venture, association, trust, unincorporated organization, Governmental Authority, or other form of entity.

1.1.89 "PGE's Cost to Cover" means, for purposes of calculating Output Shortfall, the positive difference, if any, between (a) the sum of (i) the time weighted average of the Market Price Index for each day for which the determination is being made, plus (ii) the RECs Price Component, minus (b) the Contract Price in effect on such days, stated as an amount per MWh. If for a given Contract Year, the difference between (a) minus (b) referenced above is zero or negative, then PGE's Cost to Cover shall be zero dollars ($0).

1.1.90 "PGE Representatives" has the meaning set forth in Section 3.6.

1.1.91 "PGE System" means the edge of PGE's Balancing Authority Area, excluding the Balancing Area Authority Area boundaries surrounding PGE's Remote Resources.

1.1.92 "PPT" means Pacific Prevailing Time (i.e., prevailing Standard Time or Daylight Savings Time in the Pacific Time Zone).

1.1.93 "Pre-COD Security" has the meaning given in Section 9.1.1.

1.1.94 "Product" means (a) the Energy Scheduled and delivered to the Delivery Point as required by this Agreement, (b) RECs, and (c) any Capacity Attributes.

1.1.95 "Prudent Electric Industry Practice" means those practices, methods, standards and acts engaged in or approved by a significant portion of the electric power generation industry in the Western Interconnection that at the relevant time period, in the exercise of reasonable judgment in light of the facts known or that should reasonably have been known at the time a decision was made, would have been expected to accomplish the desired result in a manner consistent with good business practices, reliability, economy, safety and expedition, and which practices, methods, standards and acts reflect due regard for operation and maintenance standards recommended by the Facility's equipment Sellers and manufacturers, operational limits, and all applicable laws and regulations. Prudent Electric Industry Practice is not intended to be limited to the optimum practice, method, standard or act to the exclusion of all others, but rather to those practices, methods and acts generally acceptable or approved by a significant portion of the electric power generation industry in the Pacific Northwest region, during the relevant period, as described in the immediately preceding sentence.

1.1.96 "PURPA" means the Public Utility Regulatory Policies Act of 1978.

1.1.97 "QF" means "Qualifying Facility," as that term is defined in the FERC regulations (codified at 18 CFR Part 292) in effect on the Effective Date.

1.1.98 "PTCs" means production tax credits under Section 45 of the Internal Revenue Code, as such law may be amended or superseded.

1.1.99 "REC" means (a) the Environmental Attributes associated with all Facility Output, together with (b) the REC Reporting Rights associated with such Facility Output and Environmental Attributes, however commercially transferred or traded under any or other product names, such as "green tags," "Green-e Certified," or otherwise. One REC represents the Environmental Attributes made available by the generation of one MWh of Facility Output.

1.1.100 "REC Price Component" means [$_____] per MWh; provided that if after the Effective Date a liquid market for RECs emerges in a form and location that PGE determines reasonably states the market value of the RECs delivered hereunder, PGE may in its discretion replace such [$____] per MWh with such designated market price reports for RECs, effective as of the time specified by PGE.

1.1.101 "REC Reporting Rights" means the exclusive right of a purchaser of Environmental Attributes to report ownership of Environmental Attributes in compliance with federal or state law, if applicable, and to federal or state agencies or other parties at such purchaser's discretion, and include reporting under Section 1605(b) of the Energy Policy Act of 1992, or under any present or future domestic, international, or foreign emissions trading program or renewable portfolio standard.

1.1.102 "Regulatory Event" has the meaning given to that term in Section 19.6.

1.1.103 "Replacement Price" is described in Section 6.1.2.

1.1.104 "Required Capacity" means [__] MW ***[Note to bidders: this should be a whole number of MWs equal to or greater than 96% of the Facility's Expected Capacity]***

1.1.105 "Rolling Period" has the meaning given to that term in Section 3.5.1.

1.1.106 "S&P" means the Standard & Poor's, a division of McGraw-Hill Companies, Inc., or any successor thereto.

1.1.107 "Sales Price" is described in Section 6.2.2.

1.1.108 "Schedule," "Scheduled" or "Scheduling" means the act of each Party or its designated representatives, if applicable, notifying, requesting and confirming to each other the scheduling of Energy in 15 minute intervals at the Delivery Point.

1.1.109 "Scheduled Commercial Operation Date" means [____, 20__].

1.1.110 "Scheduling Agent" has the meaning set forth in Section 3.3.1.

1.1.111 "Seller" is defined in the Preamble of this Agreement.

1.1.112 "Seller Excused Minutes" means, for the Facility in any Contract Year, the total number of minutes during such Contract Year during which the Facility was unable to deliver Facility Output at the Facility Meter due to one or more of the following events, each as recorded by Seller's SCADA and indicated by Seller's electronic fault log: (a) an emergency or Force Majeure event; (b) to the extent not caused by Seller's actions, a curtailment in accordance with Section 3.7; (c) the Transmission System operating outside the voltage or frequency limits defined in the applicable operating manual for inverters installed at the Facility; (d) scheduled maintenance under Section 3.2.6, but in no event exceeding 36 hours per Contract Year consistent with such operating manual; (e) a default by PGE; provided, however, that if any of the events described above in items (a) through (e) occur simultaneously, then the relevant period of time shall only be counted once in order to prevent double counting. Seller Excused Minutes shall not include minutes when (i) the Facility or any portion thereof was unavailable due to Seller's non-conformance with the Interconnection Agreement or (ii) the Facility or any portion thereof was paused or withdrawn from use by Seller for reasons other than those covered in this definition.

1.1.113 "Settlement Amount" means, with respect to this Agreement and the Non-Defaulting Party, the Losses or Gains, and Costs, expressed in USD, which such Party incurs as a result of the termination and liquidation of this Agreement pursuant to Article 5. If the Non-Defaulting Party's Costs and Losses exceed its Gains, then the Settlement Amount shall be an amount owing to the Non-Defaulting Party. If the Non-Defaulting Party's Gains exceed its Costs and Losses, then the Settlement Amount shall be zero dollars ($0). The Settlement Amount shall not include consequential, punitive, exemplary or indirect or business interruption damages.

1.1.114 "Settlement Period" has the meaning set forth in Section 5.2.2.

1.1.115 "Settlement Energy" has the meaning set forth in Section 5.2.2.

1.1.116 "Site" means the real property on which the Facility is or will be located, as more fully described on Exhibit F.

1.1.117 "Start-Up Testing" means the start-up tests for the Facility as set forth in Exhibit G.

1.1.118 "Taxes" means all taxes, rates, levies, adders, assessments, surcharges, duties and other fees and charges of any nature, including but not limited to ad valorem, consumption, excise, franchise, gross receipts (including any [*State Name*] business and occupation tax and [*State Name*] public utility tax and any successor tax thereto), import, export, license, property, sales, stamp, storage, transfer, turnover, use, or value-added taxes, and any and all items of withholding, deficiency, penalty, addition to tax, interest, or assessment related thereto.

1.1.119 "Term" means the period of time referenced in Section 2.1.

1.1.120 "Test Energy" means Facility Output Scheduled and delivered as Energy to the Delivery Point during periods before the Commercial Operation Date, and all RECs and Capacity Rights associated with Facility Output.

1.1.121 "Termination Payment" has the meaning set forth in Section 5.3.

1.1.122 "Transmission Provider(s)" means any entity (including any FERC-authorized regional transmission organization) transmitting Energy on behalf of Seller to and at the Delivery Point; or on behalf of PGE at and from the Delivery Point.

1.1.123 "Transmission Services" means any and all services (including but not limited to Ancillary Services and control area services) required for the transmission and delivery of Energy to the Delivery Point or at and from the Energy Delivery Point.

1.1.124 "Transmission System(s)" means the transmission system(s) of the Transmission Provider(s) to be used by Seller for the purpose of transmitting Energy to and at, the Delivery Point; or by PGE for the purpose of transmitting Energy at and from, the Delivery Point.

1.1.125 "USD" means United States Dollars.

1.1.126 "WECC" means the Western Electricity Coordinating Council or any successor thereto.

1.1.127 "Western Interconnection" means the network of subsystems of generators, transmission lines, transformers, switching stations, and substations owned or operated by members of the WECC and including 14 western states, British Columbia, Alberta and parts of Baja, Mexico.

1.1.128 "WREGIS" means the Western Renewable Energy Generation Information System.

1.2 Rules of Interpretation.

Unless the context otherwise requires:

1.2.1 Words singular and plural in number shall be deemed to include the other and pronouns having masculine or feminine gender shall be deemed to include the other.

1.2.2 Subject to Article 15, any reference in this Agreement to any Person includes its successors and assigns and, in the case of any Governmental Authority, any Person succeeding to its functions and capacities.

1.2.3 Any reference in this Agreement to any Section, Exhibit or Appendix means and refers to the Section contained in, or Exhibit or Appendix attached to, this Agreement.

1.2.4 Other grammatical forms of defined words or phrases have corresponding meanings.

1.2.5 A reference to writing includes typewriting, printing, lithography, photography, email and any other mode of representing or reproducing words, figures or symbols in a lasting and visible form.

1.2.6 Unless otherwise expressly provided in this Agreement, a reference to a specific time for the performance of an obligation is a reference to that time in the place where that obligation is to be performed.

1.2.7 A reference to a Party to this Agreement includes that Party's successors and permitted assigns.

1.2.8 Unless otherwise expressly provided in this Agreement, a reference to a document or agreement, including this Agreement, includes a reference to that document or agreement as modified, amended, supplemented or restated from time to time.

1.2.9 References in this Agreement to "or" shall be deemed to be disjunctive but not necessarily exclusive (i.e., unless the context dictates otherwise, "or" shall be interpreted to mean "and/or" rather than "either/or").

1.2.10 If any payment, act, matter or thing hereunder would occur on a day that is not a Business Day, then such payment, act, matter or thing shall, unless otherwise expressly provided for herein, occur on the next Business Day.

1.3 Technical Meanings.

Words not otherwise defined herein that have well known and generally accepted technical or trade meanings are used in this Agreement in accordance with such recognized meanings.

ARTICLE 2
CONTRACT TERM; DELIVERY PERIOD; PRICE; SALE OF FACILITY

2.1 Term; [Conditions Precedent].

2.1.1 Term. The term of this Agreement shall begin on the Effective Date and shall continue through [***existing facility:*** _____[*Date*]] [***facility to be built:*** the [__] anniversary of the Commercial Operation Date] (the "Term"), unless otherwise terminated in accordance with its terms; provided, however, that (a) such termination shall not affect or excuse the performance of either Party under any provision of this Agreement that by its terms survives any such termination, and (b) this Agreement and any other documents executed and delivered under this Agreement shall remain in effect until both Parties have fulfilled all of their obligations with respect to this Agreement.

2.1.2 PGE's Conditions Precedent. PGE's obligations under this Agreement are subject to the following conditions precedent, each of which may be waived by PGE in its sole discretion:

If these conditions precedent have not been satisfied or waived by PGE on or before [_____, 20__], either Party shall have the right to terminate this Agreement by giving five days' prior notice of termination to the other Party. Neither Party shall have any liability for such a termination.

2.1.3 Seller's Conditions Precedent. PGE's obligations under this Agreement are subject to the following conditions precedent, each of which may be waived by Seller in its sole discretion: ***[Note to bidders: conditions precedent, if any, to Seller's obligations under the PPA should be set out here]***

If these conditions precedent have not been satisfied or waived by Seller on or before [_____, 20__], either Party shall have the right to terminate this Agreement by giving five days' prior notice of termination to the other Party. Neither Party shall have any liability for such a termination.

2.2 Test Energy.

Before the Commercial Operation Date, Seller shall sell and deliver to PGE all Test Energy generated by the Facility at the Delivery Point in accordance with this Agreement. PGE shall pay 50% of the Contract Price for each MWh of Test Energy scheduled to the Delivery Point in accordance with this Agreement.

2.3 Delivery Period.

2.3.1 Delivery Period. Starting on [_____[*Date*]] [the Commercial Operation Date], Seller shall Schedule all of the Facility Output to PGE as Energy at the Delivery Point and shall continue such deliveries for the Term (the "Delivery Period").

2.3.2 Contract Price.

(a) During the Delivery Period, if the Facility Output is equal to or greater than the Energy Scheduled and delivered to PGE at the Delivery Point, PGE shall pay to Seller (i) the Contract Price for the quantity of Energy so Scheduled and delivered, and (ii) the REC Price Component only for RECs associated with Facility Output not Scheduled and delivered as Energy at the Delivery Point.

(b) During the Delivery Period, if the Facility Output is less than the Energy Scheduled and delivered to PGE at the Delivery Point, PGE shall pay to Seller (i) the Contract Price for the quantity of MWh equal to the Facility Output, and (ii) a price per MWh equal to the relevant Transmission Provider's real time imbalance energy price index for the quantity, stated in MWhs, by the Scheduled Energy exceeds Facility Output. If no such index exists, PGE shall designate a sub-hourly index that most closely represents the market price for real-time imbalance energy.

2.3.3 Price Adjustment for Excess Output. In any Contract Year in which Facility Output exceeds 110% of Expected Output, the Contract Price for each MWh in excess of the Expected Output for the balance of such Contract Year shall be [75%] of the price otherwise payable under Section 2.3.2.

2.4 Notice of Sale of Facility.

If Seller or an Affiliate of Seller desire to sell the Facility during the Term, either by a sale of the Facility's assets or by a direct or indirect transfer of the membership interest(s) in Seller, Seller shall first, before it or its Affiliate enters into any substantive discussions with other parties, notify PGE of its desire to sell the Facility. PGE agrees to notify Seller if it is interested in acquiring the Facility within 20 days following receipt of Seller's notice. If PGE so notifies Seller, the Parties shall engage in exclusive good faith negotiations to reach agreement with respect to such a transaction for a period of 90 days thereafter. If during this period the Parties execute a letter of intent, or other document similarly confirming the Parties' intent to enter into a transaction for the purchase and sale of the Facility, then such exclusive negotiation period shall be automatically extended for an additional 90 day period, during which time the Parties may execute a purchase and sale agreement for the Facility. Any purchase and sale agreement executed within the time frame stated in this Section 2.4, shall remain subject to regulatory approval beyond such time frame, as applicable. Seller may pursue any transaction for the sale of the Facility with one or more third parties at any time and from time to time and shall have no obligation to PGE under this Section 2.4 following an occurrence of any of the following: (i) PGE expressly declines interest in acquiring the Facility after receipt of Seller's notice provided

pursuant to the first sentence of this Section 2.4, (ii) PGE fails to respond to Seller's notice pursuant to the first sentence of this Section 2.4, within 20 days after receipt thereof; (iii) PGE and Seller fail to execute a letter of intent or other similar document with respect to the sale of the Facility within 90 days after PGE's receipt of notice from Seller provided pursuant to the first sentence of this Section 2.4; or (iv) PGE and Seller fail to execute a purchase and sale agreement for the Facility within 180 days after PGE's receipt of Notice from Seller provided pursuant to the first sentence of this Section 2.4; provided, however, that with respect to clause (iv), if Seller rejects a firm price delivered by PGE in the course of such negotiations, any sale of the Facility to a third party during the subsequent two (2)-year period must be at a price higher than such rejected price or Seller shall be required to re-engage in negotiations with PGE as otherwise set forth in this Section 2.4 for the sale of the Facility.

2.5 [Option to Purchase/Option to Extend Term]

[Note to bidders: if a Bidder wishes to propose an end of Term or during Term option for PGE to purchase the Facility, or an option for PGE to extend the Term of the PPA, it should include its proposal here in its mark up of the Agreement.]

ARTICLE 3
FACILITY DEVELOPMENT, CONSTRUCTION AND OPERATION

3.1 Development and Construction of Facility. ***[Note to bidders: Section 3.1 will be "intentionally omitted" for a Facility that has already been built.]***

3.1.1 Permitting. Seller shall obtain all Permits necessary to construct, own and operate the Facility in accordance with this Agreement.

3.1.2 Financing. Seller shall obtain any and all financing necessary to construct and operate the Facility during the Delivery Period and the Term on a schedule consistent with the requirements of this Agreement.

3.1.3 Facility Design. Seller shall be responsible for designing and building the Facility in compliance with all Permits and according to Prudent Electric Industry Practice with respect to project design, engineering and selection and installation of equipment to be used at or installed in the Facility. At PGE's request, Seller shall provide PGE with copies of the site plan for the Facility and descriptions, for the project design of the Facility. Any review by PGE of the design, construction, operation or maintenance of the Facility is solely for PGE's information, and PGE shall have no responsibility to Seller or any third party in connection with such review. Seller is solely responsible for the economic and technical feasibility, operational capability and reliability of the Facility.

3.1.4 Construction and Testing. Seller shall, at its cost, for construct and test the Facility and obtain all necessary transmission and interconnection rights, all in compliance with the Permits, the Interconnection Agreement, any other agreements with any Transmission Provider, and Prudent Electric Industry Practice.

3.1.5 Monthly Reports. After the Effective Date, Seller shall provide PGE with monthly written reports regarding Seller's progress in completing the Facility and shall, at PGE's request, meet with PGE's representatives to discuss such progress.

3.1.6 Equipment Supply. Not later than [____] Seller shall provide PGE with written evidence of Seller's commitment from [_____] for the supply of the Facility equipment in a timeframe which reasonably would allow Seller to achieve the Commercial Operation Date of the Facility on or before the Scheduled Commercial Operation Date.

3.1.7 Milestones.

(a) Time is of the essence in the performance of this Agreement. Seller shall therefor achieve each milestone set forth in this Section 3.1.7 (each, a "Milestone" and collectively the "Milestones") at the date indicated for that Milestone.

(i) On or before the 30th day following the Effective Date, Seller shall post the Pre-COD Security in the amount described in Section 9.1;

(ii) On or before the 90th day after the Effective Date, Seller shall provide to PGE a fully executed copy of the Interconnection Agreement confirming that the Facility will receive [Network Resource Interconnection Service] [Energy Resource Interconnection Service];

(iii) On or before the [__] day after the Effective Date, Seller shall provide to PGE copies of all Permits in final, nonappealable form;

(iv) By the Commercial Operation Date, Seller shall provide Delivery Period Security required under Section 9.2;

(v) [***Wind:*** Seller shall commence construction of the Facility on or before December 31, 2016 so as to vest the full amount of the PTCs available as of the Effective Date***]***;

(vi) Seller shall cause the Facility to achieve Commercial Operation on or before the Guaranteed Commercial Operation Date; and

(vii) If Commercial Operation of the Facility is achieved based on less than 100 percent of the Expected Capacity, Seller shall cause the Facility to achieve Final Completion on or before the 90th day after the Commercial Operation Date;

provided, however, that the date for achieving each Milestone other than the dates for posting Pre-COD Security and Delivery Security) shall be extended on a day for day basis for any delay due solely to (i) PGE's delay in taking, or failure to

take, any action required of it hereunder in breach of this Agreement, or (ii) an event of Force Majeure. .

(b) When Seller achieves a Milestone, Seller shall provide to PGE documentation reasonably satisfactory to PGE demonstrating Milestone completion. Seller shall provide such documentation to PGE within thirty (30) days of such completion but not later than the date specified above for such Milestone. PGE shall acknowledge receipt of the documentation provided under this Section 3.1.7 and shall provide Seller with written acceptance or denial of each Milestone within fifteen (15) Business Days of receipt of the documentation.

(c) Seller shall notify PGE promptly (and in any event within ten (10) Business Days) after Seller becomes aware of information that leads to a reasonable conclusion that a Milestone will not be met. Seller shall convene a meeting with PGE to discuss the situation not later than fifteen (15) Business Days after becoming aware of this information.

(d) If any Milestone (other than a Critical Milestone) is not completed on or before the deadline specified for that Milestone in this Section 3.1.7, Seller shall (i) inform PGE of a revised projected date for the achievement of the Milestone, (ii) inform PGE of any impact on the timing of the Commercial Operation Date and on each other Milestone, and (iii) provide PGE with a written report containing Seller's analysis of the reasons behind the failure to meet the original Milestone deadline and describing the remedial actions that the Seller agrees to undertake to ensure the achievement of the Commercial Operation Date by the Scheduled Commercial Operation Date and in any event no later than the Guaranteed Commercial Operation Date. If (1) Seller fails to submit such a report and remedial action plan within 30 days after a Milestone deadline is missed, or (2) Seller timely submits the required report and remedial action plan but thereafter fails to implement the remedial action plan with diligence, or (3) PGE reasonably concludes based on the report and proposed remedial action plan that the Facility is unlikely to achieve Commercial Operation on or before the Guaranteed Commercial Operation Date, a Seller Event of Default shall be deemed to have occurred.

(e) The Milestones described in Sections 3.1.7(a)(i), 3.1.7(a)(iv), 3.1.7(a)(vi), and 3.1.7(a)(vii) are "Critical Milestones" that are separately addressed in Section 5.1 (Events of Default), Section 3.1.11(failure to achieve the Guaranteed Commercial Operation Date), and Section 3.1.10(b) (Deficit Damages).

3.1.8 Notice of Commercial Operation. Seller shall notify PGE not less than five (5) Business Days in advance of the anticipated date of Commercial Operation and shall confirm to PGE in writing when Commercial Operation has been achieved.

3.1.9 Final Completion. If Seller achieves Commercial Operation at less than 100 percent of the Expected Capacity and Seller notifies PGE that Seller intends to bring

the Facility to 100 percent of the Expected Capacity, Seller shall provide PGE with a Final Completion Punch List. Seller must complete all items on the Final Completion Punch List on or before the 90th day after the Commercial Operation Date.

3.1.10 Delay Damages and Deficit Damages.

(a) If Commercial Operation is not achieved on or before the Scheduled Commercial Operation Date, Seller shall pay to PGE Delay Damages from and after the Scheduled Commercial Operation Date up to, but not including, the date that the Facility achieves Commercial Operation.

(b) If the Facility's Actual Capacity at Final Completion is less than the Expected Capacity, Seller shall pay to PGE Deficit Damages.

3.1.11 Contract Termination Damages. If Seller does not achieve Commercial Operation on or before the Guaranteed Commercial Operation Date, PGE may terminate this Agreement upon ten (10) Days notice to Seller, and Seller shall pay to PGE Contract Termination Damages of $25 per kW of Expected Capacity (the "Contract Termination Damages") in addition to all Delay Damages paid or payable pursuant to Section 3.1.10.

3.1.12 Damages Invoicing. By the 10th day following the end of the calendar month in which Delay Damages begin to accrue or Deficit Damages are incurred, as applicable, and continuing on the 10th day of each calendar month during the period in which Delay Damages accrue (and the following months, if applicable), PGE shall deliver to Seller an invoice showing PGE's computation of such damages and any amount due PGE in respect thereof for the preceding calendar month. No later than 10 days after receiving such an invoice and subject to Section 7.2 and Section 7.3, Seller shall pay to PGE, by wire transfer of immediately available funds to an account specified in writing by PGE 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.

3.1.13 PGE's Exclusive Remedies. PGE's exclusive remedies for the Facility's failure to achieve Commercial Operation by the Scheduled Commercial Operation Date or by the Guaranteed Commercial Operation Date, as applicable, shall be (i) the payment by Seller of Delay Damages and, if applicable, Contract Termination Damages, as provided in Sections 3.1.10 and Section 3.1.11, and (ii) the right of first offer set forth in Section 3.1.14. PGE's exclusive remedies for the Facility's failure to reach the Expected Capacity at Final Completion shall be (1) the payment of Deficit Damages, and (2) the right of first offer set forth in Section 3.1.14. Delay Damages. Contract Termination Damages and Deficit Damages are liquidated damages subject to Section 8.6.

3.1.14 Right of First Offer.

(a) If PGE terminates this Agreement under Section 3.1.11 or this Agreement is otherwise terminated before the Commercial Operation Date, neither Seller nor Seller's Affiliates may sell, market or deliver any Product associated with or attributable to the Facility to a party other than PGE for a period of two (2) years following the termination date of this Agreement, unless

before selling, marketing or delivering such Product, or entering into an agreement to sell, market or deliver such Product, Seller or Seller's Affiliates provide PGE with a written offer to sell the Product on terms and conditions materially similar to the terms and conditions contained in this Agreement (including price), and PGE fails to accept such offer within forty-five (45) days of PGE's receipt thereof.

(b) With respect to any Expected Capacity that is not included in Actual Capacity upon Final Completion ("Deficit Capacity"), neither Seller nor Seller's Affiliates may sell, market or deliver any Product associated with or attributable to the Deficit Capacity to a party other than PGE for a period of two (2) years following Final Completion, unless before selling, marketing or delivering such Product, or entering into an agreement to sell, market or deliver such Product to a party other than PGE, Seller or Seller's Affiliates provide PGE with a written offer to sell such Product on terms and conditions materially similar to the terms and conditions contained in this Agreement (including price), and PGE fails to accept such offer within forty-five (45) days of PGE's receipt thereof.

(c) Neither Seller nor Seller's Affiliates may sell or transfer the Facility, or any part thereof, or land rights or interests in the Site so long as the limitations contained in this Section 3.1.14 apply, unless the transferee agrees to be bound by the terms set forth in this Section 3.1.14 pursuant to a written agreement approved by PGE.

(d) Seller shall indemnify and hold PGE harmless from all benefits lost and other damages sustained by PGE as a result of any breach by Seller of its covenants contained within this Section 3.1.14.

3.1.15 Tax Credits. Seller shall bear all risks, financial and otherwise throughout the Term, associated with Seller's or the Facility's eligibility to receive PTCs, ITCs or other tax credits, or to qualify for accelerated depreciation for Seller's accounting, reporting or tax purposes. Seller's obligations under this Agreement shall be effective regardless of whether the sale of Facility Output from the Facility is eligible for, or receives, PTCs, ITCs or other tax credits during the Term.

3.2 Facility Operations.

3.2.1 Commitment; Prudent Electric Industry Practice. Seller hereby commits one hundred percent (100%) of the Facility Output to PGE as provided under this Agreement, except only in the limited cases where Seller is required to deliver Facility Output to the provider of integration services.

3.2.2 Site Control. At all times during the Term, Seller shall control the Site through ownership or lease and shall provide PGE with prompt notice of any change in control of the Site.

3.2.3 Operation and Maintenance. Seller shall operate and maintain the Facility, the Facility Meter and that portion of the Interconnection Facilities and related equipment and systems owned by Seller in accordance with Prudent Electric Industry Practice in a manner that is reasonably likely to: (i) maximize the Facility Output, and (ii) result in an expected useful life for such facilities of not less than thirty (30) years.

3.2.4 Facility Meter Inspection and Correction. PGE shall have the right to periodically inspect, test, repair and replace the Facility Meter, without PGE assuming any obligations the Interconnection Agreement. If any of the inspections or tests disclose an error exceeding 0.5 percent, either fast or slow, proper correction, based upon the inaccuracy found, shall be made of previous readings for the actual period during which the Facility Meter rendered inaccurate measurements if that period can be ascertained. If the actual period cannot be ascertained, the proper correction shall be made to the measurements taken during the time the metering equipment was in service since last tested, but not exceeding three months, in the amount the Facility Meter shall have been shown to be in error by such test. Any correction in billings or payments resulting from a correction in the meter records shall be made in the next monthly billing or payment rendered. Such correction, when made, shall constitute full adjustment of any claim between Seller and PGE arising out of such inaccuracy of metering equipment.

3.2.5 Inspection and Records. Seller shall inspect, maintain and repair the Facility and the components thereof in order to maintain such equipment in accordance with Prudent Electric Industry Practice and shall keep records with respect to inspections, maintenance and repairs thereto consistent with Seller's reasonable business judgment. The records of such activities shall be available for inspection by PGE during Seller's regular business hours upon reasonable notice.

3.2.6 Scheduled Maintenance. Seller shall notify PGE, on or before November 1 of each calendar year, of Facility's scheduled maintenance for the next calendar year, and shall use commercially reasonable efforts to plan scheduled maintenance (i) to maximize the productive output of the Facility and (ii) not to occur between July and September or between December and February.

3.3 Transmission and Scheduling of Energy.

3.3.1 Seller to Designate Forecasting and Scheduling Agents. At least 10 days before it begins to Schedule Test Energy under this Agreement, Seller shall engage at its expense a third-party Scheduling Agent (the "Scheduling Agent") and a third-party forecasting agent (the "Forecasting Agent"), subject in each case to PGE's prior approval. The Scheduling Agent shall perform Seller's pre-scheduling and Scheduling obligations under this Section 3.3 based exclusively on forecasts supplied by the Forecasting Agent.

3.3.2 Preschedules. The Scheduling Agent shall provide pre-Schedules for all deliveries of Energy to the Delivery Point under this Agreement, including identification of receiving and generating Balancing Authority Areas, according to WECC Scheduling practices in effect from time to time during the Term. The Scheduling Agent shall provide the pre-schedule to PGE when it is submitted. Scheduling Agent shall also

provide PGE with an estimated pre-Schedule no later than 5pm PPT on the Day before the pre-Schedule is submitted.

3.3.3 Seller's Responsibility for Transmission and Scheduling to and at Delivery Point. Seller shall arrange for, pay all costs of, and be responsible for Transmission Services, including but not limited to Balancing Authority Area services, Ancillary Services, reserves, imbalance or inadvertent energy flows, integration services or charges, and transmission losses and loss charges relating to the transmission of the Facility Output generated by the Facility to, and the delivery of such Energy at, the Delivery Point. The Scheduling Agent shall Schedule all Facility Output to the Delivery Point as firm energy in 15-minute intervals (firm at T-39) in accordance with protocols, procedures and deadlines set by NERC, WECC, the open access transmission tariff or relevant business practices and manuals of the applicable Transmission Service Provider(s), and the open access transmission tariff of the California Independent System Operation, in each case as such protocols, procedures and deadlines may be changed from time to time. Seller shall obtain at its expense all integration and other services required to Schedule such Energy as firm in each 15-minute interval. Scheduling Agent shall provide the Schedule to PGE when it is submitted. An outline of the expected Scheduling protocol, as of the Effective Date, is set forth in Exhibit H.

3.3.4 PGE's Responsibility for Transmission from the Delivery Point. PGE shall arrange for, pay all costs, and be responsible for Transmission Services, including but not limited to Balancing Authority Area services, spinning and supplemental reserves, imbalance or inadvertent energy flows, and transmission losses and loss charges relating to the transmission of the Product from the Delivery Point. Notwithstanding the foregoing, Seller shall provide at its cost all reserves required by WECC for Energy that is Scheduled to the Delivery Point.

3.3.5 Authorized Scheduling Representatives. Each Party shall designate by notice to the other Party its authorized representatives responsible for Scheduling.

3.3.6 Maximum Delivery Amounts. Seller shall sell and deliver, and PGE shall buy and receive, all Energy Scheduled and delivered pursuant to this Agreement, up to the Maximum Delivery Rate. If Seller increases, at its own expense, the ability of the Facility to deliver Facility Output in quantities in excess of the Maximum Delivery Rate through any means, including replacement or modification of equipment or related infrastructure, PGE shall not be required to purchase any Product in excess of the Maximum Delivery Rate.

3.3.7 Title to Energy. Title to Energy shall pass to PGE at the Delivery Point.

3.4 Measurement and Transfer of RECs.

RECs shall be deemed sold and delivered to PGE under this Agreement as they are produced and measured by the Facility Meter. Title to such RECs shall pass to PGE when generated. PGE shall own or be entitled to claim all RECs during the Term (including any value in the ownership, use or allocation of RECs created by legislation or regulation after the

Effective Date). The Facility Meter shall serve as the record source for purposes of calculating, certifying, and auditing RECs. Seller shall cause the Facility to implement all necessary generation information communications in WREGIS, and report generation information to WREGIS pursuant to a WREGIS-approved meter that is dedicated to the Facility and only the Facility. Seller shall deliver to PGE by the 10th day of the current Month a certificate in the form of Exhibit E for the RECs generated by the Facility during the preceding Month. Seller shall cause delivery and transfer to PGE's WREGIS account to be perfected in accordance with WREGIS rules. Seller shall hold the RECs in trust for PGE until such delivery and transfer is perfected. Each Party shall take such steps and further actions as may be required by WREGIS or applicable Law in order to effect and confirm the sale and delivery of the RECs to PGE for all purposes.

3.5 Output Guarantee.

3.5.1 Output Guarantee. Seller shall deliver an average quantity of Facility Output during each Rolling Period which is equal to the Output Guarantee. For purposes of this Agreement, "Output Guarantee" for any Rolling Period means the sum of (i) 85% of the Expected Facility Output of the Facility for such Rolling Period, less (ii) any quantities of Facility Output that were not delivered to the Facility Meter in such Rolling Period during periods constituting Seller Excused Minutes (such quantity calculated on the basis of the Net Output capable of being delivered in an hour at an average rate equivalent to the actual Nameplate Capacity Rating). For purposes of this Agreement, "Rolling Period" means any two consecutive Contract Years occurring during the Term.

3.5.2 Liquidated Damages for Output Shortfall.

(a) If the average quantity of Facility Output delivered by the Facility during any Rolling Period is equal to or greater than the Output Guarantee for such Rolling Period, Seller's delivery obligation for such Rolling Period shall be deemed satisfied for such Rolling Period.

(b) If the average quantity of Facility Output generated by the Facility during any Rolling Period is less than the Output Guarantee for such Rolling Period, the Seller shall determine the resulting shortfall, if any, for the first Contract Year occurring during such Rolling Period (the "Output Shortfall"). The Output Shortfall shall be expressed in MWh and calculated in accordance with the following formula:

Output Shortfall = (85% of the Expected Output for the Contract Year).

less

Any quantities of Facility Output that were not delivered to Facility Metter in such Contract Year during periods constituting Seller Excused Minutes (such quantity calculated on the basis of the Facility Output capable of being delivered in an hour at an average rate equivalent to the Actual Capacity),

less

The Facility Output for the Contract Year

(c) If the product of the Output Shortfall calculation set forth in Section 3.5.2(b) is a positive number, Seller shall pay PGE liquidated damages equal to the product of (a) the Output Shortfall for that Contract Year, multiplied by (b) PGE's Cost to Cover for that Contract Year. If the product of the Output Shortfall calculation set forth in Section 3.5.2(b) is zero or a negative number, Seller shall not be obligated to pay PGE liquidated damages for such Contract Year.

3.5.3 Annual Invoicing. On the 30th day following the end of each Rolling Period, Seller shall deliver to PGE a report (and supporting data) detailing whether Seller achieved the Output Guarantee for the most recently completed Rolling Period. If Seller has failed to achieve the Output Guarantee in the prior Rolling Period, Seller shall also provide a report (and supporting data) to PGE detailing the Output Shortfall for the first Contract Year occurring during such Rolling Period. Seller shall provide documentation to support all data and calculations used in each report to calculate the percent Expected Output. Thirty days after PGE has received the report and all support data, if there is an Output Shortfall, PGE shall deliver to Seller an invoice showing PGE's computation of liquidated damages calculated pursuant to Section 3.5.2. In preparing such invoices, PGE shall utilize the Facility Meter data provided to PGE for the Contract Year in question, but may also rely on historical averages and such other information as may be available to PGE at the time of invoice preparation, if the Facility Meter data for such Contract Year is then incomplete or otherwise not available. To the extent required, PGE shall true up any such invoice as promptly as practicable following its receipt of actual results for the relevant Contract Year. Seller shall pay to PGE, by wire transfer of immediately available funds to an account specified in writing by PGE 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, and shall within 30 days after receiving the invoice raise any objections regarding any disputed portion of the invoice. All disputes regarding such invoices shall be subject to Article 18. Objections not made by Seller within the 30-day period shall be deemed waived.

3.6 Access.

Upon reasonable prior notice and subject to the prudent safety requirements of Seller, and Law relating to workplace health and safety, Seller shall provide PGE and its authorized agents, employees and inspectors ("PGE Representatives") with reasonable access to the Facility: (a) for the purpose of reading or testing metering equipment, (b) as necessary to witness any acceptance tests, (c) to provide tours of the Facility to customers and other guests of PGE (not more than 12 times per year), (d) for purposes of implementing Section 17.2 (Audit Rights), and (e) for other reasonable purposes at the reasonable request of PGE. PGE shall release Seller against and from any and all Liabilities resulting from actions or omissions by any of the PGE Representatives in connection with their access to the Facility, except to the extent that such damages are caused or by the intentional or grossly negligent act or omission of Seller.

3.7 Curtailment. PGE shall not be obligated to purchase, receive, pay for, or pay any damages associated with, Facility Output (or associated PTCs or RECs) if such Facility Output (or associated PTCs or RECs) is not delivered to the Delivery Point for any reason, including any of the following: (a) the interconnection between the Facility and the Transmission System is disconnected, suspended or interrupted, in whole or in part, consistent with the terms of the Interconnection Agreement, (b) the Transmission Provider(s) directs a general curtailment, reduction, or redispatch of generation in the area, (c) the Facility Output is not delivered to the Transmission System because the Facility is not fully integrated or synchronized with the Transmission System, or (d) an event of Force Majeure prevents either Party from delivering or receiving Energy.

ARTICLE 4
FORCE MAJEURE

4.1 Definition.

"Force Majeure" means an event or circumstance that prevents one Party from performing its obligations to deliver or receive the Product under this Agreement, which event or circumstance was not anticipated as of the Effective Date, which is not within the reasonable control of, or the result of the negligence of, the Claiming Party, and which, by the exercise of due diligence, the Claiming Party is unable to overcome or avoid or cause to be avoided. Force Majeure shall not be based on: (a) the loss of PGE's markets; (b) PGE's inability economically to use or resell the Product purchased under this Agreement; (c) the loss or failure of Seller's supply or equipment; or (d) Seller's ability to sell the Product at a price greater than the Contract Price. Neither Party may raise a claim of Force Majeure based in whole or in part on curtailment by a Transmission Provider unless: (i) such Party has contracted for firm transmission with a Transmission Provider for the Product to be delivered to or received at the Delivery Point, and (ii) such curtailment is due to "force majeure" or "uncontrollable force" or a similar term as defined under the Transmission Provider's tariff; provided, however, that existence of the foregoing factors shall not be sufficient to conclusively or presumptively prove the existence of a Force Majeure absent a showing of other facts and circumstances which in the aggregate with such factors establish that a Force Majeure as defined in the first sentence of this Section 4.1 has occurred.

4.2 Occurrence and Notice.

To the extent either Party is prevented by Force Majeure from carrying out, in whole or part, its obligations under this Agreement and such Party (the "Claiming Party") gives notice and details of the Force Majeure to the other Party as soon as practicable, then, unless the terms of this Agreement specify otherwise, the Claiming Party shall be excused from the performance of its obligations related thereto. The Claiming Party shall remedy the Force Majeure with all reasonable dispatch. The non-Claiming Party shall not be required to perform or resume performance of its obligations to the Claiming Party corresponding to the obligations of the Claiming Party excused by Force Majeure.

4.3 Obligations.

No Party shall be relieved by operation of this Article 4 of any liability to pay for Products delivered hereunder or to make payments then due or which the Party is obligated to make with respect to performance which occurred prior to the Force Majeure.

4.4 Right to Terminate.

If a Force Majeure event prevents a Party from performing its material obligations under this Agreement for a period exceeding 180 consecutive days before the Commercial Operation Date or, after the Commercial Operation Date, for a period exceeding 240 consecutive days (despite the affected Party's effort to take all reasonable steps to remedy the effects of the Force Majeure with all reasonable dispatch), then the Party not affected by the Force Majeure event, with respect to its obligations under this Agreement, may terminate this Agreement by giving 10 days' prior notice to the other Party. Upon such termination, neither Party will have any liability to the other with respect to periods following the effective date of such termination, except for the right of first offer set forth in Section 3.1.14 and as otherwise expressly provided in this Agreement; 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.

ARTICLE 5
EVENTS OF DEFAULT; REMEDIES

5.1 Events of Default.

An "Event of Default" shall mean, with respect to a Party (a "Defaulting Party"), the occurrence of any of the following:

5.1.1 in the case of the Seller, the occurrence of a Material Adverse Change with respect to Seller or its Guarantor; provided, such Material Adverse Change shall not be considered an Event of Default if Seller establishes and maintains for so long as the Material Adverse Change is continuing, Performance Assurance to PGE in an amount equivalent to the Termination Payment as determined under Section 5.3 and in accordance with Section 9.3;

5.1.2 the failure to make, when due, any payment required pursuant to this Agreement if such failure is not remedied within 10 Business Days after written notice;

5.1.3 any representation or warranty made by such Party in this Agreement is false or misleading in any material respect when made or when deemed made or repeated if such inaccuracy is not cured within 30 days after the non-defaulting Party gives the defaulting Party a notice of default;

5.1.4 if a Party fails to deliver or receive Product as required by this Agreement, and such failure occurs for more than five consecutive Days or on 10 Days out of any Contract Year (it being the intent of the Parties that other failures to deliver or receive Product in any Contract Year will be governed by Article 6);

5.1.5 such Party becomes Bankrupt;

5.1.6 the occurrence of a Merger Event with respect to such Party or its Guarantor that is not cured within 10 Business Days of notice by the other Party;

5.1.7 in the case of Seller, Seller's failure to establish, maintain, extend or increase Performance Assurance when required pursuant to this Agreement;

5.1.8 in the case of Seller, if the average quantity of Facility Output delivered by the Facility during any Rolling Period is less than 50% of Expected Output;

5.1.9 in the case of Seller, the occurrence of a Letter of Credit Default;

5.1.10 with respect to Seller's Guarantor, if any, the occurrence of a Guaranty Default;

5.1.11 in the case of Seller, the occurrence of an Event of Default under Section 3.1.7(d); or

5.1.12 the failure to perform any material covenant or obligation set forth in this Agreement for which an exclusive remedy is not provided in this Agreement and which is not addressed in any other Event of Default, if the failure is not cured within 30 days after the non-defaulting Party gives the defaulting Party notice of the default; provided that if such default is not reasonably capable of being cured within the 30 day cure period but is reasonably capable of being cured within a 60 day cure period, the defaulting Party will have such additional time (not exceeding an additional 30 days) as is reasonably necessary to cure, if, prior to the end of the thirty (30) day cure period the defaulting Party provides the non-defaulting Party a remediation plan, the non-defaulting party approves such remediation plan, and the defaulting Party promptly commences and diligently pursues the remediation plan.

5.2 Declaration of an Early Termination Date and Calculation of Settlement Amounts.

5.2.1 Early Termination Date. If an Event of Default with respect to a Defaulting Party shall have occurred at any time during the Term and be continuing, the other Party (the "Non-Defaulting Party") shall have the right to (i) designate a day, no earlier than the day such notice is effective and no later than 20 days after such notice is effective, as an early termination date ("Early Termination Date") on which to liquidate, terminate, and accelerate all amounts owing between the Parties, (ii) withhold any payments due to the Defaulting Party under this Agreement and (iii) suspend performance. If an Early Termination Date has been designated, the Non-Defaulting Party shall calculate, in a commercially reasonable manner, its Gains or Losses and Costs resulting from the termination of this Agreement as of the Early Termination Date and the Termination Payment (hereinafter defined) payable hereunder shall be calculated in accordance with Section 5.2.2 below.

5.2.2 Calculation of Settlement Amounts. The Gains or Losses resulting from the termination of this Agreement shall be determined by calculating the amount that would be incurred or realized to replace or to provide the economic equivalent of the remaining payments or deliveries in respect of this Agreement. The Gains or Losses shall be calculated for a period equal to the remaining Term ("Settlement Period"). The quantity of Energy in each month of the Settlement Period shall be equal to the hours in such month (or portion thereof) multiplied by the Expected Capacity ("Settlement Energy"). The Non-Defaulting Party (or its agent) may determine its Gains and Losses by reference to information either available to it internally or supplied by one or more third parties including, without limitation, quotations (either firm or indicative) of relevant rates, prices, yields, yield curves, volatilities, spreads or other relevant market data in the relevant markets. Third parties supplying such information may include, without limitation, dealers in the relevant markets, end-users of the relevant product, information vendors and other sources of market information. However, it is expressly agreed that (a) a Party shall not be required to enter into a replacement agreement in order to determine the Termination Payment and (b) a Party's Gains, Losses or Costs will in no event include any penalties, ratcheted demand or similar charges.

5.3 Termination Payment.

The "Termination Payment" shall equal the sum of all amounts owed by the Defaulting Party to the Non-Defaulting Party under this Agreement, including a Settlement Amount (if any), less any amounts owed by the Non-Defaulting Party to the Defaulting Party determined as of the Early Termination Date.

5.4 Notice of Payment of Termination Payment.

As soon as practicable after calculating the Termination Payment, the Non-Defaulting Party shall give notice to the Defaulting Party of the amount of the Termination Payment and whether the Termination Payment is due to or due from the Non-Defaulting Party. The notice shall include a written statement explaining in reasonable detail the calculation of such amount. If the Termination Payment is due from the Defaulting Party, the Termination Payment shall be made by the Defaulting Party within two (2) Business Days after such notice is effective. Notwithstanding any provision to the contrary contained in this Agreement, the Non-Defaulting Party shall not be required to pay to the Defaulting Party any amount under this Article 5 until the earlier of (i) the date the Non-Defaulting Party receives confirmation satisfactory to it in its reasonable discretion (which may include an opinion of its counsel) that all other obligations of any kind whatsoever of the Defaulting Party to make any payments to the Non-Defaulting Party under this Agreement or otherwise which are due and payable as of the Early Termination Date have been fully and finally performed, or (ii) 180 days after the Early Termination Date.

5.5 Disputes with Respect to Termination Payment.

If the Defaulting Party disputes the Non-Defaulting Party's calculation of the Termination Payment in whole or in part, the Defaulting Party shall, within 10 Business Days of receipt of Non-Defaulting Party's calculation of the Termination Payment provide to the Non-

Defaulting Party a detailed written explanation of the basis for such dispute; provided, however, that if the Termination Payment is due from the Defaulting Party, the Defaulting Party shall pay the non-disputed amount of the Termination Payment as provided in Section 5.4 and transfer, within two (2) Business Days, Performance Assurance to the Non-Defaulting Party in an amount equal to the disputed amount of the Termination Payment.

5.6 Closeout Setoffs.

After calculation of a Termination Payment in accordance with Section 5.3, if the Defaulting Party would be owed the Termination Payment, the Non-Defaulting Party shall be entitled, at its option and in its discretion, to set off against such Termination Payment any amounts due and owing by the Defaulting Party to the Non-Defaulting Party under any other agreements, instruments or undertakings between the Defaulting Party and the Non-Defaulting Party. The remedy provided for in this Section 5.6 shall be without prejudice and in addition to any right of setoff, combination of accounts, lien or other right to which the Non-Defaulting Party is at any time otherwise entitled (whether by operation of law, contract or otherwise).

5.7 Suspension of Performance.

Notwithstanding any other provision of this Agreement, if an Event of Default shall have occurred and be continuing, the Non-Defaulting Party, upon written notice to the Defaulting Party, shall have the right (i) to suspend performance under this Agreement; provided, however, in no event shall any such suspension continue for longer than ten (10) Business Days with respect to any single Scheduled Product unless an early Termination Date shall have been declared and notice thereof pursuant to Section 5.2 given, and (ii) to the extent an Event of Default shall have occurred and be continuing to exercise any remedy available at law or in equity.

5.8 Post-Termination PURPA Status.

If this Agreement is terminated because of a default by Seller, neither Seller nor any Affiliate of Seller, nor any successor to Seller with respect to the ownership of the Facility or Site, on whose behalf Seller acts herein as agent, may thereafter require or seek to require PGE to make any purchases from the Facility or any electric generation facility constructed on the Site under PURPA, or any other Law, for any periods that would have been within the Term had this Agreement remained in effect. Seller, on behalf of itself and on behalf of any other entity on whose behalf it may act, hereby waives its rights to require PGE to do so. On or before the Effective Date, the Parties shall execute and record, in the appropriate real property records of the Counties in which the Facility or Site is situated, and any federal agency as applicable, a memorandum in form acceptable to PGE to provide constructive notice to third parties of Seller's agreements under this Section 5.8.

ARTICLE 6
REMEDIES FOR FAILURE TO DELIVER/RECEIVE

6.1 Remedy for Seller's Failure to Deliver.

6.1.1 Liquidated Damages Due to PGE. If Seller fails to Schedule and/or deliver all or part of the Product pursuant to this Agreement, and such failure is not excused under the terms of this Agreement or by PGE's failure to perform, then Seller shall pay PGE within five (5) Business Days of invoice receipt, an amount for such deficiency equal to the positive difference, if any, obtained by subtracting the Contract Price from the Replacement Price. The invoice for such amount shall include a written statement explaining in reasonable detail the calculation of such amount.

6.1.2 Calculation of Replacement Price. The "Replacement Price" in regard to any Product Scheduled but not delivered to PGE, or generated by the Facility but not Scheduled to the Delivery Point, shall be the price at which PGE either:

(a) purchased a replacement for any such Product in a commercially reasonable manner, adding any:

(i) costs reasonably incurred by PGE in replacing such Product; and

(ii) additional transmission charges, if any, reasonably incurred by PGE in delivering such Product to the Delivery Point;

(b) or, absent a purchase, then the market price at Mid-Columbia plus the REC Price Component, for such Product not delivered, as determined by PGE in a commercially reasonable manner.

However, in no event shall such price include any penalties, ratcheted demand or similar charges, nor shall PGE be required to utilize or change its utilization of its owned or controlled assets, including contractual assets, or market positions to minimize Seller's liability.

6.2 PGE's Failure to Receive.

6.2.1 Liquidated Damages Due to Seller. If PGE fails to receive all or part of the Product Scheduled pursuant to this Agreement and such failure is not excused under the terms of this Agreement or by Seller's failure to perform, then PGE shall pay Seller, on the date payment would otherwise be due in respect of the Month in which the failure occurred or within five (5) Business Days of invoice receipt, an amount for such deficiency equal to the positive difference, if any, obtained by subtracting the Sales Price from the Contract Price associated with the amount of Product Scheduled by Seller but not received by PGE. The invoice for such amount shall include a written statement explaining in reasonable detail the calculation of such amount.

6.2.2 Calculation of Sales Price. The Sales Price in regard to any Product Scheduled to the Delivery Point but not received by PGE shall be the price at which Seller:

(a) resells for delivery any such Product in a commercially reasonable manner, deducting from such proceeds any:

(i) costs reasonably incurred by Seller in reselling such Product; and

(ii) additional transmission charges, if any, reasonably incurred by Seller in delivering such Product to third party purchasers at the Mid-Columbia.

(b) or, absent a sale, the market price at the Delivery Point for such Product not received as determined by Seller in a commercially reasonable manner.

However, in no event shall such price include any penalties, ratcheted demand or similar charges, nor shall Seller be required to utilize or change its utilization of its owned or controlled assets, including contractual assets, or market positions to minimize PGE's liability.

6.3 Duty to Mitigate.

Subject to Sections 6.1.2 and 6.2.2, each Party agrees that it has a duty to mitigate damages and covenants that it will use commercially reasonable efforts to minimize any damages it may incur as a result of the other Party's performance or non-performance of this Agreement.

6.4 Acknowledgement of the Parties.

The Parties stipulate that the payment obligations set forth in this Article 6 are reasonable in light of the anticipated harm and the difficulty of estimation or calculation of actual damages and waive the right to contest such payments as an unreasonable penalty. If either Party fails to pay undisputed amounts in accordance with this Article 6 when due, the other Party shall have the right to: (i) suspend performance until such amounts plus interest at the Interest Rate have been paid, and/or (ii) exercise any remedy available at Law or in equity to enforce payment of such amount plus interest at the Interest Rate. With respect to the amount of such damages only, the remedy set forth in this Article 6 shall be the sole and exclusive remedy of the Parties for the failure of Seller to sell and deliver, and PGE to purchase and receive the Product and all other damages and remedies are hereby waived. Disagreements with respect to the calculation of damages pursuant to this Article 6 may be submitted by either Party for resolution in accordance with applicable law.

6.5 Survival.

The provisions of this Article 6 shall survive the expiration or termination of this Agreement for any reason.

ARTICLE 7
PAYMENT AND NETTING

7.1 Billing Period.

Unless otherwise specifically agreed upon by the Parties, the Month shall be the standard period for all payments under this Agreement (other than for Seller or PGE failure under Sections 6.1 and 6.2 respectively and for termination under Section 5.4). On or before the tenth (10th) day of each Month, each Party shall render to the other Party an invoice for the payment obligations, if any, incurred hereunder during the preceding Month.

7.2 Timeliness of Payment.

Unless otherwise agreed by the Parties, all invoices under this Agreement shall be due and payable in accordance with each Party's invoice instructions on or before the later of the twentieth (20th) day of each Month, or the tenth (10th) day after receipt of the invoice or, if such day is not a Business Day, then on the next Business Day. Each Party will make payments by electronic funds transfer, or by other mutually agreeable method(s), to the account designated by the other Party. Any amounts not paid by the due date will be deemed delinquent and will accrue interest at the Interest Rate, such interest to be calculated from and including the due date to but excluding the date the delinquent amount is paid in full.

7.3 Disputes and Adjustments of Invoices.

A Party may, in good faith, dispute the correctness of any invoice or any adjustment to an invoice, rendered under this Agreement or adjust any invoice for any arithmetic or computational error within twenty-four (24) months of the date the invoice, or adjustment to an invoice, was rendered. In the event an invoice or portion thereof, or any other claim or adjustment arising hereunder, is disputed, payment of the undisputed portion of the invoice shall be required to be made when due, with notice of the objection given to the other Party. Any invoice dispute or invoice adjustment shall be in writing and shall state the basis for the dispute or adjustment. Payment of the disputed amount shall not be required until the dispute is resolved. Upon resolution of the dispute, any required payment shall be made within 10 Business Days of such resolution along with interest accrued at the Interest Rate from and including the due date to but excluding the date paid. Inadvertent overpayments shall be returned upon request or deducted by the Party receiving such overpayment from subsequent payments, with interest accrued at the Interest Rate from and including the date of such overpayment to but excluding the date repaid or deducted by the Party receiving such overpayment. Any dispute with respect to an invoice is waived unless the other Party is notified in accordance with this Section 7.3 within twenty-four (24) months after the invoice is rendered or any specific adjustment to the invoice is made. If an invoice is not rendered within twelve (12) months after the close of the Month during which performance of this Agreement occurred, the right to payment for such performance is waived.

7.4 Netting of Payments.

The Parties hereby agree that they shall discharge mutual debts and payment obligations due and owing to each other on the same date through netting, in which case all amounts owed by one Party to the other Party during the monthly billing period under this Agreement, including any related damages calculated pursuant to Article 5 (unless one of the Parties elects to accelerate payment of such amounts as permitted by Article 6), interest, and payments or credits, shall be netted so that only the excess amount remaining due shall be paid by the Party who owes it.

7.5 Payment Obligation Absent Netting.

If no mutual debts or payment obligations exist and only one Party owes a debt or obligation to the other during the monthly billing period, including, but not limited to, any related damage amounts calculated pursuant to Article 6, interest, and payments or credits, that Party shall pay such sum in full when due.

ARTICLE 8
LIMITATIONS

8.1 Essential Purposes. THE PARTIES CONFIRM THAT THE EXPRESS REMEDIES AND MEASURES OF DAMAGES PROVIDED IN THIS AGREEMENT SATISFY THE ESSENTIAL PURPOSES OF THIS AGREEMENT.

8.2 Exclusive Remedies. FOR BREACH OF ANY PROVISION FOR WHICH AN EXPRESS REMEDY OR MEASURE OF DAMAGES IS PROVIDED, SUCH EXPRESS REMEDY OR MEASURE OF DAMAGES SHALL BE THE SOLE AND EXCLUSIVE REMEDY, THE OBLIGOR'S LIABILITY SHALL BE LIMITED AS SET FORTH IN SUCH PROVISION AND ALL OTHER REMEDIES OR DAMAGES AT LAW OR IN EQUITY ARE WAIVED.

8.3 Direct Damages. IF NO REMEDY OR MEASURE OF DAMAGES IS EXPRESSLY PROVIDED HEREIN, THE OBLIGOR'S LIABILITY SHALL BE LIMITED TO DIRECT ACTUAL DAMAGES ONLY, SUCH DIRECT ACTUAL DAMAGES SHALL BE THE SOLE AND EXCLUSIVE REMEDY AND ALL OTHER REMEDIES OR DAMAGES AT LAW OR IN EQUITY ARE WAIVED.

8.4 No Consequential Damages. EXCEPT AS PROVIDED IN SECTION 6 OR AS OTHERWISE EXPRESSLY PROVIDED IN THIS AGREEMENT, NEITHER PARTY SHALL BE LIABLE FOR CONSEQUENTIAL, INCIDENTAL, PUNITIVE, EXEMPLARY OR INDIRECT DAMAGES, LOST PROFITS OR OTHER BUSINESS INTERRUPTION DAMAGES, BY STATUTE, IN TORT OR CONTRACT, UNDER ANY INDEMNITY PROVISION OR OTHERWISE.

8.5 Causes Disregarded. IT IS THE INTENT OF THE PARTIES THAT THE LIMITATIONS IMPOSED IN THIS AGREEMENT ON REMEDIES AND THE MEASURE OF DAMAGES BE WITHOUT REGARD TO THE CAUSE OR CAUSES RELATED

THERETO, INCLUDING THE NEGLIGENCE OF ANY PARTY, WHETHER SUCH NEGLIGENCE BE SOLE, JOINT OR CONCURRENT, OR ACTIVE OR PASSIVE.

8.6 Liquidated Damages. TO THE EXTENT ANY DAMAGES REQUIRED TO BE PAID UNDER THIS AGREEMENT ARE LIQUIDATED, THE PARTIES ACKNOWLEDGE THAT THE DAMAGES ARE DIFFICULT OR IMPOSSIBLE TO DETERMINE, OR OTHERWISE OBTAINING AN ADEQUATE REMEDY IS INCONVENIENT, AND THE DAMAGES CALCULATED UNDER THIS AGREEMENT CONSTITUTE A REASONABLE APPROXIMATION OF THE HARM OR LOSS.

ARTICLE 9
CREDIT AND COLLATERAL REQUIREMENTS

9.1 Pre-COD Security.

9.1.1 Amount of Pre-COD Security. On or before the date specified in Section 3.1.7(a)(i), Seller shall post and maintain Performance Assurance in favor of PGE, equal in each case to $25 per kW of Expected Capacity (the "Pre-COD Security"). Any Person providing a guaranty for Seller shall provide within five Business Days from receipt of a written request from PGE all reasonable financial records necessary for PGE to confirm Seller and/or the guarantor satisfies the Credit Requirements.

9.1.2 Use of Pre-COD Security to Pay Delay Damages. If the Commercial Operation Date occurs after the Expected Commercial Operation Date and Seller has failed to pay any Delay Damages when due under Section 3.1.12, PGE shall be entitled to and shall draw upon the Pre-COD Security an amount equal to the Delay Damages until such time as the Pre-COD Security is exhausted. PGE shall also be entitled to draw upon the Pre-COD Security for Contract Termination Damages.

9.1.3 Termination of Pre-COD Security. Seller shall no longer be required to maintain the Pre-COD Security (or the remaining balance thereof) after the Commercial Operation Date, if at such time no damages are owed to PGE under this Agreement. However, as of the Commercial Operation Date, Seller may elect to apply the Pre-COD Security toward the Delivery Period Security required by Section 9.2, including by the automatic continuation (as opposed to the replacement) thereof.

9.2 Delivery Period Security.

9.2.1 Duty to Post Delivery Period Security. Beginning on the Commercial Operation Date, at any time during the Term when Seller does not satisfy the Credit Requirements, Seller shall post and maintain Performance Assurance in favor of PGE as provided in this Section 9.2 (the "Delivery Period Security"). If Seller posts Delivery Period Security and thereafter satisfies the Credit Requirements, as demonstrated to the reasonable satisfaction of PGE, then Seller shall be entitled to a release by PGE of the Delivery Period Security for so long as Seller continues to satisfy the Credit Requirements. Seller and any party providing a guaranty for Seller shall provide within five Business Days from receipt of a written request from PGE all reasonable financial

records necessary for PGE to confirm Seller and/or the guarantor satisfies the Credit Requirements.

9.2.2 Amount of Delivery Period Security. The amount of the Delivery Period Security required by Section 9.2.1 shall be sufficient to provide replacement power and corresponding RECs under this Agreement for the next 18 calendar months. This amount shall be deemed equal to the positive difference between (a) the forward power prices at Mid-Columbia (as determined by PGE in good faith using information from a commercially reasonable independent source) for the next 18 calendar months (or, if the remaining Term is less than 18 calendar months), then for the remainder of the Term), multiplied by 110 percent, plus the REC Price Component, minus (b) the Contract Price, multiplied by the MWhs that would be delivered for such period under this Agreement (assuming Facility Output based on the total of the estimated monthly output set forth on Exhibit C for that period); provided, however, that the Delivery Period Security shall in no event be less than an amount equal to the Facility's expected gross revenues for the next 12 months (assuming Facility Output based on the total of the estimated monthly output set forth on Exhibit C for that period).

9.2.3 Adjustments to Delivery Period Security. On or before January 31st of each year during the Term, Seller shall (a) adjust the Delivery Period Security by increasing or decreasing the Delivery Period Security to correspond to the amount reasonably determined by PGE under Section 9.2.2 and (b) deliver such adjusted Delivery Period Security to PGE. PGE shall notify Seller of the determination of such amount on or before the preceding December 1.

9.3 Grant of Security Interest/Remedies.

To secure its obligations under this Agreement and to the extent Seller delivers Performance Assurance, Seller hereby grants to PGE a present and continuing security interest in, and lien on (and right of setoff against), and assignment of, all cash collateral and cash equivalent collateral and any and all proceeds resulting therefrom or the liquidation thereof, whether now or hereafter held by, on behalf of, or for the benefit of, PGE, and Seller agrees to take such action as PGE reasonably requires in order to perfect PGE's first-priority security interest in, and lien on (and right of setoff against), such collateral and any and all proceeds resulting therefrom or from the liquidation thereof.

Upon or at any time after the occurrence and during the continuation of an Event of Default or an Early Termination Date affecting the Seller, PGE may do any one or more of the following: (i) exercise any of the rights and remedies of a secured party with respect to all Performance Assurance, including any such rights and remedies under law then in effect; (ii) exercise its rights of setoff against any and all property of the Seller in the possession of PGE or its agent; (iii) draw on any outstanding Letter of Credit issued for its benefit; and (iv) liquidate all Performance Assurance then held by or for the benefit of PGE free from any claim or right of any nature whatsoever of Seller, including any equity or right of purchase or redemption by Seller. PGE shall apply the proceeds of the collateral realized upon the exercise of any such rights or remedies to reduce the Seller's obligations under this Agreement (the Seller remaining

liable for any amounts owing to PGE after such application), subject to PGE's obligation to return any surplus proceeds remaining after such obligations are satisfied in full.

9.4 Holding Performance Assurance.

PGE will be entitled to hold Performance Assurance in the form of cash provided that the following conditions are satisfied: (i) PGE is not a Defaulting Party and a Material Adverse Change has not occurred and is continuing with respect to such Party and (ii) Performance Assurance is held only in a jurisdiction within the United States.

9.5 Interest Rate on Cash Collateral.

Performance Assurance in the form of cash shall bear interest at the Interest Rate on Cash Collateral and shall be paid to the Seller on the third Business Day of each Month. "Interest Rate on Cash Collateral" means the lesser of (i) the maximum amount allowed by applicable law and (ii) the Federal Funds Rate for the holding period. The "Federal Funds Rate" means the effective Federal Funds Rate as published daily by the Federal Reserves Bank H.15 Statistical Release website for each day of the holding period. Such interest shall be calculated on the basis of the actual number of days elapsed over a year of 360 days.

9.6 Performance Assurance is Not a Limit on Seller's Liability.

The Performance Assurance contemplated by this Article 9: (a) constitutes security for, but is not a limitation of, Seller's obligations under this Agreement, and (b) shall not be PGE's exclusive remedy for Seller's failure to perform in accordance with this Agreement. To the extent that PGE draws on any Pre-COD Security or Delivery Period Security, Seller shall replenish or reinstate the Pre-COD Security or Delivery Period Security to the full amount then required under this Article 9.

9.7 Waiver.

This Agreement sets forth the entire agreement of the Parties regarding credit, collateral, financial assurances and adequate assurances. Except as expressly set forth in this Agreement, including this Article 9, neither Party:

(a) has or will have any obligation to post margin, provide letters of credit, pay deposits, make any other prepayments or provide any other financial assurances, in any form whatsoever, or

(b) will have reasonable grounds for insecurity with respect to the creditworthiness of a Party that is complying with the relevant provisions of Article 9 of this Agreement; and all implied rights relating to financial assurances arising from Section 2-609 of the Uniform Commercial Code or case law applying similar doctrines, are hereby waived.

ARTICLE 10
GOVERNMENTAL CHARGES

10.1 Cooperation.

Each Party shall use reasonable efforts to implement the provisions of and to administer this Agreement in accordance with the intent of the Parties to minimize all taxes, so long as neither Party is materially adversely affected by such efforts.

10.2 Non-Sale Related Governmental Charges and Taxes.

Seller shall pay or cause to be paid all charges or taxes imposed by any government authority ("Governmental Charges") on or with respect to the Product arising prior to the Delivery Point. PGE shall pay or cause to be paid all Governmental Charges on or with respect to the Product at and from the Delivery Point (other than those related to the sale of the Product, which are the responsibility of Seller). In the event Seller is required by law or regulation to remit or pay Governmental Charges which are PGE's responsibility hereunder, PGE shall promptly reimburse Seller for such Governmental Charges. If PGE is required by law or regulation to remit or pay Governmental Charges which are Seller's responsibility hereunder, PGE may invoice Seller for the amount of any such Governmental Charges or, in its sole discretion, deduct the amount of any such Governmental Charges from the sums due to Seller under Article 7 of this Agreement. Nothing in this Agreement shall obligate or cause a Party to pay or be liable to pay any Governmental Charges for which it is exempt under the Law.

10.3 Sale-related Governmental Charges and Taxes.

In addition to all other payments required under this Agreement, Seller shall be solely responsible for all existing and any new sales, use, excise, ad valorem, and any other similar taxes imposed or levied by any federal, state or local governmental agency on the Product sold and delivered hereunder (including any taxes imposed or levied with respect to the transmission of such energy) up to the delivery of such Product to the Delivery Point.

10.4 Indemnification.

Each Party shall indemnify, release, defend and hold harmless the other Party from and against any and all liability for taxes imposed or assessed by any taxing authority with respect to the Product sold, delivered and received hereunder that are the responsibility of such Party pursuant to this Article 10.

ARTICLE 11
RATES AND TERMS BINDING;
FERC STANDARD OF REVIEW

11.1 Mobile-Sierra Doctrine.

Absent the agreement of all Parties to the proposed change, the standard of review for changes to any rate, charge, classification, term or condition of this Agreement, proposed by a Party (to the extent that any waiver in subsection (2) below is unenforceable or ineffective as to

such Party), or FERC acting *sua sponte*, shall solely be the "public interest" application of the "just and reasonable" 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) and clarified by Morgan Stanley Capital Group, Inc. v. Public Util. Dist. No. 1 of Snohomish 554 U.S. __ (2008) (the "Mobile-Sierra" doctrine).

In addition, and notwithstanding the foregoing subsection (1), to the fullest extent permitted by applicable law, each Party, for itself and its successors and assigns, hereby expressly and irrevocably waives any rights it can or may have, now or in the future, whether under §§ 205 and/or 206 of the Federal Power Act or otherwise, to seek to obtain from FERC by any means, directly or indirectly (through complaint, investigation or otherwise), and each hereby covenants and agrees not at any time to seek to so obtain, an order from FERC changing any Section of this Agreement specifying the rate, charge, classification, or other term or condition agreed to by the Parties, it being the express intent of the Parties that, to the fullest extent permitted by applicable law, neither Party shall unilaterally seek to obtain from FERC any relief changing the rate, charge, classification, or other term or condition of this Agreement, notwithstanding any subsequent changes in applicable law or market conditions that may occur. In the event it were to be determined that applicable law precludes the Parties from waiving their rights to seek changes from FERC to their market-based power sales contracts (including entering into covenants not to do so) then this subsection (2) shall not apply, provided that, consistent with the foregoing subsection (1), neither Party shall seek any such changes except solely under the "public interest" application of the "just and reasonable" standard of review and otherwise as set forth in the foregoing subsection (1).

ARTICLE 12
REPRESENTATIONS AND WARRANTIES; INDEMNITY

12.1 Representations and Warranties.

On the Effective Date and throughout the Term, each Party represents and warrants to the other Party that:

12.1.1 it is duly organized, validly existing and in good standing under the laws of the jurisdiction of its formation;

12.1.2 it has all regulatory authorizations necessary for it to legally perform its obligations under this Agreement;

12.1.3 the execution, delivery and performance of this Agreement are within its powers, have been duly authorized by all necessary action and do not violate any of the terms and conditions in its governing documents, any contracts to which it is a party or any law, rule, regulation, order or the like applicable to it;

12.1.4 this Agreement, and each other document executed and delivered in accordance with this Agreement constitutes its legally valid and binding obligation enforceable against it in accordance with its terms; subject only to any Equitable Defenses;

12.1.5 it is not Bankrupt and there are no proceedings pending or being contemplated by it or, to its knowledge, threatened against it which would result in it being or becoming Bankrupt;

12.1.6 there is not pending or, to its knowledge, threatened against it or any of its Affiliates any legal proceedings that could materially adversely affect its ability to perform its obligations under this Agreement;

12.1.7 no Event of Default with respect to it has occurred and is continuing and no such event or circumstance would occur as a result of its entering into or performing its obligations under this Agreement;

12.1.8 it is acting for its own account, has made its own independent decision to enter into this Agreement and as to whether this Agreement is appropriate or proper for it based upon its own judgment, is not relying upon the advice or recommendations of the other Party in so doing, and is capable of assessing the merits of and understanding, and understands and accepts, the terms, conditions and risks of this Agreement;

12.1.9 it has entered into this Agreement in connection with the conduct of its business and it has the capacity or ability to make or take delivery of all Products referred to in this Agreement;

12.1.10 the material economic terms of this Agreement were subject to individual negotiation by the Parties;

12.1.11 it, and any guarantor of its obligations under this Agreement, is an "eligible contract participant" within the meaning of the Commodity Exchange Act.

12.2 Indemnity.

To the fullest extent permitted by law, each Party (the "Indemnitor") hereby indemnifies and agrees to defend and hold harmless the other Party (the "Indemnitee") from and against any Indemnity Claims caused by, resulting from, relating to or arising out of any act or incident involving or related to the Product and occurring at any time when such Product is under the Indemnitor's possession and control; provided, however, that the Indemnitor shall not have any obligation to indemnify the Indemnitee from or against any Indemnity Claims caused by, resulting from, relating to or arising out of the gross negligence or intentional misconduct of the Indemnitee.

12.3 Additional Representations and Warranties of Seller.

Seller hereby further represents and warrants to PGE that:

12.3.1 Seller has the right to sell the Product to PGE free and clear of liens of encumbrances;

12.3.2 Seller has title to the Product sold under this Agreement free and clear of liens and encumbrances;

12.3.3 Seller is authorized to sell power at market-based rates pursuant to FERC Dockets Number ER [_____];

12.3.4 The Facility is either an EWG or a QF;

12.3.5 Seller has obtained, or will obtain as and when required by this Agreement, all Permits and all other rights and agreements required to construct, own, operate and maintain the Facility, and they will be in full force and effect for the Term;

12.3.6 All leases of real property and other real property rights and agreements required for the operation of the Facility or the performance of any obligations of Seller under this Agreement have been obtained and are owned by Seller, free and clear of liens and encumbrances;

12.3.7 Except as disclosed on Exhibit E, neither Seller nor any Affiliate of Seller has entered into any document, arrangement, understanding, promise or agreement or the like with any Person concerning, with respect to the Facility, (i) remediation or mitigation of environmental impacts, (ii) endangered species, (iii) migratory birds (including eagles), (iv) wildlife and species of conservation concern (state and federal), (v) environmentally, culturally or historically sensitive property or resources, (vi) a military facility, or (vii) national security. In addition, neither Seller nor any Affiliate of Seller has entered into any agreement where public disclosure of the agreement or the subject matter of the agreement could reasonably be expected to negatively affect the Facility's reputation.

12.3.8 Except as disclosed in Exhibit J, there is no litigation, legal action or administrative action pending with respect to the Facility nor, to Seller's knowledge, is any such litigation. legal action or administrative action threatened.

12.3.9 Seller has at all times been fully compliant with the requirements of the Federal Trade Commission's "Green Guides," 77 F.R. 62122, 16 C.F.R. Part 260, as amended or restated in any communication concerning Facility Output, the Facility or the RECs.

12.4 No Other Representations or Warranties. Each Party acknowledges that it has entered into this Agreement in reliance upon only the representations and warranties set forth in this Agreement, and that no other representations or warranties have been made by the other Party with respect to the subject matter of this Agreement.

ARTICLE 13 INSURANCE

13.1 Insurance. During the Term, Seller shall secure and continuously carry the following insurance coverage:

13.1.1 Commercial general liability insurance with a minimum combined single limit of $1,000,000 per occurrence and in the annual aggregate, with coverage for bodily injury, personal injury and broad form property damage, contractual liability, products and completed operations.

13.1.2 Workers' compensation insurance to cover statutory limits of the worker's compensation laws and employers liability insurance with a minimum limit of $1,000,000.

13.1.3 Business automobile liability insurance (including coverage for owned, non-owned, and hired automobiles) used in connection with the Facility in an amount not less than $1,000,000 per accident for combined bodily injury, property damage or death. To the extent that the Seller does not own automobiles, coverage for non-owned and hired automobiles may be combined with commercial general liability.

13.1.4 Umbrella/excess insurance covering claims in excess of the underlying insurance described in Sections 13.1.1, 13.1.2 (employers liability only) and 13.1.3 with a $5,000,000 minimum per occurrence and annual aggregate.

13.1.5 All-risk property insurance including boiler & machinery coverage insuring Seller's property at replacement cost value.

13.2 Seller to Provide Certificate of Insurance. All policies required, with the exception of workers' compensation employers liability and business automobile liability, shall include (i) endorsement(s) naming PGE as an additional insured but only to the extent of Indemnitee's indemnifications as stated in Section 13.1, and (ii) a cross-liability and severability of interest clause. Said policies shall also contain provisions that such insurance is primary insurance without right of contribution of any other insurance carried by or on behalf of PGE with respect to its interests as additional insured. A certificate of insurance showing that the above-required insurance is in full force and effect (on Accord or similar form) shall be furnished to PGE. All policies shall be placed with companies with a minimum A.M. Best rating of A- IX. Seller shall deliver copies of all certificates of insurance to PGE within thirty (30) days of the Effective Date.

13.3 Seller to Notify PGE of Loss of Coverage. Seller or Seller's insurers shall endeavor to provide PGE thirty (30) days notice (or ten (10) days in the case of cancellation due to non-payment of premiums) in the event of any material change to, cancellation or non-renewal of the required insurance.

ARTICLE 14
TITLE AND RISK OF LOSS

Title and risk of loss related to the Product shall transfer from Seller to PGE at the Delivery Point, except that title to RECs shall transfer to PGE when generated and shall be measured at the Facility Meter. Seller represents and warrants that it will deliver all Product to PGE free and clear of all liens, security interests, claims and encumbrances or any interest therein or thereto by any Person arising prior to the Delivery Point.

ARTICLE 15
ASSIGNMENT; BINDING EFFECT

15.1 Assignment.

Neither Party shall assign this Agreement or its rights hereunder to any entity whose Credit Rating is not equal to or higher than that of such Party and is at least above BBB- by S&P and Baa3 by Moody's. No assignment may be made without the prior written consent of the other Party, which consent shall not be unreasonably withheld or delayed; provided, however, either Party may, without the consent of the other Party (and without relieving itself from liability hereunder), (i) transfer, sell, pledge, encumber or assign this Agreement or the accounts, revenues or proceeds hereof in connection with any financing or other financial arrangements, (ii) transfer or assign this Agreement to an Affiliate of such Party which Affiliate's Credit Rating is equal to or higher than that of such Party, or (iii) transfer or assign this Agreement to any person or entity succeeding to all or substantially all of its assets whose Credit Rating is equal to or higher than that of such Party; provided, however, that in each such case, any such assignee shall agree in writing to be bound by the terms and conditions hereof and so long as the transferring Party delivers such tax and enforceability assurance as the non-transferring Party may reasonably request.

15.2 Change in Control.

No direct or indirect change in the control of Seller may occur without PGE's prior written consent, not to be unreasonably withheld, conditioned or delayed.

15.3 Binding Effect.

This Agreement shall inure to the benefit of and be binding upon the Parties and their respective successors and permitted assigns. No assignment or transfer permitted hereunder shall relieve the assigning or transferring Party of any of its obligations under this Agreement.

ARTICLE 16
GOVERNING LAW

THIS AGREEMENT AND THE RIGHTS AND DUTIES OF THE PARTIES HEREUNDER SHALL BE GOVERNED BY AND CONSTRUED, ENFORCED AND PERFORMED IN ACCORDANCE WITH THE LAWS OF THE STATE OF OREGON, WITHOUT REGARD TO ITS PRINCIPLES OF CONFLICTS OF LAW.

ARTICLE 17
RECORDS AND AUDIT

17.1 Records.

Each Party shall keep proper books of records and account, in which full and correct entries shall be made of all dealings in relation to this Agreement in accordance with generally accepted accounting principles, consistently applied.

17.2 Audit Rights.

Each Party has the right, at its sole expense and during normal working hours, to examine the records of the other Party to the extent reasonably necessary to verify the accuracy of any statement, charge or computation made pursuant to this Agreement. If requested, a Party shall provide to the other Party statements evidencing the quantity of Product delivered at the Delivery Point. If any such examination reveals any inaccuracy in any statement, the necessary adjustments in such statement and the payments thereof will be made promptly and shall bear interest calculated at the Interest Rate from the date the overpayment or underpayment was made until paid; provided, however, that no adjustment for any statement or payment will be made unless objection to the accuracy thereof was made prior to the lapse of twenty-four (24) months from the rendition thereof, and thereafter any objection shall be deemed waived.

ARTICLE 18
DISPUTE RESOLUTION

18.1 Referral to Senior Management

In the event of any controversy, claim or dispute between the Parties arising out of or related to this Agreement ("Dispute"), the Parties' representatives will first attempt to resolve the Dispute informally through negotiation and consultation. If they are unable to do so, then within three (3) Business Days following the date of delivery of a written request by either Party, (i) each Party shall appoint as its representative a senior officer, and (ii) such senior officers shall meet, negotiate and attempt in good faith to resolve the Dispute quickly, informally and inexpensively.

18.2 Mediation.

Any Dispute that is not resolved pursuant to Section 18.1 may be submitted for mediation before a single mediation in accordance with the provisions contained herein and in accordance with the Commercial Mediation Procedures of the AAA in effect at the time of the mediation ("AAA Procedures"); provided, however, that in the event of any conflict between the procedures herein and the AAA Procedures the procedures herein shall control. The mediator will be named by mutual agreement of the Parties or by obtaining a list of five (5) qualified Persons from the Parties and alternately striking names. All mediation shall be administered by the AAA. All mediation shall take place in the City of Portland, Oregon, unless otherwise agreed to by the Parties. Each Party shall be required to exchange documents to be used in the mediation not less than five (5) Business Days prior to the mediation. The Parties shall use all commercially reasonable efforts to conclude the mediation as soon as practicable. All aspects of the mediation shall be treated as confidential. Neither the Parties nor any mediator may disclose the content or results of the mediation, except as necessary to comply with legal, audit or regulatory requirements. Before making any such disclosure, a Party shall give written notice to the other Party and shall afford such Party a reasonable opportunity to protect its interests. Each Party shall be responsible for its own expenses and one-half of any mediation expenses incurred to resolve the dispute. The mediator will provide the Parties with a fee and expense schedule in advance of mediation. Mediation will terminate by: (a) written agreement signed by both Parties, (b) determination by the mediator that the Parties are at an unresolvable impasse, or (c)

two unexcused absences by either Party from the mediation sessions. The mediator will never participate in any claim or controversy covered by this Article as a witness, collateral contract, or attorney and may not be called as a witness to testify in any proceeding involving the subject matter of mediation. O.R.S. §§ 36.100 to 36.238 will apply to the entire process of mediation.

18.3 Legal ActionIf the Parties are still unable to resolve their differences after good faith consideration of a resolution through mediation pursuant to Section 18.2, then each of the Parties hereby irrevocably consents and agrees that any legal action or proceedings with respect to this Agreement may be brought in any of the courts of the State of Oregon located in the City of Portland or the courts of the United States of America for the District of Oregon having subject matter jurisdiction. By execution and delivery of this Agreement and such other documents executed in connection herewith, each Party hereby (a) accepts the exclusive jurisdiction of the aforesaid courts, (b) irrevocably agrees to be bound by any final judgment (after any and all appeals) of any such court with respect to such documents, (c) irrevocably waives, to the fullest extent permitted by law, any objection it may now or hereafter have to the laying of venue of any action or proceeding with respect to such documents brought in any such court, and further irrevocably waives, to the fullest extent permitted by law, any claim that any such action or proceeding brought in any such court has been brought in any inconvenient forum, (d) agrees that services of process in any such action or proceeding may be effected by mailing a copy thereof by registered or certified mail (or any substantially similar form of mail), postage prepaid, to such Party at its address set forth in Exhibit A, or at such other address of which the Parties have been notified.

18.4 Waiver of Jury Trial. EACH PARTY IRREVOCABLY WAIVES, TO THE FULLEST EXTENT PERMITTED BY APPLICABLE LAW, ANY AND ALL RIGHTS TO TRIAL BY JURY IN ANY LEGAL PROCEEDING ARISING OUT OF OR RELATING TO THIS AGREEMENT OR THE TRANSACTIONS CONTEMPLATED HEREBY.

18.5 Attorneys' Fees. If either Party institutes any legal suit, action or proceeding against the other party arising out of or relating to this Agreement, including, but not limited to, contract, equity, tort, fraud and statutory claims, the prevailing party in the suit, action or proceeding will be entitled to receive, in addition to all other remedies to which the prevailing party may be entitled, the costs and expenses incurred by the prevailing party in conducting the suit, action or proceeding, including reasonable attorneys' fees and expenses, court costs and other legal expenses such as expert witness fees, and all fees, taxes, costs and expenses incident to appellate, bankruptcy and post-judgment proceedings.

18.6 Survival. The provisions set forth in this Article 18 shall survive the termination or expiration of this Agreement.

ARTICLE 19
GENERAL PROVISIONS

19.1 Entire Agreement.

This Agreement (including the attached exhibits and schedules), any designated collateral, credit support or margin agreement or similar arrangement between the Parties and all

transactions under this Agreement constitute the entire agreement between the Parties relating to the subject matter. There are no prior or contemporaneous agreements or representations affecting the same subject matter other than those herein expressed. Any and all Exhibits referred to in this Agreement are, by such reference, incorporated herein and made a part hereof for all purposes.

19.2 Joint Efforts.

This Agreement shall be considered for all purposes as prepared through the joint efforts of both Parties and shall not be construed against one Party or the other as a result of the preparation, substitution, submission or other event of negotiation, drafting or execution hereof.

19.3 Amendments in Writing.

No amendment or modification to this Agreement shall be enforceable unless reduced to writing and executed by both Parties.

19.4 No Third Party Beneficiaries.

This Agreement shall not impart any rights enforceable by any third party (other than a permitted successor or assignee bound to this Agreement), it being the intent of the Parties that this Agreement shall not be construed as a third party beneficiary contract.

19.5 Non-Waiver.

No waiver by any Party of any one or more defaults by the other Party in the performance of any of the provisions of this Agreement shall be construed as a waiver of any other default or defaults whether of a like kind or different nature. No failure or delay by either Party in exercising any right, power, privilege, or remedy hereunder shall operate as a waiver thereof.

19.6 Severability.

Any provision of this Agreement declared or rendered invalid, unlawful, or unenforceable by any applicable court of law or regulatory agency or deemed unlawful because of a statutory change (individually or collectively, such events referred to as "Regulatory Event") will not otherwise affect the remaining lawful obligations that arise under this Agreement; and provided, further, that if a Regulatory Event occurs, the Parties shall use their best efforts to reform this Agreement in order to give effect to the original intention of the Parties.

19.7 Survival.

All indemnity and audit rights shall survive the termination of this Agreement. All obligations provided in this Agreement shall remain in effect, after the expiration or termination for any reason of this Agreement, for the purpose of complying herewith.

19.8 Bankruptcy Matters.

The Parties acknowledge and agree that this Agreement constitutes a "forward contract" within the meaning of the United States Bankruptcy Code. Bankruptcy Code Matters. The Parties acknowledge and intend that this Agreement, the transactions contemplated in this Agreement, and any instruments that may be provided by either Party under this Agreement (including any Guaranty) will each, and together, constitute one and the same "forward contract," "forward agreement" and "master netting agreement" within the meaning of the Bankruptcy Code, and that PGE and Seller are "forward contract merchants" within the meaning of the Bankruptcy Code. Each Party agrees that it will not make any assertion or claim, or otherwise take any position to the effect that this Agreement, the transactions contemplated under this Agreement, and any instrument(s) that may be provided by either Party under this Agreement (including the Guaranty) do not each, and together, constitute one and the same "forward contract," "forward agreement" and "master netting agreement" within the meaning of the Bankruptcy Code, or that PGE and Seller are not "forward contract merchants" within the meaning of the Bankruptcy Code.

19.9 Relationships of Parties.

The Parties shall not be deemed in a relationship of partners or joint venturers by virtue of this Agreement, nor shall either Party be deemed an agent, representative, trustee or fiduciary of the other. Neither Party shall have any authority to bind the other to any agreement. This Agreement is intended to secure and provide for the services of each Party as an independent contractor.

19.10 Headings.

The headings used for the Sections and Articles herein are for convenience and 19.11of this Agreement.

19.11 Consolidation of Variable Interest Entities.

If PGE or one of its Affiliates determines that, under Accounting Standards Codification 810 ("ASC 810") Consolidation of Variable Interest Entities ("VIE's"), formerly referred to as the Financial Accounting Standards Board's revised Interpretation No. 46 ("FIN 46"), it may hold a controlling financial interest in Seller, but it lacks the information necessary to make a definitive conclusion, Seller hereby agrees to provide, upon PGE's written request, sufficient financial and ownership information so that PGE or its Affiliate may assess whether a controlling financial interest in a VIE does exist under FIN 46. If PGE or its Affiliate determines that, under FIN 46, it holds a variable interest in Seller, Seller hereby agrees to provide, upon PGE's written request, sufficient financial and other information to PGE or its Affiliates so that PGE may properly consolidate the entity in which it holds the controlling financial interest and present the required disclosures. PGE shall reimburse Seller for Seller's reasonable costs and expenses, if any, incurred in connection with PGE's requests for information under this Section 19.11.

ARTICLE 20
CONFIDENTIALITY

Neither Party shall disclose the terms or conditions of this Agreement to a third party except (i) as may become generally available to the public, (ii) as may be required or appropriate in response to any summons, subpoena, or otherwise in connection with any litigation or to comply with any applicable law, order, regulation, ruling, or accounting disclosure rule or standard, (iii) as may be obtained from a non-confidential source that disclosed such information in a manner that did not violate its obligations to the non-disclosing Party in making such disclosure, (iv) to an index publisher or rating agency who has executed a confidentiality agreement with such Party, (v) in order to comply with any applicable law, regulation, order, or directive, including an order or directive of the Oregon Public Utility Commission, or (vi) in connection with any court or regulatory proceeding, including a proceeding of the Oregon Public Utility Commission; provided, however, that in the case of a disclosure under paragraphs (ii), (v) or (vi), each Party shall, to the extent practicable, use reasonable efforts to prevent or limit the disclosure. The parties shall be entitled to all remedies available at law or in equity to enforce, or seek relief in connection with, this confidentiality obligation. Before Seller issues any news release or publicly distributed promotional material regarding the Facility that mentions the Facility or PGE, Seller shall first provide a copy thereof to PGE for its review and approval, which approval shall not be unreasonably withheld, conditioned or delayed.

ARTICLE 21
NOTICES AND COUNTERPARTS

21.1 Notices.

21.1.1 All notices, requests, statements or payments shall be made to the addresses and persons specified in Exhibit A. All notices, requests, statements or payments shall be made in writing except where this Agreement expressly provides that notice may be made orally. Notices required to be in writing shall be delivered by hand delivery, overnight delivery, facsimile, e-mail (so long as a copy of such e-mail notice is provided immediately thereafter by hand delivery, overnight delivery, or facsimile), or other documentary form. Notice by facsimile shall (where confirmation of successful transmission is received) be deemed to have been received on the day on which it was transmitted (unless transmitted after 5:00 p.m. at the place of receipt or on a day that is not a Business Day, in which case it shall be deemed received on the next Business Day); provided that Scheduling and Dispatch notifications and notifications of changes in availability of the Facility sent by facsimile shall be treated as received when confirmation of successful transmission is received. Notice by hand delivery or overnight delivery shall be deemed to have been received when delivered. Notice by e-mail shall be deemed to have been received when delivered, so long as a copy of such e-mail notice is provided immediately thereafter by hand delivery, overnight delivery, courier or facsimile. Notice by telephone shall be deemed to have been received at the time the call is received.

21.1.2 A Party may change its address by providing notice of the same in accordance with the provisions of Section 21.1.

21.2 Counterparts.

This Agreement may be executed in counterparts, each of which is an original and all of which constitute one and the same instrument.

IN WITNESS WHEREOF, the Parties have caused this Wholesale Renewable Energy Purchase and Sale Agreement to be duly executed as of the Effective Date. This Agreement shall not become effective as to either Party unless and until executed by both Parties.

PORTLAND GENERAL ELECTRIC COMPANY		**[*Seller*]**	
Signature:	_____	Signature:	_____
Name:	_____	Name:	_____
Title:	_____	Title:	_____

EXHIBIT A

NOTICES

Portland General Electric Company ("PGE")

All Notices:

Street: 121 SW Salmon Street

City: Portland, Oregon 97204

Attn: Power Contracts; 3WTCBR06
Phone: (503) 464-___
Facsimile: (503) 464-2605
Duns: 00-790-9054
Federal Tax ID Number: 93-0256820

Invoices:
Attn: Accounts Payable
Phone: (503) 464-7126
Facsimile: 464-7006

Scheduling:
Attn: Manager Power Coordination
Phone: (503) 464-7241
Facsimile: (503) 464-2605

Wire Transfer:
BNK: United States National Bank of Oregon-Portland
ABA: 123000220
ACCT: #153600063512
NAME: Portland General Electric Company

Credit and Collections:
Attn: Credit Manager
Phone: (503) 464-_____
Facsimile: (503) 464-2605

With additional Notices of an Event of Default to:
Attn: General Counsel
Phone: (503) 464-7822
Facsimile: (503) 464-2200

Seller ("Seller" or "Name")

All Notices:

Street: _____

City: _____ Zip: _____

Attn: Contract Administration
Phone: _____
Facsimile: _____
Duns: _____
Federal Tax ID Number: _____

Invoices:
Attn: _____
Phone: _____
Facsimile: _____

Scheduling:
Attn: _____
Phone: _____
Facsimile: _____

Wire Transfer:
BNK: _____
ABA: _____
ACCT: _____

Credit and Collections:
Attn: _____
Phone: _____
Facsimile: _____

With additional Notices of an Event of Default to:
Attn: _____
Phone: _____
Facsimile: _____

EXHIBIT B

Contract Price

Contract Year	Contract Price

EXHIBIT C

EXPECTED FACILITY OUTPUT AND ESTIMATES OF MONTHLY FACILITY OUTPUT

EXHIBIT D

FACILITY DESCRIPTION

EXHIBIT E

FACILITY DOCUMENTS

EXHIBIT F

SITE

EXHIBIT G

START-UP TESTING

EXHIBIT H

OUTLINE OF SCHEDULING PROTOCOL AS OF EFFECTIVE DATE

1. T – 75 minutes Seller submits a base schedule to the California Independent System Operator (CAISO) Base Schedule Aggregation Portal (BSAP) for the upcoming operating hour.

2. T – 57 minutes Seller makes any final adjustments to base schedule and adjusts the NERC e-tag energy profile to match the base schedule amount for the upcoming operating hour.

3. By T-39 of each 15-minute interval within the operating hour, Seller updates NERC e-tag energy profile to reflect the firm delivered output for the relevant 15-minute interval. The schedule will become the final, firm 15-minute firm value to PGE.

EXHIBIT I

REC CERTIFICATE

_____ ("Seller") hereby sells, transfers and delivers to PGE all RECs associated with the generation of Energy under the Wholesale Renewable Power Purchase Agreement between Seller and PGE dated [_____] (the "PPA"), as described below, in the amount of one Environmental Attribute for each megawatt hour generated. Defined terms used in this RECs Certificate (as indicated by initial capitalization) shall have the meaning set forth in the PPA.

Facility name and location: _____ Fuel Type:
Capacity (MW): Operational Date:
Energy Admin. ID no.: _____

Dates	MWh generated
_____	_____

Seller further attests, warrants and represents, under penalty of perjury, as follows:

i) to the best of its knowledge, the information provided herein is true and correct;

ii) its sale to PGE is its one and only sale of the RECs referenced in this certificate;

iii) the Facility generated Energy in the amount indicated above;

iv) Seller has at all times complied with the requirements of the Federal Trade Commission's "Green Guides," 77 F.R. 62122, 16 C.F.R. Part 260, as amended or restated.

iv) to the best of Seller's knowledge, each of the RECs associated with the generated Energy have been generated and sold by the Facility.

This RECs Certificate confirms, in accordance with the PPA, the transfer from Seller to PGE all of Seller's right, title and interest in and to the RECs, as set forth above.

SECTION 1 Seller's Contact Person: [_____]
SECTION 2WITNESS MY HAND,
SECTION 3_____
SECTION 4a _____limited liability company
SECTION 5 By _____
SECTION 6 Its _____
SECTION 7 Date: _____

This Attestation may be disclosed by Seller and PGE to others, including the Center for Resource Solutions and the public utility commissions having jurisdiction over PGE, to substantiate and verify the accuracy of PGE's advertising and public

communication claims, as well as in PGE's advertising and other public communications.

EXHIBIT J

LITIGATION

15 Appendix D – Asset Purchase Agreement

Template provided in a separate document available for download on PortlandGeneralRFP.accionpower.com.

APPENDIX D

ASSET PURCHASE AGREEMENT[1]

by and between

PORTLAND GENERAL ELECTRIC COMPANY

and

_____

Dated _____

[1] NTD: Bidder is advised that this form of Asset Purchase Agreement was drafted contemplating the purchase of a development stage project that would not be constructed as of the Effective Date. Terms will be adjusted to accommodate assets that are operating or in further stages of development.

TABLE OF CONTENTS

Page

ARTICLE 1 DEFINITIONS AND CONSTRUCTION 1

1.1 Specific Definitions 1
1.2 Construction 8

ARTICLE 2 PURCHASE AND SALE OF ASSETS; PURCHASE PRICE AND PAYMENT 9

2.1 Purchase and Sale 9
2.2 Instruments of Conveyance 9
2.3 Payments 10
2.4 Late Payments 10
2.5 Further Assurances; Cooperation 10

ARTICLE 3 CONDITIONS PRECEDENT 11

3.1 Conditions Generally 11
3.2 PGE Conditions Precedent to the Closing 11
3.3 Seller Conditions Precedent to the Closing 13
3.4 Term; Termination 14
3.5 Effect of Termination; Remedies 14

ARTICLE 4 CLOSING 15

4.1 Place of Closing 15
4.2 Closing Deliveries 15

ARTICLE 5 REPRESENTATIONS AND WARRANTIES OF SELLER 16

5.1 Organization and Authority 16
5.2 Binding Agreement 16
5.3 No Adverse Order or Injunctions 16
5.4 Litigation 17
5.5 No Conflicts 17
5.6 Third-Party Consents 17
5.7 Project Assets 17
5.8 [Real Estate 18
5.9 Tax Matters 19
5.10 [Contracts.] 20
5.11 Legal Compliance 21
5.12 [Environmental Laws.] 21
5.13 [Permits 21
5.14 [Renewable Resource Data 21
5.15 Solvency 21
5.16 Brokers 22
5.17 Investment Company 22
5.18 [Intellectual Property 22

5.19 Material Misstatements or Omissions 22
5.20 [Project-Specific Representations 22

ARTICLE 6 REPRESENTATIONS AND WARRANTIES OF PGE 22

6.1 Organization and Authority 23
6.2 Binding Agreement 23
6.3 No Adverse Order or Injunctions 23
6.4 No Conflicts 23
6.5 Third-Party Consents 23
6.6 Brokers 24

ARTICLE 7 CONFIDENTIAL INFORMATION 24

7.1 PGE Confidential Information 24
7.2 Seller Confidential Information 25

ARTICLE 8 [COVENANTS OF PGE AND SELLER] 26

8.1 [Conduct Pending the Closing 26
8.2 [Exclusivity 27
8.3 [Site and Project Access 28
8.4 [Due Diligence 28
8.5 [Notice of Developments 28

ARTICLE 9 INDEMNIFICATION 28

9.1 Survival 28
9.2 Applicable Survival Period 28
9.3 Indemnification by Seller 29
9.4 Indemnification by PGE 30
9.5 Claims for Indemnification 30
9.6 Defense 31
9.7 Limitations on Liability 32

ARTICLE 10 TAX MATTERS 32

10.1 Allocation of Purchase Price 32
10.2 Sales, Transfer and Documentary Taxes 33
10.3 Treatment of Indemnity Payments 33

ARTICLE 11 MISCELLANEOUS 33

11.1 Successors and Assigns 33
11.2 Entire Agreement; Amendments; Attachments 33
11.3 Severability 33
11.4 Dispute Resolution Process; Consent to Jurisdiction 34
11.5 Consequential Damages 35
11.6 Governing Law 36
11.7 Section Headings 36
11.8 Counterparts 36

11.9 No Third-Party Beneficiaries 36
11.10 Waiver 36
11.11 Costs 36
11.12 Relationship of Parties 37
ARTICLE 12 NOTICES 37

Exhibits[2]

[Exhibit A	Form of Bill of Sale]
[Exhibit B	Form of Assignment and Assumption Agreement]
[Exhibit C	Form of Assignment of Real Property Interests]
[Exhibit D	Form of Contract Estoppel Letter]

Schedules

Schedule 2.1	Assumed Liabilities
Schedule 5.6	Seller Third-Party Consents; Seller Required Regulatory Approvals
Schedule 5.7	Project Assets
Schedule 5.8	Real Property Interests
Schedule 5.10	Contracts
Schedule 5.13	Permits
Schedule 5.14	Renewable Resource Data
Schedule 6.5	PGE Third-Party Consents; PGE Required Regulatory Approvals
Schedule 8.1.6	Project Development

[2] NTD: The type of project assets being conveyed to PGE will dictate the appropriate forms of these exhibits.

ASSET PURCHASE AGREEMENT

This **ASSET PURCHASE AGREEMENT** (together with all exhibits and schedules appended hereto, this "***Agreement***"), dated as of [DATE] (the "***Effective Date***"), is made by and between [COUNTERPARTY], [STATE] [ENTITY TYPE] ("***Seller***"), and Portland General Electric Company, an Oregon corporation ("***PGE***"). PGE and Seller each may be referred to herein as a "***Party***", and collectively as the "***Parties***".

RECITALS

WHEREAS, Seller owns [and operates] the Project and owns all right, title and interest in and to the Project Assets.

WHEREAS, in accordance with the terms and conditions set forth in this Agreement, Seller desires to sell and transfer to PGE, and PGE desires to purchase from Seller, the Project and the Project Assets.

NOW, THEREFORE, in consideration of the mutual promises and covenants contained in this Agreement, the adequacy and sufficiency of which are hereby acknowledged, the Parties agree as follows:

AGREEMENT

ARTICLE 1
DEFINITIONS AND CONSTRUCTION

1.1 Specific Definitions. As used in this Agreement, the following terms shall have the meanings ascribed to them below:

"***AAA***" shall mean the American Arbitration Association.

"***AAA Procedures***" shall have the meaning given to it in Section 11.4.2.

"***Account***" shall have the meaning given to it in Section 2.3.2.

"***Affiliate***" of a specified Person shall mean any other Person that directly, or indirectly through one or more intermediaries, controls, is controlled by or is under common control with the Person specified. For purposes of the immediately preceding sentence, "control" shall mean the ability to control or affect the day-to-day management and control of the Person or a fifty percent (50%) or greater beneficial ownership interest in the partnership interests, membership interests or voting stock of the Person. For purposes of this Agreement, any Person owning an interest in Seller shall be considered an "Affiliate" of Seller.

"***Affiliate Contracts***" shall have the meaning given to it in Section 5.10.1.

"***Agreement***" shall have the meaning given to it in the Preamble.

"***Allocation***" shall have the meaning given to it in Section 10.1.

"***Applicable Law***" shall mean all laws, treaties, ordinances, judgments, decrees, injunctions, writs, orders, rules, regulations and interpretations of any Governmental Authority having jurisdiction over (a) any Party, (b) the Project Assets or (c) the Project.

"***Applicable Survival Period***" shall have the meaning given to it in Section 9.2.

"***ARRA***" shall mean the American Recovery and Reinvestment Act of 2009, Public Law 111-5.

"***Assumed Liabilities***" shall mean those Liabilities and obligations of Seller set forth on Schedule 2.1, which shall be assumed by PGE.

"***Business Day***" shall mean a day on which national banks are not required or authorized by law or executive order to close in Portland, Oregon.

"***Claim***" shall have the meaning given to it in Section 9.5.

"***Claim Notice***" shall have the meaning given to it in Section 9.5.

"***Closing***" shall have the meaning given to it in Section 4.1.

"***Closing Date***" shall have the meaning given to it in Section 4.1.

"***Code***" shall mean the Internal Revenue Code of 1986, as amended.

"***Contracts***" shall have the meaning given to it in Section 5.10.1.

"***Debt***" of any Person at any date means, without duplication, (a) all obligations of such Person for borrowed money, (b) all obligations of such Person evidenced by bonds, debentures, notes or other similar instruments, (c) all obligations of such Person to pay the deferred purchase price of property or services, (d) all monetary liabilities of such Person under contracts, (e) all obligations of such Person to purchase securities (or other property) which arise out of or in connection with the sale of the same or substantially similar securities (or property), (f) all obligations of such Person to reimburse any bank or other Person in respect of amounts paid or advanced under a letter of credit or other instrument, (g) all obligations of others secured by a Lien on any asset of such Person, whether or not such obligation is assumed by such Person, and (h) all obligations of others guaranteed directly or indirectly by such Person or as to which such Person has an obligation substantially the economic equivalent of a guaranty.

"***Dispute***" shall have the meaning given to it in Section 11.4.1.

"***Effective Date***" shall have the meaning given to it in the Preamble.

"***Environmental Attributes***" means any and all credits, benefits, emissions reductions, offsets and allowances of any kind, howsoever entitled, attributable to an electric generating facility or the electric energy, capacity or other generator-based products produced therefrom, including (a) any avoided emissions of pollutants to the air, soil or water, such as sulfur oxides, nitrogen oxides and carbon monoxide, and any rights related thereto, (b) any avoided emissions of methane, carbon dioxide and other "greenhouse gases" that have been determined by the United Nations Intergovernmental Panel on Climate Change or any other governmental, quasi-governmental or non-governmental agency or body to contribute to the actual or potential threat of altering the Earth's climate by trapping heat in the atmosphere, and (c) any reporting rights relating to the reduction of "greenhouse gases" under Section 1605(b) of the National Energy Policy Act of 1992 or under any other federal, state, local or foreign law, rule or regulation related to the reduction of air pollutants or "greenhouse gases" or the trading of emissions or emissions credits, including so-called "green tags" or "green certificates."

"***Environmental Laws***" shall mean all laws that regulate or relate to (a) the protection or clean-up of the environment, (b) the handling of Hazardous Substances, (c) the preservation or protection of waterways, groundwater, drinking water, air, wildlife, plants or other natural resources, and (d) the health and safety of persons or property as it pertains to the environment, including, without limitation, protection of the health and safety of employees. Environmental Laws shall include, without limitation, the Resource Conservation & Recovery Act, Clean Water Act, Safe Drinking Water Act, Occupational Safety and Health Act, Toxic Substances Control Act, Clean Air Act, Comprehensive Environmental Response, Compensation and Liability Act, Emergency Planning and Community Right-to-Know Act, Hazardous Materials Transportation Act and Centers for Disease Control guidelines, policies and procedures, and all analogous or related laws.

"***Federal Funds Effective Rate***" shall mean, for any day, the weighted average (rounded upwards, if necessary, to the next 1/100 of 1%) of the rates on overnight federal funds transactions with members of the Federal Reserve System arranged by federal fund brokers, as published on the next succeeding Business Day by the Federal Reserve Bank of New York, or, if such rate is not published for any day that is a Business Day, the weighted average (rounded upwards if necessary, to the next 1/100 of 1%) of the rates on overnight federal funds transactions with the members of the Federal Reserve System arranged by federal fund brokers, as published on the next succeeding Business Day by the Federal Reserve of New York.

"***Final Order***" shall mean, with respect to a Seller Required Regulatory Approval or PGE Required Regulatory Approval, as the case may be, that such Seller Required Regulatory Approval or PGE Required Regulatory Approval has not been reversed, stayed, set aside, annulled or suspended, with respect to which any waiting period prescribed by Applicable Laws

before the transactions contemplated hereby may be consummated has expired (but without the requirement for expiration of any applicable rehearing period), and as to which all conditions to the consummation of such transactions prescribed by Applicable Laws have been satisfied.

"***Governmental Authority***" shall mean any federal, state, local or other governmental, judicial, public or statutory instrumentality, tribunal, agency, authority, body or entity, or any political subdivision thereof, having legal jurisdiction over the matter or person in question.

"***Hazardous Material***" shall mean (a) any petroleum or petroleum products, flammable explosives, radioactive materials, asbestos in any form that is or could become friable, lead containing paints or coatings, urea formaldehyde foam insulation and transformers or other equipment that contain dielectric fluid containing levels of polychlorinated biphenyls, (b) any chemicals or other materials or substances which are defined as or included in the definition of "hazardous substances," "hazardous wastes," "hazardous materials," "extremely hazardous wastes," "restricted hazardous wastes," "toxic substances," "toxic pollutants" or words of similar import under any Environmental Law, and (c) any other chemical or other material or substance, exposure to which is prohibited, limited or regulated by any Governmental Authority under any Environmental Law.

"***Indemnified Party***" shall have the meaning given to it in Section 9.5.

"***Indemnifying Party***" shall have the meaning given to it in Section 9.5.

"***Instruments of Conveyance***" shall have the meaning given to it in Section 2.2.

"***Liabilities***" shall mean, with respect to any Person, any and all Debts, liabilities, payables, obligations, commitments, losses, damages, expenses, claims, deficiencies, guarantees or endorsements, of any kind whatsoever, in each case requiring a payment (including a potential payment of damages for non-performance), including those of a contingent or deferred nature.

"***Lien***" shall mean mortgages, deeds of trust, liens, pledges, charges, security interests, assessments, reservations, hypothecations, restrictive covenants, easements or encumbrances.

"***Losses***" shall have the meaning given to it in Section 9.3.1.

"***Material Adverse Effect***" shall mean any event, occurrence, change or effect that, individually or in the aggregate, (a) with respect to Seller, could reasonably be expected to have a material adverse effect on the ability of Seller to consummate the transactions contemplated by this Agreement and to satisfy its obligations contemplated by this Agreement, and (b) with respect to the Project or the Project Assets, could reasonably be expected to have a material adverse effect on the interconnection, ownership, operation or maintenance of the Project, or on the fair market value of the Project Assets; *provided*, *however*, that a "Material Adverse Effect" shall not include any adverse change, effect or circumstance directly or indirectly resulting from

or arising out of (i) actions taken or omissions made by a Party at the request or with the consent of the other Party, or the failure to take any action prohibited by this Agreement, (ii) changes in the renewable power development industry or in renewable energy markets generally or (iii) changes in economic conditions or financial markets in any country or region or globally, including changes in interest or exchange rates and changes in currency and credit markets.

"***OPUC***" shall mean the Public Utility Commission of Oregon.

"***Ordinary Course of Business***" means the ordinary course of business consistent in material respects with past practices and Prudent Utility Standards.

"***Party***" or "***Parties***" shall have the meaning given to it in the Preamble.

"***Permits***" shall mean permits, licenses, approvals, consents, orders, registrations, privileges, franchises, memberships, certificates, entitlements variances, waivers, certificates of occupancy and other authorizations issued by any Governmental Authorities, and any siting, zoning and land use approvals required under Applicable Laws in connection with the development, construction, operation, use and/or maintenance of the Project, and all amendments, modifications, supplements, general conditions and addenda thereto.

"***Permitted Liens***" shall mean all of the following: (a) liens for property Taxes and installments of assessments and charges of Governmental Authorities not yet due and payable as of the Closing Date; (b) liens created by the act or omission of PGE; (c) any other encumbrances created or permitted with the prior written consent of PGE; and (d) any encumbrances that will not have an adverse effect on the construction, ownership, operation or performance of the Project and/or Project Assets.

"***Person***" shall mean any natural person, corporation, limited liability company, partnership, firm, association, Governmental Authority or any other entity whether acting in an individual, fiduciary or other capacity.

"***PGE***" shall have the meaning given to it in the Preamble.

"***PGE Conditions Precedent***" shall have the meaning given to it in Section 3.2.

"***PGE Confidential Information***" shall have the meaning given to it in Section 7.1.

"***PGE Indemnified Party***" shall have the meaning given to it in Section 9.3.1.

"***PGE Indemnity Cap***" shall have the meaning given to it in Section 9.7.2.

"***PGE Required Regulatory Approvals***" shall mean those items listed on Part II of Schedule 6.5.

"***Placed in Service***" means placed in service for purposes of (a) Section 1603 of ARRA and any guidance issues by Treasury in relation thereto, (b) Sections 48(b)(2) and (3) of the Code (as in effect on the day before the date of the enactment of the Revenue Reconciliation Act of 1990) and (c) Section 168 of the Code.

"***Post-Closing Assets***" shall mean all assets and rights of any kind, whether tangible or intangible, real or personal, including land and properties (or interests therein, including rights of way, leaseholds and easements), buildings, equipment, machinery, improvements, fixtures, agreements, contracts, renewable resource data, reports and studies (including those related to interconnection, environmental, cultural, resource and market matters), Permits, intellectual property, inventory, books and records, proprietary rights, return and other rights under or pursuant to all warranties, representations and guarantees, cash, accounts receivable, deposits and prepaid expenses acquired by PGE after the Closing Date in connection with or associated with the Project.

"***Project***" shall mean that certain [[____] MW [solar] [wind] [hydroelectric] [OTHER TECHNOLOGY][3] energy generating project [under development] [located in _____]].

"***Project Assets***" shall mean the assets, other than Retained Contracts, set forth on Schedule 5.7, which shall include all assets and rights of any kind, related to the ownership, operation or maintenance of the Project and owned by Seller, whether tangible or intangible, real or personal, including land and properties (or interests therein including rights of way, leaseholds and easements), buildings, equipment, machinery and associated equipment, improvements, fixtures, agreements, contracts, renewable resource data, reports and studies (including those related to interconnection, environmental, cultural, resource and market matters), the ownership of Environmental Attributes created on or after the Closing Date, Permits, software and intellectual property, inventory, books and records, proprietary rights, return and other rights under or pursuant to all warranties, representations and guarantees, cash, accounts receivable, deposits and prepaid expenses.

"***Prudent Utility Standards***" shall mean those practices, methods, equipment, specifications and standards of care, skill, safety and diligence and acts as the same may change from time to time, but applied in light of the facts known at the time, as are generally applied or utilized under comparable circumstances by experienced and prudent professionals in respect of the interconnection, transmission, ownership, operation or maintenance of renewable resource generating facilities of comparable type and complexity to the Project and which would have been expected to accomplish the desired result in a manner consistent with Applicable Law, safety, environmental protection, economy and expedition. Prudent Utility Standards are not

[3] NTD: Bidder to include appropriate technology descriptor.

necessarily defined as the optimal standard practice method or act to the exclusion of others, but rather, refer to a range of actions reasonable under the circumstances.

"***Purchase Price***" shall have the meaning given to it in Section 2.3.

["***Real Property Agreements***" shall mean the agreements set forth on Schedule 5.8 evidencing the Real Property Interests.]

["***Real Property Interests***" shall mean, collectively, [_____].]

"***Renewable Resource Data***" means any and all renewable resource data measured by Seller at the Site and collected by the meteorological towers on the Site through the Closing Date and which are included as part of the Project Assets.

"***Representatives***" shall mean, with respect to a Person, such Person's directors, partners, officers, managers, employees, members, agents and representatives, including attorneys, accountants, consultants, potential lenders, lenders, potential investors, investors and financial advisors.

"***Retained Contracts***" shall have the meaning given to it in Section 5.10.5.

"***Retained Liabilities***" shall mean those obligations and Liabilities of Seller arising under [_____], which shall be retained by Seller.

"***RFP***" shall mean that certain request for proposals for renewable energy resources issued by PGE in May 2016 and conducted in accordance with the OPUC Competitive Bidding Guidelines set forth in OPUC Order 14-149 (Docket UM-1182), dated April 30, 2014.

"***Seller***" shall have the meaning given to it in the Preamble.

"***Seller Conditions Precedent***" shall have the meaning given to it in Section 3.3.

"***Seller Confidential Information***" shall have the meaning given to it in Section 7.2.1.

"***Seller Contracts***" shall have the meaning given to it in Section 5.10.1.

"***Seller's Exclusivity Obligations***" shall have the meaning given to it in Section 8.2.

"***Seller Indemnified Party***" shall have the meaning given to it in Section 9.4.1.

"***Seller Indemnity Cap***" shall have the meaning given to it in Section 9.7.1.

"***Seller Required Regulatory Approvals***" shall mean those items listed on Part II of Schedule 5.6.

"***Site***" shall mean [_____][4].

"***Tax***" or "***Taxes***" shall mean any federal, state, local or foreign income, gross receipts, license, payroll, employment, excise, severance, stamp, occupation, premium, windfall profits, environmental, customs duties, capital stock, franchise, profits, withholding, social security, unemployment, disability, real property, personal property, sales, use, transfer, registration, value added, alternative, minimum, estimated or similar tax, levy or assessment and any related interest or penalty.

"***Tax Return***" shall mean any return, report, statement, claim for refund, information return or other document (including any amendments thereto and any related or supporting information) filed or required to be filed with any Governmental Authority in connection with the determination, assessment, collection or administration of Taxes or the administration of any Applicable Law relating to Taxes.

"***Third-Party Claim***" shall have the meaning given to it in Section 9.6.

"***Treasury***" shall mean the United States Department of Treasury, including any successor agency.

"***Treasury Regulations***" shall mean the Treasury regulations promulgated under the Code, including any successor regulations.

1.2 Construction. Headings and the rendering of text in bold and italics are for convenience and reference purposes only and do not affect the meaning or interpretation of this Agreement.

1.2.1 A reference to an Exhibit, Schedule, Article, Section or other provision shall be, unless otherwise specified, to exhibits, schedules, articles, sections or other provisions of this Agreement, which exhibits and schedules are incorporated herein by reference.

1.2.2 Any reference in this Agreement to another agreement or document shall be construed as a reference to that other agreement or document as the same may have been, or may from time to time be, varied, amended, supplemented, substituted, novated, assigned or otherwise transferred.

1.2.3 Any reference in this Agreement to "this Agreement," "herein," "hereof" or "hereunder" shall be deemed to be a reference to this Agreement as a whole and not limited to the particular Article, Section, Exhibit, Schedule or provision in which the relevant reference

[4] NTD: Bidder to provide description of project site.

appears and to this Agreement as varied, amended, supplemented, substituted, novated, assigned or otherwise transferred from time to time.

1.2.4 References to any Party shall, where applicable, include any successors, transferees and permitted assigns of the Party.

1.2.5 References to the term "includes" or "including" shall mean "includes, without limitation" or "including, without limitation."

1.2.6 Words importing the singular include the plural and vice versa and the masculine, feminine and neuter genders include all genders.

1.2.7 If the time for performing an obligation under this Agreement occurs or expires on a day that is not a Business Day, the time for performance of such obligation shall be extended until the next succeeding Business Day.

1.2.8 References to any statute, code or statutory provision are to be construed as a reference to the same as it may have been, or may from time to time be, amended, modified or reenacted, and include references to all bylaws, instruments, orders and regulations for the time being made thereunder or deriving validity therefrom unless the context otherwise requires.

1.2.9 References to any amount of money shall mean a reference to the amount in United States Dollars.

ARTICLE 2
PURCHASE AND SALE OF ASSETS; PURCHASE PRICE AND PAYMENT

2.1 Purchase and Sale. Subject to and upon the terms and conditions of this Agreement, including (a) the satisfaction or written waiver by PGE of the PGE Conditions Precedent, and (b) the satisfaction or written waiver by Seller of the Seller Conditions Precedent, on the Closing Date, Seller shall sell, assign, transfer, convey and deliver to PGE, and PGE shall purchase, acquire and accept from Seller, all of the Project Assets, free and clear of any and all Liens other than Permitted Liens. Upon the consummation of the purchase by PGE of the Project Assets, PGE agrees to assume and become responsible for, and shall pay, discharge or perform when due, all of the Assumed Liabilities as of and after the Closing Date. PGE and its Affiliates shall not assume or incur any Liability in respect of, and Seller shall remain bound by and be liable for, and shall pay, discharge or perform when due, the Retained Liabilities.

2.2 Instruments of Conveyance. The sale, conveyance, assignment, transfer and delivery of the Project Assets will be effected by the execution and delivery by Seller and PGE of (a) the Bill of Sale, substantially in the form of Exhibit A, (b) the Assignment and Assumption Agreement substantially in the form set forth in Exhibit B, [(c) assignments of the Real Property Interests in recordable form, substantially in the form set forth in Exhibit C,] and (d) such other

agreements or documents requested by PGE, with the items described in clauses (a) through (d) of this Section 2.2 collectively referred to herein as the "***Instruments of Conveyance***."

2.3 Payments. As consideration for the sale, transfer, assignment, conveyance and delivery by Seller to PGE of the Project Assets, PGE will pay to Seller the "***Purchase Price***" in an amount equal to [_____] as further described and on the terms and conditions contained in this Agreement.

2.3.1 [Payment Terms.][5] [_____].

2.3.2 Wiring Instructions. PGE shall pay the Purchase Price, to the extent due pursuant to the terms of this Agreement, to Seller by depositing the applicable amount for Seller's account into the account listed below (the "***Account***") by the date due (as provided in this Article 2) in accordance with the following transfer instructions, or such other instructions as Seller may provide to PGE in writing:

TO: [_____]

Account No.: [_____]

ABA Routing No.: [_____]

Bank Name: [_____]

Branch Address: [_____]

Contact: [_____]

2.4 Late Payments. Unless otherwise specified herein, the amount of any payment due by either PGE or Seller pursuant to the terms of this Agreement that is not paid when due hereunder shall bear interest at an annual rate equal to the lower of the Federal Funds Effective Rate plus two percent (2%) or the maximum rate allowed by Applicable Law, from the date such payment was required to have been made through and including the date such payment is actually received by the Party to whom such payment is due.

2.5 Further Assurances; Cooperation. At any time, and from time to time after the Closing Date, at either Party's reasonable request, the other Party shall promptly execute, acknowledge and deliver all such further acts, assurances and instruments of sale, transfer, conveyance, assignment and confirmation, as are reasonably required, and take all such other action as the requesting Party may reasonably request, in connection with the performance of such Party's obligations under this Agreement. From and after the Effective Date until the

[5] NTD: Bidder to propose additional payment terms, as applicable.

Closing Date, each Party shall reasonably cooperate with the other Party in connection with the performance of such Party's obligations under this Agreement.

ARTICLE 3
CONDITIONS PRECEDENT

3.1 Conditions Generally. For purposes of this Agreement, there shall be conditions which must be satisfied or waived prior to the Closing. PGE's obligation to cause the Closing to occur is subject to the satisfaction, or waiver in writing by PGE, of each of the PGE Conditions Precedent, and Seller's obligation to cause the Closing to occur is subject to the satisfaction or waiver in writing by Seller, of each of the Seller Conditions Precedent, in each case within the applicable time periods herein. Seller and PGE expressly acknowledge and agree that each of the (a) PGE Conditions Precedent are for the sole benefit of and may only be waived by PGE in writing, and (b) Seller Conditions Precedent are for the sole benefit of and may only be waived by Seller in writing.

3.2 PGE Conditions Precedent to the Closing. PGE shall not be obligated to effect the Closing hereunder if the following conditions precedent (the "***PGE Conditions Precedent***") are not satisfied (or waived in writing by PGE) on or prior to the Closing Date:

3.2.1 [Project Specific Conditions. _____][6].

3.2.2 Third-Party Consents. All authorizations, approvals and consents of all Persons, including Governmental Authorities, that are required in connection with the execution, delivery, and performance of this Agreement by each of PGE and Seller shall have been received.

3.2.3 Certificates. PGE shall have received a certificate, dated as of the Closing Date, in form and substance reasonably satisfactory to PGE, of a duly authorized officer of Seller certifying that attached thereto are the following: (a) the incumbency of Seller's officers executing this Agreement and any other agreement delivered on the Closing Date and any certificate delivered in connection with the Closing; (b) true, accurate and complete copies of the certificates issued by the Secretary of State of the State of [_____] within ten (10) days of the Closing Date certifying that Seller is duly [organized] [incorporated] [formed] and validly existing under the laws of the State of [_____] and is current in payment of Taxes in such state; (c) true, accurate and complete resolutions of Seller duly authorizing the execution, delivery and performance of this Agreement and all other related agreements and transactions contemplated hereby and thereby, and that such resolutions are in full force and effect as of the

[6] NTD: PGE reserves the right to require additional conditions precedent to be met prior to the Closing, based on the nature and state of development of Bidder's project. Such conditions may include, but are not limited to, delivery of a title insurance policy, survey, Permits and environmental reports.

Closing Date; (d) the certificate of formation of Seller, as certified by the Secretary of State of the State of [_____]; and (e) the [operating agreement] [by-laws] of Seller (as amended through the Closing Date).

3.2.4 Representations and Warranties. Each of the representations and warranties of Seller in this Agreement shall be true and correct on and as of the Closing Date as though such representations and warranties were made on and as of the Closing Date (except to the extent such representations and warranties are made as of a particular date, in which case such representations and warranties shall be true and correct as of such date).

3.2.5 UCC Search Report. PGE shall have received Uniform Commercial Code search reports from the relevant jurisdictions covering the Seller with respect to the Project Assets, the results of which shall be satisfactory to PGE in its sole discretion.

3.2.6 Performance. Seller shall have performed, in all material respects, each and all of the covenants and obligations required to be performed by it prior to the Closing Date, on or prior to the Closing Date.

3.2.7 Litigation. No action or proceeding by or before any court or other Governmental Authority shall have been instituted or threatened by any Governmental Authority or Person whatsoever that (a) could reasonably be expected to impair, restrain, prohibit or invalidate the Closing, (b) could reasonably be expected to have a Material Adverse Effect on Seller, the Project or the Project Assets, (c) challenges any Permit in a way that could reasonably be expected to invalidate, impair or restrain, in a material way, such Permit, in PGE's reasonable discretion, or (d) could reasonably be expected to have a material adverse effect on PGE's ability to consummate the Closing.

3.2.8 No Material Adverse Effect. As of the Closing Date, no Material Adverse Effect shall have occurred with respect to Seller, the Project or the Project Assets.

3.2.9 Regulatory Approvals. The Seller Required Regulatory Approvals in Schedule 5.6 and the PGE Required Regulatory Approvals in Schedule 6.5 shall have been made or obtained and shall have become Final Orders.

3.2.10 FIRPTA Certificate. Seller shall have executed and delivered an affidavit, dated as of the Closing Date, stating, under penalty of perjury, Seller's United States taxpayer identification number and that Seller is not a foreign person, pursuant to Section 1445(b)(2) of the Code and Treasury Regulation 1.1445-2(b)(2)(iii)(B) (or any similar provision under other applicable Tax law).

3.2.11 Assignment of Project Contracts and Real Property Interests.[7] PGE shall have received an assignment of each Contract (as set forth on Schedule 5.10) and each Real Property Interest (as set forth on Schedule 5.8), executed by all parties thereto, all in form and substance reasonably acceptable to PGE, and an estoppel letter from each counterparty to each Contract executed and delivered no earlier than ten (10) days prior to the Closing Date substantially similar to the form set forth in Exhibit D.

3.2.12 Completion of Due Diligence. PGE shall have completed its due diligence review of the Project and the Project Assets to its satisfaction.

3.3 Seller Conditions Precedent to the Closing. Seller shall not be obligated to effect the Closing hereunder if the following conditions precedent (the "***Seller Conditions Precedent***") are not satisfied (or waived in writing by Seller) on or prior to the Closing Date:

3.3.1 Certificates. Seller shall have received a certificate, dated as of the Closing Date, in form and substance reasonably satisfactory to Seller, of a duly authorized officer of PGE certifying that attached thereto are the following: (a) the incumbency of PGE's officers executing this Agreement and any other agreement delivered on the Closing Date and any certificate delivered in connection with the Closing; (b) true, accurate and complete copies of the certificates issued by the Secretary of State of the State of Oregon within ten (10) days of the Closing Date certifying that PGE is duly organized and validly existing under the laws of the State of Oregon and is current in payment of Taxes in such state; (c) true, accurate and complete resolutions of PGE duly authorizing the execution, delivery and performance of this Agreement and all other related agreements and transactions contemplated hereby and thereby, and that such resolutions are in full force and effect as of the Closing Date; and (d) the certificate of formation of PGE, as certified by the Secretary of State of the State of Oregon.

3.3.2 Representations and Warranties. Each of the representations and warranties of PGE in this Agreement shall be true and correct on and as of the Closing Date as though such representations and warranties were made on and as of the Closing Date (except to the extent such representations and warranties are made as of a particular date, in which case such representations and warranties shall be true and correct as of such date).

3.3.3 Performance. PGE shall have performed, in all material respects, each and all of the covenants and obligations required to be performed by it prior to the Closing Date, on or prior to the Closing Date.

3.3.4 Litigation. No action or proceeding by or before any court or other Governmental Authority shall have been instituted that seeks to impair, restrain, prohibit or

[7] NTD: Any assignment of a Real Property Interest must be in recordable form and shall be recorded at Closing.

invalidate the Closing (other than an action or proceeding commenced by Seller or an Affiliate of Seller).

3.3.5 Regulatory Approvals. The Seller Required Regulatory Approvals and the PGE Required Regulatory Approvals shall have been made or obtained and shall have become Final Orders. The PGE Required Regulatory Approvals shall have been made or obtained at PGE's cost.

3.4 Term; Termination.

3.4.1 Term. This Agreement shall become effective on the Effective Date and, unless terminated earlier as provided in this Agreement, shall remain in full force and effect until the obligations of each of the Parties under the Agreement shall have been satisfied in full or waived in writing by the other Party, as applicable.

3.4.2 [Termination. This Agreement may be terminated prior to the Closing as follows:

(a) By the mutual written consent of the Parties;

(b) by PGE upon written notice to Seller of such termination, in the event the Closing has not occurred on or before [_____]; provided, that the failure to consummate the transactions contemplated by this Agreement did not result from the failure by PGE to fulfill in any material respect any undertaking or commitment provided for herein that is required to be fulfilled by it prior to the Closing; or

(c) by either Party, upon written notice to the other Party of such termination due to a breach of or default under this Agreement which breach or default continues for thirty (30) days after the non-breaching Party has delivered written notice of the default or breach to the breaching Party.][8]

3.5 Effect of Termination; Remedies.

3.5.1 In the event that this Agreement is validly terminated in accordance with Section 3.4, this Agreement shall forthwith have no further force and effect and, except as set forth in this Agreement to the contrary, there shall be no further liability or obligation on the part of PGE or Seller under this Agreement. No such termination shall serve (a) to release any Party from any liability with respect to any breach of its duties and obligations hereunder prior to such termination, or (b) to void or terminate the limitations on liability expressly set forth in this Agreement.

---

[8] NTD: This Section can be omitted for any transaction that contemplates a simultaneous signing and closing.

3.5.2 Notwithstanding the foregoing, Article 7 (Confidential Information) shall survive the termination of this Agreement for a period of two (2) years from the date on which such termination occurs.

ARTICLE 4
CLOSING

4.1 Place of Closing. Upon the terms and conditions set forth in this Agreement, the sale of the Project Assets (the "***Closing***") shall take place no later than the second Business Day after satisfaction or waiver of the conditions set forth in Article 3, unless this Agreement has been terminated prior to such date in accordance with the provisions of Section 3.4 (the actual time and date of the Closing being referred to herein as the "***Closing Date***"). The Closing shall take place at PGE's offices or at such other location as the Parties may agree, on the Closing Date.

4.2 Closing Deliveries. On the Closing Date, the following shall occur:

4.2.1 Payment of Purchase Price. PGE shall deliver to Seller the Purchase Price in accordance with Section 2.3.1.

4.2.2 Delivery of Certificates by Seller. On the Closing Date, Seller shall deliver to PGE a certificate, dated as of the Closing Date, in form and substance satisfactory to PGE, stating that (a) the conditions set forth in Section 3.3 have been satisfied or waived in writing by Seller, and (b) that all representations and warranties of Seller set forth in Article 5 are true and correct as of the Closing Date (except to the extent such representations and warranties are made as of a particular date in which case such representations and warranties shall be true and correct as of such date).

4.2.3 Delivery of Certificates by PGE. On the Closing Date, PGE shall deliver to Seller one or more certificates of PGE, in form and substance satisfactory to Seller, stating that (a) the conditions set forth in Section 3.2 have been satisfied or waived in writing by PGE, and (b) that all representations and warranties of PGE set forth in Article 6 are true and correct as of the Closing Date (except to the extent such representations and warranties are made as of a particular date in which case such representations and warranties shall be true and correct as of such date).

4.2.4 Other Items. All other items required to be delivered or received as a Seller Condition Precedent or as a PGE Condition Precedent shall have been delivered to, or received by, Seller or PGE, as applicable, unless waived. Without limiting the generality of the foregoing, unless already delivered or unless waived by the relevant Party, the following documents, instruments and certificates shall be delivered at Closing: (a) by each Party to the other Party, executed counterparts of the Instruments of Conveyance; (b) by PGE to Seller, all

documents, instruments and certificates required to be delivered by PGE to Seller pursuant to this Agreement; (c) by Seller to PGE, all documents, instruments and certificates required to be delivered by Seller to PGE pursuant to this Agreement; and (d) by Seller to PGE, all books, records[and operating logs] relating to the Project and the Project Assets, in the possession of, or subject to the control of, Seller.

ARTICLE 5
REPRESENTATIONS AND WARRANTIES OF SELLER

Seller represents and warrants to PGE that, as of the Effective Date [and as of the Closing Date][9], the following are true and correct:

5.1 Organization and Authority. Seller is a [_____] duly [organized] [formed], validly existing and is qualified to do business under the laws of the State of [_____], and has all requisite power and authority to own the Project Assets, to execute and deliver this Agreement, to consummate the transactions contemplated hereby and to carry on its business as now being conducted. Seller is duly qualified to do business and is in good standing in all other jurisdictions in which its ownership of property or the character of its business requires such qualification.

5.2 Binding Agreement. All necessary action on the part of Seller has been taken to authorize the execution and delivery of this Agreement, the performance of its obligations under this Agreement and the consummation of the transactions contemplated hereby. This Agreement has been, and the other documents and instruments required to be delivered by Seller in accordance with the provisions hereof at the Closing have been, or will be, duly and validly executed and delivered by Seller, and upon execution and delivery thereof by Seller, will constitute the valid and binding agreement and obligations of Seller, enforceable in accordance with their respective terms, except as the enforceability thereof may be limited by bankruptcy, insolvency, reorganization, moratorium and similar laws of general application relating to or affecting creditors' rights generally and to general principles of equity (regardless of whether such enforceability is considered in any proceeding in equity or at law), including the availability of injunctive relief.

5.3 No Adverse Order or Injunctions. Seller is not a party to, nor is Seller subject to or bound by, nor does there exist any agreement, or any judgment, order, writ, prohibition, injunction or decree of any Governmental Authority with respect to Seller, which would prevent the execution, delivery or performance of this Agreement by Seller, or the transfer, conveyance and sale of all of the Project Assets to PGE pursuant to the terms hereof.

---

[9] NTD: This item can be omitted for any transaction that contemplates a simultaneous signing and closing.

5.4 Litigation. There is no action, suit, investigation or proceeding pending in which Seller has been named or served as a party or threatened against Seller before any Governmental Authority.

5.5 No Conflicts. None of the execution, delivery nor performance by Seller of this Agreement nor the consummation of the transactions contemplated by this Agreement, nor the compliance by Seller with any of the provisions of this Agreement, will result in: (a) a violation of or a conflict with any provision of the formation documents of Seller or any law, judgment, order, writ, decree, determination, award or injunction applicable to Seller; (b) a breach or violation of, a conflict with or a default under, or the creation of a right of any Person to accelerate, terminate or cancel any Contract; (c) a violation by Seller of any Applicable Laws; or (d) a violation, or conflict with, or result in a breach of any provision of, or constitute a default (or any event which, with or without due notice or lapse of time, or both, would constitute a default) under, or result in the termination, cancellation, suspension, modification or acceleration of, or result in or give to any Person any additional rights or entitlement to increased, additional, accelerated or guaranteed payments under, or result in the impairment, loss or forfeiture of any material benefit, rights or privilege under, or the creation of any Lien or other encumbrance upon any of the assets of Seller under any contract, note, bond, mortgage, indenture, deed of trust, license, lease, agreement or other instrument or obligation to which Seller is a party.

5.6 Third-Party Consents. Part I of Schedule 5.6 sets forth a true, correct and complete list of all consents and approvals of all Persons, including Governmental Authorities, (other than any Permits) that are required in connection with the execution, delivery and performance of this Agreement by Seller or the consummation by Seller of the transactions contemplated by this Agreement. Part II of Schedule 5.6 sets forth a true, correct and complete list of all Seller Required Regulatory Approvals that are required in connection with the execution, delivery and performance of this Agreement by Seller or the consummation by Seller of the transactions contemplated by this Agreement.

5.7 Project Assets.

5.7.1 Seller holds of record and owns beneficially one hundred percent (100%) of the ownership interests of the Project Assets. Seller does not currently own any asset necessary for PGE to be able after the Closing to develop, construct, own, operate or maintain the Project in accordance with Prudent Utility Standards, except such assets that are (or by the Closing, will be) included in the Project Assets. Schedule 5.7 sets forth a true, accurate and complete list of the Project Assets owned by Seller, which constitute all of the assets and rights of any kind necessary for PGE to develop, construct, own, operate and maintain the Project.

5.7.2 [All of the Project Assets constituting physical assets, if any, including equipment, machinery, vehicles, structures, fixtures and other tangible property, have been

maintained in accordance with Prudent Utility Standards and are in good operating condition and repair, ordinary wear and tear excepted.]

5.7.3 Seller has good, valid and marketable title to all the Project Assets, which are free and clear of any and all Liens, other than Permitted Liens.

5.7.4 [There are no existing or continuing claims against Seller, the Project or the Project Assets by any prior developers of the Project (or partners of or investors in Seller (with respect to the Project Assets)).]

5.8 [Real Estate.

5.8.1 Schedule 5.8 sets forth a true, accurate and complete list of the Real Property Interests Seller holds with respect to the Project and that will be assigned to PGE at Closing.]

5.8.2 [Seller represents and warrants to PGE that the Real Property Agreements: (a) comprise all of the property interests and other rights necessary in connection with the ownership, operation and maintenance of the Project in accordance with Applicable Law and Permits; (b) with respect to the Real Property Agreements, Seller has delivered to PGE correct and complete copies of each of them; (c) provide legal and practical ingress and egress rights for any reasonable purpose in connection with the development, construction, ownership, operation and maintenance of the Project; (d) each of the Real Property Agreements constitute the legal, valid and binding obligations of Seller, and the counterparties thereto, and are in full force and effect except, in each case, as enforceability may be limited by applicable bankruptcy, insolvency, moratorium, reorganization or other similar laws affecting the enforcement of creditors' rights and subject to general equitable principles; (e) each of the Real Property Agreements will continue to be legal, valid, binding and in full force and effect on identical terms immediately following the consummation of the transactions contemplated hereby (including any assignments and assumptions referred to herein) except, in each case, as enforceability may be limited by applicable bankruptcy, insolvency, moratorium, reorganization or other similar laws affecting the enforcement of creditors' rights and subject to general equitable principles; (f) no party to any Real Property Agreements is in breach or default and, no event has occurred which, with notice or lapse of time or without a cure being completed, would constitute a breach or default or permit termination or modification thereof or acceleration thereunder; (g) no party to any Real Property Agreement has repudiated any provision thereof; (h) there are no disputes, oral agreements or representations or forbearance programs in effect as to any Real Property Agreements; (i) no Real Property Agreement has been assigned, transferred, conveyed, mortgaged, deeded in trust or encumbered by Seller; and (j) except as set forth in the Real Property Agreements, there are no rents, royalties, fees or other amounts payable or receivable by Seller or any Person in connection with any Real Property Interests.]

5.9 Tax Matters.[10] Seller represents and warrants with respect to itself:

5.9.1 All Tax Returns required to have been filed with respect to the Project and the Project Assets have been duly and timely filed and each such Tax Return was true, correct and complete in all material respects. All Taxes required to be paid (whether or not shown on any Tax Return) with respect to the Project and the Project Assets have been duly and timely paid. Seller has adequately provided for, in its books of account and related records, liability for all unpaid Taxes with respect to the Project and the Project Assets.

5.9.2 Solely with respect to the Project or any of the Project Assets: (a) there is no action, audit, dispute or claim now pending against, or any proposed or threatened action, audit, dispute or claim against, or with respect to, Seller in respect of any Taxes; (b) no Tax Return of Seller has been subject to examination or audit; (c) Seller has not received from any Governmental Authority any written (i) notice indicating an intent to open an audit or other review, (ii) request for information related to Tax matters, or (iii) notice of deficiency or proposed adjustment for any amount of Tax proposed, asserted or assessed by any taxing authority; and (d) no written claim has been made by a Governmental Authority in any jurisdiction where Seller does not file Tax Returns that Seller is or may be subject to taxation by such jurisdiction.

5.9.3 Neither the Project nor any of the Project Assets constitutes tax-exempt bond financed property or tax-exempt use property within the meaning of Section 168 of the Code. None of Seller or any of its Affiliates has applied for, claimed or received a Cash Grant, production tax credit pursuant to Code Section 45, or an investment tax credit pursuant to Code Section 48 with respect to any of the Project Assets. At least 80% of the Project Assets constitutes "new Section 38 property," as defined in Treasury Regulation Section 1.48-2. Neither the Project nor any Project Assets have been Placed in Service. Either: (a) the Project is a "qualified facility" that produces electricity using "qualified energy resources" within the meaning of Sections 45(d)(1) and 45(a)(2)(A)(i) or the Code, respectively; (b) the Project Assets are "energy property" within the meaning of Section 48(a)(3) of the Code; (c) the Project Assets are "qualified property" or a "qualified investment credit facility" within the meaning of Section 48(a)(5) of the Code; or (d) the Project Assets are "specified energy property," as that term is defined in Section 1603(d) of ARRA. In respect of any financial projections setting forth the amount of depreciation deductions available under Section 168 of the Code, any tax credits available pursuant to either Section 45 or Section 48 of the Code, or any grant available pursuant to Section 1603 of ARRA, in each case in respect of the Project or any Project Assets, (i) the facts and information used to create such financial projections are true, complete and correct and (ii) such financial projections are based on reasonable assumptions and, to the knowledge of Seller, fairly represent the expected performance of the Project and the Project Assets.

---

[10] NTD: Subject to additional review by KLG tax group.

5.9.4 Seller is not a "foreign person" as defined in Section 1445(f)(3) of the Code, and Seller will provide to PGE the certification described in Section 1445(b)(2) of the Code and Treasury Regulations Section 1.1445-2(b).

5.9.5 There are no Liens (other than Permitted Liens) for unpaid or delinquent Taxes, assessments or other charges or deposits upon the Project or the Project Assets.

5.10 [Contracts.]

5.10.1 [Part I of Schedule 5.10 sets forth a true, accurate and complete list of all written agreements and contracts entered into by Seller on or prior to the Effective Date for the benefit of the Project or otherwise related to the Project (the "***Seller Contracts***"). Part II of Schedule 5.10 sets forth a true, accurate and complete list of all written agreements and contracts entered into by Seller on or prior to the Effective Date for the benefit of the Project or otherwise related to the Project, which will be retained by Seller. Part III of Schedule 5.10 sets forth a true, accurate and complete list of all written agreements and contracts entered into by an Affiliate of Seller on or prior to the Effective Date for the benefit of the Project or otherwise related to the Project, which will be assigned to PGE on the Closing Date (the "***Affiliate Contracts***" and together with the Seller Contracts, the "***Contracts***"). Part IV of Schedule 5.10 sets forth a true, accurate and complete list of all written agreements and contracts entered into by an Affiliate of Seller on or prior to the Effective Date for the benefit of the Project or otherwise related to the Project, which will be retained by Seller.]

5.10.2 [Each Contract has been duly authorized, executed and delivered by Seller, is in full force and effect, and constitutes the legal, valid, binding and enforceable agreement as to Seller, the respective counterparties thereto, and will not be rendered invalid or unenforceable as a result of the transactions contemplated by this Agreement, except, in each case, as such enforceability may be limited by applicable bankruptcy, insolvency, moratorium, reorganization or other similar laws affecting the enforcement of creditors' rights and subject to general equitable principles.]

5.10.3 [Neither Seller (or its Affiliate with respect to the Affiliate Contracts), nor the counterparty thereto, is in material breach of or in default under any Contract, no event has occurred which with the passage of time or giving of notice or both would constitute such a default, result in a loss of material rights or permit termination or acceleration under, or result in the creation of any Lien (other than a Permitted Lien) under any Contract.]

5.10.4 [Neither Seller nor any of Seller's Affiliates, as the case may be, has sold or transferred, or agreed to sell or transfer, or granted any options or rights to purchase energy or Environmental Attributes related to the electric power to be generated by the Project for any period after the Closing.]

5.10.5 [Each of the Contracts listed on Parts II and IV of Schedule 5.10 (the "***Retained Contracts***") will not be assigned to PGE as part of the Project Assets. None of the Retained Contracts will provide any material ongoing benefit to the Project on or after the Closing Date.]

5.11 Legal Compliance. Seller is in compliance with all Applicable Laws (other than Environmental Laws, which are the subject of Section 5.12) with respect to the Project and the Project Assets.

5.12 [Environmental Laws.]

5.12.1 [Seller has conducted its activities with respect to the development of the Project and the Project Assets in compliance with all Environmental Laws, and no action, suit, proceeding, hearing, investigation or written charge, complaint, claim, demand or notice has been filed or commenced or threatened against Seller (with respect to the Project Assets), the Project or the Site alleging any failure to comply with or any violation of any applicable Environmental Law.]

5.12.2 [All environmental investigations, studies, audits, tests, reviews or other analyses conducted on behalf of, or that are in the possession of, Seller in relation to the Site, the Project Assets and the Real Property Interests have been delivered to PGE prior to the Effective Date of this Agreement and there are no other such items.]

5.13 [Permits. Schedule 5.13 sets forth a true, correct and complete list of all Permits that Seller is required to obtain, and has obtained, in order to develop, construct, operate, and maintain the Project.]

5.14 [Renewable Resource Data. Schedule 5.14 of this Agreement sets forth a true, correct and complete list of the Renewable Resource Data, which data does not contain any material errors. Seller has the right to use and to validly transfer to PGE the Renewable Resource Data.]

5.15 Solvency. Seller is solvent and has sufficient assets and capital to carry on its business as it is now conducted and to perform its obligations hereunder. No petition or notice has been presented, no order has been presented, no order has been made and no resolution has been passed for the bankruptcy, liquidation, winding-up or dissolution of Seller. No receiver, trustee, custodian or similar fiduciary has been appointed over the whole or any part of the Project Assets or the income of Seller, nor does Seller have any plan or intention of, or has received any notice that any other Person has any plan or intention of, filing, making or obtaining any such petition, notice, order or resolution or of seeking the appointment of a receiver, trustee, custodian or similar fiduciary. Seller is solvent and has sufficient assets and capital to carry on its businesses as they are now conducted and to perform its obligations hereunder.

5.16 Brokers. Seller does not have any contract, arrangement or understanding with any broker or other intermediary with respect to the transactions contemplated by this Agreement.

5.17 Investment Company. Seller is not an "investment company" or a company controlled by an "investment company" within the meaning of the Investment Company Act of 1940, as amended.

5.18 [Intellectual Property. Seller has the right to use and to transfer to PGE all patents, trademarks, copyrights or other intellectual property rights used in connection with the Project Assets, and which constitute all intellectual property necessary for the operation, maintenance or use of the Project. Seller has not infringed nor has been claimed to have infringed the patent, trademark, copyright or other intellectual property rights of any Person. No Person is infringing the patent, trademark or other intellectual property rights of Seller.]

5.19 Material Misstatements or Omissions. None of the representations or warranties (a) given by Seller in this Agreement (including the Schedules hereto) or any certificate delivered by Seller at Closing, (b) included in any document, exhibit, written communication, certificate or schedule heretofore prepared by Seller, an Affiliate of Seller or a Representative (commissioned by Seller or an Affiliate of Seller) and furnished by or on behalf of Seller in connection with the transactions contemplated by this Agreement (including any and all materials delivered to and written communication made to any Governmental Authority), or (c) included in any document, exhibit, written communication, certificate or schedule heretofore furnished by or on behalf of Seller in connection with the transactions contemplated by this Agreement, that was not prepared by Seller, an Affiliate of Seller or a Representative (commissioned by Seller or an Affiliate of Seller) (including any and all materials delivered to and written communication made to any Governmental Authority), when taken as a whole, contains any untrue statement of a material fact, or omits to state any material fact necessary to make the statements or facts contained in such representations or warranties, in light of the circumstances in which they were made, not materially misleading.

5.20 [Project-Specific Representations.][11]

ARTICLE 6
REPRESENTATIONS AND WARRANTIES OF PGE

PGE represents and warrants to Seller that, as of the Effective Date [and as of the Closing Date], the following are true and correct:

---

[11] NTD: PGE reserves the right to require the inclusion of additional representations and warranties based on the nature and state of development of Bidder's project. Such representations may include, but are not limited to, representations regarding permitting, regulatory status, insurance, affiliate transactions and studies and reports.

6.1 Organization and Authority. PGE is a corporation duly organized, validly existing and is qualified to do business under the laws of the State of Oregon, and has all requisite corporate power and authority to execute and deliver this Agreement and to perform its obligations hereunder. PGE is duly qualified to do business and is in good standing in all other jurisdictions in which its ownership of property or the character of its business requires such qualification, except where the failure to be so qualified would not reasonably be expected to have a material adverse effect with respect to PGE.

6.2 Binding Agreement. All necessary company action on the part of PGE has been taken to authorize the execution and delivery of this Agreement, the performance of its obligations under this Agreement and the consummation of the transactions contemplated hereby. This Agreement has been, and the other documents and instruments required to be delivered by PGE in accordance with the provisions hereof have been, or will be, duly and validly executed and delivered by PGE, and upon execution and delivery thereof by PGE, will constitute the valid and binding agreement and obligations of PGE, enforceable in accordance with their respective terms, except as the enforceability thereof may be limited by bankruptcy, insolvency, reorganization, moratorium and similar laws of general application relating to or affecting creditors' rights generally and to general principles of equity (regardless of whether such enforceability is considered in any proceeding in equity or at law), including the availability of injunctive relief.

6.3 No Adverse Order or Injunctions. PGE is not a party to, and to PGE's knowledge, is not subject to or bound by, any agreement, or any judgment, order or injunction of any Governmental Authority, which would prevent or have a material adverse effect on the execution, delivery or performance of this Agreement by PGE, or the purchase of the Project Assets by PGE pursuant to the terms hereof.

6.4 No Conflicts. Neither the execution, delivery nor performance by PGE of this Agreement will result in (a) a violation of or a conflict with any provision of the articles of incorporation, bylaws or other corporate documents of PGE, or (b) a violation by PGE of any Applicable Laws, except any such conflict, breach or violation, acceleration, termination or cancellation that would not have or be expected to have a material adverse effect on PGE.

6.5 Third-Party Consents. Part I of Schedule 6.5 sets forth a true, accurate and complete list of all consents and approvals of all Persons, including Governmental Authorities, that are required in connection with the execution, delivery and performance of this Agreement or the consummation by PGE of the transactions contemplated by this Agreement. Part II of Schedule 6.55.6 sets forth a true, correct and complete list of all PGE Required Regulatory Approvals that are required in connection with the execution, delivery and performance of this Agreement by Seller or the consummation by Seller of the transactions contemplated by this Agreement.

6.6 Brokers. Neither PGE nor its Affiliates has any contract, arrangement or understanding with any broker or other intermediary with respect to the transactions contemplated by this Agreement.

ARTICLE 7
CONFIDENTIAL INFORMATION

7.1 PGE Confidential Information.

7.1.1 Seller acknowledges that PGE Confidential Information (as defined below) is valuable and proprietary and Seller agrees not to, directly or indirectly, use, publish, disseminate, describe or otherwise disclose any PGE Confidential Information without the prior written consent of PGE. For purposes of this Agreement, "***PGE Confidential Information***" shall mean (i) any and all information provided by PGE to Seller and identified by PGE as confidential and (ii) any and all information provided by PGE to Seller with respect to the Project or the transactions contemplated hereby. Information shall not be deemed to be PGE Confidential Information if: (a) it has become generally known or available within the industry or the public through no act or omission of Seller; (b) Seller can demonstrate that, prior to disclosure in connection with the transactions contemplated hereby, such information was already in the possession of Seller; (c) it was rightfully received by Seller from a third party who became aware of it through no act or omission of Seller and who is not under an obligation of confidentiality to PGE; or (d) Seller can demonstrate it was independently developed by employees or consultants of Seller. Notwithstanding the foregoing, from and after the Closing, PGE Confidential Information shall include any information that is a Project Asset, whether or not of the type referred to in clauses (b), (c) or (d) above.

7.1.2 Seller shall maintain any PGE Confidential Information which has been or will be disclosed directly or indirectly to Seller by or on behalf of PGE or its Affiliates in confidence and shall not disclose or cause to be disclosed by them or any third person without PGE's prior express written consent; provided, however, that Seller may disclose the PGE Confidential Information to Persons who provide legal, accounting or other services to Seller in connection with Seller's evaluation or implementation of the transactions contemplated by this Agreement, provided that such persons have first been informed of the duties required hereby.

7.1.3 Notwithstanding the preceding Section 7.1.1 and Section 7.1.2, PGE Confidential Information may be disclosed if required by any Governmental Authority or court or otherwise by Applicable Law; provided, however, that: (a) such PGE Confidential Information is submitted under any and all applicable provisions for confidential treatment and (b) PGE is given written notice of the requirement for disclosure promptly after such disclosure is requested, so that it may take whatever action it deems appropriate, including intervention in any proceeding and seeking a protective order or an injunction, to prohibit such disclosure.

7.1.4 Seller agrees that it will not make any use of any PGE Confidential Information received pursuant to this Agreement except in connection with the transactions contemplated by this Agreement, unless specifically authorized to do so in writing by PGE, and this Agreement shall not be construed as a license or authorization to Seller to utilize the PGE Confidential Information except for such purpose.

7.1.5 Seller acknowledges that a breach of the covenants contained in this Section 7.1 will cause irreparable damage to PGE, the exact amount of which will be difficult to ascertain, and that the remedies at law for any such breach will be inadequate. Accordingly, Seller agrees that if Seller breaches any of the covenants contained in this Section 7.1, in addition to any other remedy that may be available at law or in equity, PGE shall be entitled to injunctive relief, without posting bond or other security and Seller shall have no right or power to raise the defense of adequate remedy at law.

7.2 Seller Confidential Information.

7.2.1 PGE acknowledges that Seller Confidential Information (as defined below) is valuable and proprietary to Seller and PGE agrees not to, directly or indirectly, use, publish, disseminate, describe or otherwise disclose any Seller Confidential Information in respect of the Project without the prior written consent of either Seller. For purposes of this Agreement, "***Seller Confidential Information***" shall mean (i) any and all information provided by Seller to PGE and identified by Seller as confidential and (ii) any and all information provided by Seller to PGE with respect to the Project or the transactions contemplated hereby. Information shall not be deemed to be Seller Confidential Information if: (a) the Closing has occurred and such information is also an a Project Asset and/or Post-Closing Asset under this Agreement; (b) it has become generally known or available within the industry or the public though no act or omission of PGE; (c) PGE can demonstrate that, prior to disclosure in connection with the transactions contemplated hereby, such information was already in the possession of PGE; (d) it was rightfully received by PGE from a third party who became aware of it through no act or omission of PGE and who is not under an obligation of confidentiality to Seller; or (e) PGE can demonstrate it was independently developed by employees or consultants of PGE.

7.2.2 PGE shall maintain any Seller Confidential Information which has been or will be disclosed directly or indirectly to PGE by or on behalf of Seller in confidence by it and shall not disclose or cause to be disclosed by PGE or any third person without Seller's prior express written consent; provided, however, that PGE may disclose Seller Confidential Information to its Representatives and to Persons who provide financial analysis, banking, legal, accounting or other services to PGE provided that such Persons have first been informed of the duties required hereby.

7.2.3 Notwithstanding the preceding Section 7.2.1 and Section 7.2.2, Seller Confidential Information may be disclosed (a) if required by any Governmental Authority or court or otherwise by Applicable Law and (b) to the OPUC and/or the independent evaluator retained by PGE and approved by the OPUC in connection with the RFP; provided, however, that (i) such Seller Confidential Information is submitted under any and all applicable provisions for confidential treatment and (ii) if PGE is permitted to do so, Seller is given written notice of the requirement for disclosure promptly after such disclosure is requested, so that it may take whatever action it deems appropriate, including intervention in any proceeding and seeking a protective order or an injunction, to prohibit such disclosure.

7.2.4 PGE agrees that it will not make any use of any Seller Confidential Information received pursuant to this Agreement except in connection with the transactions contemplated by this Agreement, unless specifically authorized to do so in writing by Seller, and this Agreement shall not be construed as a license or authorization to PGE to utilize Seller Confidential Information except for such purpose.

7.2.5 PGE acknowledges that a breach of the covenants contained in this Section 7.2 will cause irreparable damage to Seller and Seller's Affiliates, the exact amount of which will be difficult to ascertain, and that the remedies at law for any such breach will be inadequate. Accordingly, PGE agrees that if PGE breaches any of the covenants contained in this Section 7.2, in addition to any other remedy that may be available at law or in equity, Seller and its Affiliates shall be entitled to injunctive relief, without posting bond or other security, and PGE shall have no right or power to raise the defense of adequate remedy at law.

ARTICLE 8
[COVENANTS OF PGE AND SELLER][12]

8.1 [Conduct Pending the Closing.] Between the Effective Date and the earlier to occur of the termination of this Agreement and the Closing Date, Seller shall:

8.1.1 [continue to operate the Project and conduct its business in the Ordinary Course of Business;]

8.1.2 [maintain and keep the Project and the Project Assets in a state of repair and condition as good as at the Effective Date, ordinary wear and tear excepted, and in accordance with the Ordinary Course of Business;]

8.1.3 [maintain relationships with landowners and suppliers in accordance with the Ordinary Course of Business;]

[12] NTD: This Article 8 can be omitted for any transaction that contemplates a simultaneous signing and closing.

8.1.4 [maintain the Permits and comply with Applicable Law affecting the Project or the Project Assets;]

8.1.5 [perform and comply in all material respects with [the Contracts, the Real Property Agreements and the Permits] and Seller shall not, without PGE's consent, (a) amend or modify, or consent to the amendment or modification of, any of the [Contracts, the Real Property Agreements and the Permits] which amendments, modifications or consents would remain in effect for any period after Closing, or (b) enter into any new or additional contracts, real property agreements or permits relating to the Project that would remain in effect for any period after the Closing;]

8.1.6 [continue development of the Project as provided on Schedule 8.1.6;]

8.1.7 [not, without PGE's prior written consent, (a) sell, transfer or otherwise dispose of, or agree to sell, transfer or otherwise dispose of, any of the Project Assets, or (b) lease, mortgage or pledge any of the Project Assets and which such lease, mortgage or pledge would remain in effect for any period after the Closing;]

8.1.8 [not place or cause to be Placed in Service the Project or any of the Project Assets, in each case for purposes of Section 45 or Section 48 of the Code or Section 1603 of ARRA;

8.1.9 [not claim or permit any Person to claim any tax credit pursuant to Section 45 or Section 48 of the Code or any grant pursuant to Section 1603 of ARRA with respect to the Project or any Project Asset;]

8.1.10 [not cause or permit the Project or any Project Assets to become tax-exempt bond financed property or tax-exempt use property within the meaning of Section 168 of the Code;]

8.1.11 [not make any election or take any action that would limit, prevent or preclude the Project or any of the Project Assets from being classified in the hands of PGE as: (a) "qualified energy resources" and "qualified facilities" within the meaning of Sections 45(a)(2)(A)(i) and 45(d)(1) of the Code; (b) "energy property" in the hands of PGE within the meaning of Section 48(a)(3) of the Code; (c) "qualified property" or a "qualified investment credit facility" within the meaning of Section 48(a)(5) of the Code; or (d) "specified energy property" within the meaning of Section 1603(d) of ARRA;]

8.1.12 [maintain all books and records of Seller relating to the Project Assets in the Ordinary Course of Business.]

8.2 [Exclusivity. From and after the Effective Date, Seller agrees that it shall not (and shall not permit or cause any of its Affiliates to) solicit, initiate, encourage, entertain, make

or accept offers with respect to the sale of the Project or the Project Assets (the "***Seller's Exclusivity Obligations***").]

8.3 [Site and Project Access. From and after the Effective Date, Seller shall allow, permit or obtain the right of PGE to reasonable access to the Site and the Project (all in accordance with the limitations imposed by the Real Property Agreements and other Project safety rules and regulations and security limitations imposed by Seller or the relevant landowners), upon reasonable prior notice, in order to perform its due diligence review, including physical inspection and analysis of the Project Assets.]

8.4 [Due Diligence. From and after the Effective Date, Seller shall allow, permit or obtain the right of PGE (a) to access to the management, development and operational personnel of Seller and (b) to review and make copies of the books and records of Seller. Any and all such access to Seller's management, development and operational personnel shall take place during normal business hours.]

8.5 [Notice of Developments. Seller shall, from time to time prior to the Closing, promptly (a) supplement or amend the Schedules referred to in Article 5, with respect to any matter that arises after the Effective Date, which if existing as of the Effective Date, would have been required to be set forth or described in such Schedules in order to make any representation or warranty set forth in Article 5 true and correct, and (b) notify PGE of any conditions, circumstances or events that could reasonably be expected to have a Material Adverse Effect.]

ARTICLE 9
INDEMNIFICATION

9.1 Survival. Except as set forth in Sections 9.1.1, all representations, warranties and related indemnification obligations contained in this Agreement and any Schedule, certificate or other document delivered pursuant to this Agreement at Closing, shall survive the Closing for a period of twenty-four (24) months.

9.1.1 The representations, warranties and related indemnification obligations of (a) Seller contained in Section 5.1 (Organization and Authority) and Section 5.7 (Project Assets), and (b) PGE contained in Section 6.1 (Organization and Authority) shall survive termination of this Agreement. The representations, warranties and related indemnification obligations of Seller contained in Section 5.9 (Tax Matters) and Section 5.12 (Environmental Laws) shall survive the Closing until the expiration of the applicable statute of limitations. The obligations of (i) Seller pursuant to Sections 9.3.1(d) and (e) or (ii) PGE pursuant to Sections 9.4.1(c) and (d) shall survive the Closing indefinitely.

9.2 Applicable Survival Period. The period for which a representation, warranty or indemnification obligation survives the Closing is referred to herein as the "***Applicable Survival***

Period." In the event notice of claim for indemnification under Sections 9.3 or 9.4 is given within the Applicable Survival Period, the representation, warranty or indemnification obligation that is the subject of such indemnification claim (whether or not formal legal action shall have been commenced based upon such claim) shall survive with respect to such claim until such claim is finally resolved. All claims for indemnification shall be made no later than ninety (90) days after the Applicable Survival Period. In the event notice of claim for indemnification under Sections 9.3 or 9.4 is not given within ninety (90) days after the Applicable Survival Period, such claim shall be null and void and no remedy, relief or recourse will be available to the indemnified party with respect to such claim.

9.3 Indemnification by Seller.

9.3.1 Seller shall indemnify and defend PGE and its Affiliates and their respective stockholders, members, managers, officers, directors, employees, agents, successors and assigns (each, a "***PGE Indemnified Party***") against, and shall hold them harmless from, any and all losses, damages, claims (including third-party claims), charges, interest, penalties, Taxes, costs and expenses (including legal, consultant, accounting and other professional fees, costs of sampling, testing, investigation, removal, treatment and remediation of contamination and fees and costs incurred in enforcing rights under this Section 9.3) (collectively, "***Losses***") resulting from, arising out of, or incurred by any PGE Indemnified Party in connection with, or otherwise with respect to:

(a) the failure of any representation and warranty or other statement by Seller contained in this Agreement or any certificate or other document furnished to PGE at Closing, to be true and correct in all respects as of the Effective Date [or the Closing Date, as applicable];

(b) any material breach of any covenant or agreement of Seller contained in this Agreement or any certificate or other document furnished to PGE at the Closing;

(c) any Retained Liabilities;

(d) any fraud, intentional misrepresentation, willful misconduct by or gross negligence of Seller in connection with this Agreement or the transactions contemplated by this Agreement;

(e) any claims, actions or suits made by third parties (before, on or after the Closing Date) against any PGE Indemnified Party arising from or as a result of the acts or omissions of Seller or any of its Affiliates in connection with the development, ownership or operation of the Project or the Project Assets; and

(f) any liability for Taxes (including Tax Liens) imposed on or incurred by PGE relating to any taxable period ending on or before the time of the Closing or the portion of any other taxable period beginning before and occurring on or before the time of the Closing relating to the Project or the Project Assets.

9.4 Indemnification by PGE.

9.4.1 PGE shall indemnify and defend Seller and its Affiliates and their respective stockholders, members, managers, officers, directors, employees, agents, successors and assigns (each, a "***Seller Indemnified Party***") against, and shall hold them harmless from, any and all Losses resulting from, arising out of, or incurred by any Seller Indemnified Party in connection with, or otherwise with respect to:

(a) the failure of any representation and warranty or other statement by PGE contained in this Agreement or any certificate or other document furnished to Seller at Closing, to be true and correct in all respects as of the Effective Date [and as of the Closing Date, as applicable;]

(b) any material breach of any covenant or agreement of PGE contained in this Agreement, or any certificate or other document furnished to Seller at the Closing;

(c) any claims, actions or suits made by third parties (before, on or after the Closing Date) against any Seller Indemnified Party arising from or as a result of the acts or omissions of PGE or any of its Affiliates in connection with its ownership or operation of the Project, the Project Assets or the Post-Closing Assets;

(d) any fraud, intentional misrepresentation, willful misconduct by or gross negligence of PGE in connection with this Agreement or the transactions contemplated by this Agreement;

(e) any liability for Taxes (including Tax Liens) imposed on or incurred by Seller relating to any taxable period ending on or after the time of the Closing or the portion of any other taxable period beginning before and occurring on or after the time of the Closing relating to the Project and the Project Assets; and

(f) Assumed Liabilities.

9.5 Claims for Indemnification. A Party seeking indemnification (the "***Indemnified Party***") under this Article 9 shall give written notice (a "***Claim Notice***") to the other Party (the "***Indemnifying Party***") as soon as practicable after the Indemnified Party becomes aware of any fact, condition or event which may give rise to Losses for which indemnification may be sought under this Article 9 (a "***Claim***"). Except as set forth in Section 9.2, the failure of the Indemnified

Party to timely give a Claim Notice to the Indemnifying Party hereunder shall not affect the Indemnified Party's rights to indemnification hereunder, except and only to the extent that the Indemnifying Party is materially prejudiced by such delay.

9.6 Defense. In the case of a Claim involving the assertion of a claim by a third party (whether pursuant to a lawsuit or other legal action or otherwise, a "***Third-Party Claim***"), the Indemnifying Party may, upon written notice to the Indemnified Party, take control of the defense and investigation of such Third-Party Claim if the Indemnifying Party acknowledges to the Indemnified Party in writing the obligation of the Indemnifying Party to indemnify the Indemnified Party with respect to all elements of such Third-Party Claim. If the Indemnifying Party assumes the defense of any such Third-Party Claim, the Indemnifying Party shall select counsel reasonably acceptable to the Indemnified Party (and separate from counsel to the Indemnifying Party if there is any conflict or divergence of interest between the Indemnifying Party and the Indemnified Party) to conduct the defense of such claims or legal proceedings and, at the sole cost and expense of the Indemnifying Party, shall take all steps necessary in the defense or settlement thereof. The Indemnifying Party shall not consent to a settlement of or the entry of any judgment arising from any such Third-Party Claim without the prior written consent of the Indemnified Party (which consent shall not be unreasonably withheld or delayed). The Indemnified Party shall be entitled to participate in (but not control) the defense of any such Third-Party Claim, with its own counsel and at its own expense; *provided*, *however*, that the Indemnified Party shall be entitled to settle any Third-Party Claim involving criminal penalties, civil fines or harm without the consent, but at the expense, of the Indemnifying Party if the Indemnifying Party shall unreasonably fail to do so after being requested to do so by the Indemnified Party. If the Indemnifying Party does not notify the Indemnified Party that it will assume the defense of such Third-Party Claim within thirty (30) days after the Indemnifying Party receives notice of such claim from the Indemnified Party: (a) the Indemnified Party may defend against such Third-Party Claim in such manner as it may deem reasonably appropriate, *provided* that the Indemnified Party shall not consent to a settlement of or the entry of any judgment arising from such Third-Party Claim without the prior written consent of the Indemnifying Party (which consent shall not be unreasonably withheld or delayed); and (b) the Indemnifying Party shall be entitled to participate in (but not control) the defense of such action, with its counsel and at its own expense. Regardless of which Party shall assume the defense of the Third-Party Claim, the Parties agree to cooperate fully with one another in connection therewith. Such cooperation shall include the providing of records and information which are relevant to such Third-Party Claim and making employees and officers available on a mutually convenient basis to provide additional information and explanation of any material provided hereunder and to act as a witness or respond to legal process, in each case to the extent that the Party being requested to provide records and information or to make employees and officers available can do so without waiving any evidentiary privileges to which it is entitled.

9.7 Limitations on Liability.

9.7.1 Notwithstanding any provision in this Agreement to the contrary, the aggregate maximum liability of Seller for indemnity under this Agreement shall not exceed the sum of one hundred percent (100%) of the Purchase Price (the "***Seller Indemnity Cap***"); provided, however, that the Seller Indemnity Cap shall not apply to any breach by Seller of Sections 5.1 (Organization and Authority), 5.7 (Project Assets), 5.15 (Solvency) or 5.17 (Investment Company), any Third-Party Claim or any claims based upon fraud or willful misconduct of Seller.

9.7.2 Notwithstanding any provision in this Agreement to the contrary, the aggregate maximum liability of PGE for indemnity under this Agreement shall not exceed the sum of one hundred percent (100%) of the Purchase Price (the "***PGE Indemnity Cap***"); provided, however, that the PGE Indemnity Cap shall not apply to any breach by PGE of Section 6.1 (Organization and Authority) or any Third-Party Claim or any claims based upon fraud or willful misconduct of PGE.

9.7.3 No Indemnified Party shall be entitled to indemnification under Sections 9.3 or 9.4 for Losses to the extent directly or indirectly caused by the willful misconduct, fraud or a negligent act of such Indemnified Party, or any of its Affiliates, or a breach by such Indemnified Party, or any of its Affiliates, of any representation, warranty, covenant or other agreement set forth in this Agreement. Any Indemnified Party making a claim under Sections 9.3 or 9.4 shall take such commercially reasonable steps to mitigate its Losses upon becoming aware of any event which could reasonably be expected to give rise thereto.

9.7.4 Any Claim made or Losses claimed under this Article 9 shall be reduced to the extent the Seller Indemnified Party or PGE Indemnified Party, as applicable, recovers any insurance proceeds in respect of such Claim or Loss.

ARTICLE 10
TAX MATTERS

10.1 Allocation of Purchase Price. The allocation of the Purchase Price (the "***Allocation***") shall be agreed between the Parties each acting reasonably as soon as practicable, but in no event later than sixty (60) days after the Closing Date. The Allocation agreed to by the parties shall be consistent with Section 1060 of the Code and the Treasury Regulations promulgated thereunder, and any analogous provisions of state, local or foreign law. If any adjustment is subsequently made to the Purchase Price or other relevant items, the Parties shall reasonably cooperate with each other to promptly amend the Allocation to reflect such adjustment. The Allocation (as so adjusted) shall be binding on the Parties and each of their respective Affiliates for all purposes. The Parties and each of their respective Affiliates shall report, act and file Tax Returns (including Internal Revenue Service Form 8594) in all respects

and for all purposes consistent with the Allocation, to the extent permitted by Applicable Law. Neither the Parties nor their respective Affiliates shall take any position on any Tax Return, before any Governmental Authority or in any judicial proceeding, that is inconsistent with the Allocation, unless taking such a position is required by Applicable Law.

10.2 Sales, Transfer and Documentary Taxes. Seller shall be responsible for all federal, state and local sales, documentary and other transfer taxes, if any, due as a result of the purchase, sale or transfer of the Project Assets in accordance herewith, whether imposed by law on Seller or PGE.

10.3 Treatment of Indemnity Payments. The Parties shall treat all payments made by Seller to or for the benefit of PGE and all payments by PGE to or for the benefit of Seller under any indemnity provision of this Agreement, as adjustments to the Purchase Price, unless otherwise required by Applicable Law (taking into account all relevant facts and circumstances underlying such payment), in which case any such payment will be increased by any Tax cost actually incurred by the recipient or reduced by any Tax benefit actually realized by the recipient, as applicable.

ARTICLE 11
MISCELLANEOUS

11.1 Successors and Assigns. This Agreement shall be binding upon and inure to the benefit of the Parties and their respective successors and assigns, except that PGE, on the one hand, and Seller, on the other hand, may not assign their respective obligations hereunder without the prior written consent of the other Party.

11.2 Entire Agreement; Amendments; Attachments. This Agreement, and all exhibits and schedules hereto, represents the entire understanding and agreement between the Parties with respect to the subject matter hereof and supersedes all prior oral and written and all contemporaneous oral negotiations, commitments and understandings between the Parties. PGE and Seller may amend or modify this Agreement, in such manner as may be agreed upon, by a written instrument executed by PGE and Seller. If the provisions of any exhibit or schedule are inconsistent with the provisions of this Agreement, the provisions of this Agreement shall prevail. The exhibits and schedules attached hereto are hereby incorporated as integral parts of this Agreement.

11.3 Severability. Any provision of this Agreement which is invalid, illegal or unenforceable shall be ineffective to the extent of such invalidity, illegality or unenforceability, without affecting in any way the remaining provisions hereof or rendering that or any other provision of this Agreement invalid, illegal or unenforceable. Upon such determination that any term or other provision is invalid, illegal or incapable of being enforced, the Parties shall negotiate in good faith to modify this Agreement so as to effect the original intent of the Parties

as closely as possible in an acceptable manner to the end that the transactions contemplated hereby are fulfilled to the fullest extent possible.

11.4 Dispute Resolution Process; Consent to Jurisdiction.

11.4.1 Avoidance and Mediation. The Parties agree to cooperate with each other and agree to communicate regularly with each other at all times so as to avoid or minimize disputes. In the event of any controversy, claim or dispute between the Parties arising out of or related to this Agreement ("***Dispute***"), within three (3) Business Days following the date of delivery of a written request by either Party, (a) each Party shall appoint as its representative a senior officer, and (b) such senior officers shall meet, negotiate and attempt in good faith to resolve the Dispute quickly, informally and inexpensively.

11.4.2 Mandatory Mediation. Any Dispute that is not resolved pursuant to Section 11.4.1 may be submitted for mediation before a single mediator in accordance with the provisions contained herein and in accordance with the Commercial Mediation Procedures of the AAA in effect at the time of the mediation ("***AAA Procedures***"); provided, however, that in the event of any conflict between the procedures herein and the AAA Procedures, the procedures herein shall control. The mediator will be named by mutual agreement of the Parties or by obtaining a list of five (5) qualified Persons from the Parties and alternately striking names. All mediation shall be administered by the AAA. All mediation shall take place in the City of Portland, Oregon, unless otherwise agreed to by the Parties. Each Party shall be required to exchange documents to be used in the mediation not less than five (5) Business Days prior to the mediation. The Parties shall use all commercially reasonable efforts to conclude the mediation as soon as practicable. All aspects of the mediation shall be treated as Confidential Information. Neither the Parties nor any mediator may disclose the content or results of the mediation, except as necessary to comply with legal, audit or regulatory requirements. Before making any such disclosure, a Party shall give written notice to the other Party and shall afford such Party a reasonable opportunity to protect its interests. Each Party shall be responsible for its own expenses and one-half of any mediation expenses incurred to resolve the dispute. The mediator will provide the Parties with a fee and expense schedule in advance of mediation. Mediation will terminate by (a) written agreement signed by both Parties, (b) determination by the mediator that the Parties are at an unresolvable impasse, or (c) two unexcused absences by either Party from the mediation sessions. The mediator will never participate in any claim or controversy covered by this Article as a witness, collateral contract or attorney and may not be called as a witness to testify in any proceeding involving the subject matter of mediation. O.R.S. §§ 36.100 to 36.238 will apply to the entire process of mediation.

11.4.3 If the Parties are still unable to resolve their differences after good faith consideration of a resolution through mediation pursuant to Section 11.4.2, then each of the Parties hereby irrevocably consents and agrees that any legal action or proceedings with respect

to this Agreement may be brought in any of the courts of the State of Oregon located in the City of Portland or the courts of the United States of America for the District of Oregon having subject matter jurisdiction. By execution and delivery of this Agreement and such other documents executed in connection herewith, each Party hereby (a) accepts the exclusive jurisdiction of the aforesaid courts, (b) irrevocably agrees to be bound by any final judgment (after any and all appeals) of any such court with respect to such documents, (c) irrevocably waives, to the fullest extent permitted by law, any objection it may now or hereafter have to the laying of venue of any action or proceeding with respect to such documents brought in any such court, and further irrevocably waives, to the fullest extent permitted by law, any claim that any such action or proceeding brought in any such court has been brought in any inconvenient forum, and (d) agrees that services of process in any such action or proceeding may be effected by mailing a copy thereof by registered or certified mail (or any substantially similar form of mail), postage prepaid, to such Party at its address set forth in Article 12, or at such other address of which the Parties have been notified.

11.4.4 EACH PARTY IRREVOCABLY WAIVES, TO THE FULLEST EXTENT PERMITTED BY APPLICABLE LAW, ANY AND ALL RIGHTS TO TRIAL BY JURY IN ANY LEGAL PROCEEDING ARISING OUT OF OR RELATING TO THIS AGREEMENT OR THE TRANSACTIONS CONTEMPLATED HEREBY.

11.4.5 If either Party institutes any legal suit, action or proceeding against the other Party arising out of or relating to this Agreement, including, but not limited to, contract, equity, tort, fraud and statutory claims, the prevailing Party in the suit, action or proceeding will be entitled to receive, in addition to all other remedies to which the prevailing Party may be entitled, the costs and expenses incurred by the prevailing Party in conducting the suit, action or proceeding, including reasonable attorneys' fees and expenses, court costs and other legal expenses such as expert witness fees, and all fees, taxes, costs and expenses incident to appellate, bankruptcy and post-judgment proceedings.

11.4.6 The provisions set forth in this Section 11.4 shall survive the termination or expiration of this Agreement.

11.5 Consequential Damages. EXCEPT WITH RESPECT TO LOSSES DIRECTLY OR INDIRECTLY CAUSED BY A PARTY'S WILLFUL MISCONDUCT OR FRAUD, IN NO EVENT SHALL SELLER OR PGE OR ANY OF THEIR RESPECTIVE OFFICERS, DIRECTORS, MEMBERS, PARTNERS, SHAREHOLDERS, EMPLOYEES, AGENTS OR AFFILIATES BE LIABLE FOR ANY SPECIAL, INDIRECT, NON-COMPENSATORY, CONSEQUENTIAL, INCIDENTAL, PUNITIVE OR EXEMPLARY DAMAGES, LOST OR PROSPECTIVE PROFITS, LOSS OF BUSINESS OPPORTUNITY OR BUSINESS INTERRUPTIONS UNDER OR IN RESPECT TO THIS AGREEMENT OR FOR ANY FAILURE OF PERFORMANCE RELATED HERETO, IRRESPECTIVE OF WHETHER

SUCH DAMAGES ARE REASONABLY FORESEEABLE OR WHETHER SUCH CLAIMS ARISE IN CONTRACT, TORT (INCLUDING NEGLIGENCE, WHETHER SOLE, JOINT OR CONCURRENT OR STRICT LIABILITY) OR OTHERWISE.

11.6 Governing Law. This Agreement shall be governed by and construed in accordance with the laws of the State of Oregon applicable to contracts made and to be performed in the State of Oregon and without reference to the conflicts of laws rules thereof.

11.7 Section Headings. The Section headings are for the convenience of the Parties and in no way alter, modify, amend, limit or restrict the contractual obligations of the Parties.

11.8 Counterparts. This Agreement may be executed in one or more counterparts, each of which shall be deemed to be an original, but all of which shall be one and the same document.

11.9 No Third-Party Beneficiaries. This Agreement is entered into for the sole benefit of the Parties, and except as specifically provided herein, no other Person shall be a direct or indirect beneficiary of, or shall have any direct or indirect cause of action or claim in connection with, this Agreement.

11.10 Waiver. At any time prior to the Closing Date, any Party may (a) extend the time for the performance of any of the obligations or other acts of the other Parties hereto, (b) waive any inaccuracies in the representations and warranties of the other Parties contained herein or in any document delivered pursuant hereto and (c) waive compliance by any other Party with any of the agreements or conditions contained herein. Any such extension or waiver shall be valid only if set forth in an instrument in writing signed by the Party or Parties to be bound thereby. The failure of any Party to this Agreement to assert any of its rights under this Agreement or otherwise shall not constitute a waiver of such rights.

11.11 Costs. Each Party shall pay all of its own costs and expenses, including the fees and costs of its attorneys, consultants, contractors and representatives and internal overhead costs, incurred in connection with the negotiation, authorization, execution and delivery of this Agreement and the agreements, Permits and other documents prepared or to be entered into in connection with the transactions contemplated herein. In the event of legal action to enforce or interpret any provision of this Agreement or the agreements, instruments or certificates delivered pursuant hereto, the prevailing Party shall be entitled to recover from the other Party its reasonable attorneys' fees and other costs of suit so incurred from the losing Party, at trial, on any appeal, and on any petition for review or other proceeding, in addition to all other sums provided by law.

11.12 Relationship of Parties.

11.12.1 The duties, obligations and Liabilities of the Parties are intended to be several and not joint or collective. This Agreement shall not be interpreted or construed to create an association, joint venture, fiduciary relationship or partnership between Seller and PGE or to impose any partnership obligation or liability or any trust or agency obligation or relationship upon either Party. Seller and PGE shall not have any right, power or authority to enter into any agreement or undertaking for, or act on behalf of, or to act as or be an agent or representative of, or to otherwise bind, the other Party.

11.12.2 The relationship between PGE and Seller shall be that of contracting party to independent contractor. Accordingly, subject to the specific terms of this Agreement, PGE shall have no general right to prescribe the means by which Seller shall meet its obligations under this Agreement.

ARTICLE 12
NOTICES

Any communications between the Parties hereto or regular notices provided herein to be given shall be given to the following addresses:

To PGE:

Portland General Electric Company
121 SW Salmon St.
1 WTC 1700
Portland, Oregon 97204
Attention: [_____]
Facsimile: [_____]

To Seller:

[_____]
[_____]
[_____]
[_____]
Attention: [_____]
Facsimile: [_____]

Any notice which is personally served shall be effective upon the date of service; any notice given by U.S. Mail shall be deemed effectively given, if deposited in the U.S. Mail, registered or certified with return receipt requested, postage prepaid and addressed as provided above, on the date of receipt, refusal or non-delivery indicated on the return receipt. In addition,

either Party may send notices by electronic mail, facsimile or by a nationally recognized overnight courier service which provides written proof of delivery (such as U.P.S. or Federal Express). Any notice sent by electronic mail or facsimile shall be effective upon confirmation of receipt in legible form, and any notice sent by a nationally recognized overnight courier shall be effective on the date of delivery to the Party at its address specified above as set forth in the courier's delivery receipt. Either Party may, by notice to the other from time to time in the manner herein provided, specify a different address for notice purposes.

[SIGNATURE PAGE FOLLOWS]

IN WITNESS WHEREOF, this Agreement has been duly executed by the Parties hereto as of and on the date first above written.

SELLER:	PORTLAND GENERAL ELECTRIC COMPANY
[_____]	
By:_____	By:_____
Name:	Name:
Title:	Title:
By:_____	
Name:	
Title:	

16 Appendix E – Engineering, Procurement and Construction Agreement

Template provided in a separate document available for download on PortlandGeneralRFP.accionpower.com.

ENGINEERING, PROCUREMENT AND CONSTRUCTION AGREEMENT

by and between

PORTLAND GENERAL ELECTRIC COMPANY

as Owner

and

as Contractor

dated as of

_____, 2016

for the

PROJECT

Legal Notice: The drawings and specifications of this Agreement will contain the following requisite statutory notices: (i) "Notice of Alternative Billing Cycle" (O.R.S. 701.625(2)) (as applicable to the extent that any payments to Contractor as described in this Agreement are not considered monthly progress payments), (ii) "Notice of Extended Certification Period Provision" (O.R.S. 701.625(6)) (as with respect to Owner's making of progress payments and final payment as described in this Agreement), and (iii) "Notice of Extended Payment Provision" (O.R.S. 701.625(3)(b)) (as regards the timing of Owner's payments to Contractor as described in this Agreement).

TABLE OF CONTENTS

ARTICLE I DEFINITIONS 1

1.1 Definitions 1
1.2 Rules of Interpretation 10
1.3 Order of Precedence 11

ARTICLE II RETENTION OF CONTRACTOR; CONTRACTOR RESPONSIBILITIES 11

2.1 Work to be Performed 11
2.2 Project 12
2.3 Further Work Responsibilities and Commitments 12
2.4 Prudent Industry Practices for the Work/Compliance 20
2.5 Commencement of Work; Project Schedule; Acceleration 21
2.6 Hazardous Materials 22
2.7 Owner's Right to Inspect; Correction of Defects 24
2.8 Inspection Not Approval 25
2.9 Liens 25
2.10 Cooperation 26
2.11 Intellectual Property Rights 27
2.12 Credit Support 27

ARTICLE III SUBCONTRACTORS 27

3.1 Subcontractors 27
3.2 Owner as Third Party Beneficiary 28
3.3 Subcontractor Warranties 28

ARTICLE IV CONTRACT PRICE 29

4.1 Contract Price 29
4.2 Taxes 29
4.3 Disputed Invoices 31
4.4 Retainage 31
4.5 Conditions of Payment 31
4.6 Deductions from Payments 32
4.7 Effect of Payment 32

4.8 Set off 32
4.9 No Payment if Default 32
4.10 Interest 32
ARTICLE V OWNER RESPONSIBILITIES 32
5.1 Project Site Access 33
5.2 Permits 33
ARTICLE VI STAGES OF COMPLETION OF THE WORK 33
6.1 Work Completion 33
6.2 Project Mechanical Completion 34
6.3 Project Substantial Completion 34
6.4 Punch List for Project 35
6.5 Final Completion 36
6.6 Reasonable Amount; Exclusive Remedy 37
ARTICLE VII WARRANTIES 37
7.1 Warranty Provisions 37
7.2 Delay 39
7.3 Subcontractor Warranties 39
7.4 Proprietary Rights 40
7.5 NO IMPLIED WARRANTIES 40
7.6 Survival of Warranties 40
ARTICLE VIII FORCE MAJEURE; OWNER-CAUSED DELAYS 40
8.1 Force Majeure 40
8.2 Owner-Caused Delay 41
8.3 No Effect on Obligation to Pay Delay Liquidated Damages 42
ARTICLE IX CHANGES 42
9.1 Changes 42
9.2 Changes at Owner's Request 42
9.3 No Unapproved Changes 43
9.4 Changes Initiated by Contractor 43
9.5 Required Change Orders 43

ARTICLE X INDEMNIFICATION 46

10.1 Indemnities 46
10.2 Indemnification Procedure 48

ARTICLE XI INSURANCE 49

ARTICLE XII DEFAULT, TERMINATION AND SUSPENSION 49

12.1 Contractor Default 49
12.2 Owner Default 52
12.3 Termination Without Cause 52
12.4 Termination Payment 52
12.5 Actions Required Following Termination 53
12.6 Suspension by Owner for Convenience 54

ARTICLE XIII TITLE AND RISK OF LOSS 55

13.1 Title to Project and the Work 55
13.2 Title to Contractor Deliverables 55
13.3 Risk of Loss 55

ARTICLE XIV DISPUTE RESOLUTION 56

14.1 Referral to Senior Management 56
14.2 Mediation. 56
14.3 Legal Action 56
14.4 Waiver of Jury Trial. 57
14.5 Attorneys' Fees 57
14.6 Survival 57

ARTICLE XV REPRESENTATIONS AND WARRANTIES 57

15.1 Contractor Representations 57
15.2 Owner Representations 58
15.3 Survival of Representations and Warranties 59

ARTICLE XVI MISCELLANEOUS PROVISIONS 59

16.1 Confidentiality and Publicity 59
16.2 Consequential Damages 61
16.3 Limitation on Liability 61

16.4 Notice 62
16.5 Time of the Essence 62
16.6 No Rights in Third Parties 62
16.7 Entire Agreement 62
16.8 Amendments 63
16.9 GOVERNING LAW 63
16.10 Right of Waiver 63
16.11 Severability 63
16.12 Successors and Assigns; Assignment 63
16.13 Survival 64
16.14 Expenses and Further Assurances 64
16.15 Counterparts 64
16.16 Status of Contractor; No Partnership; No Agency 64
16.17 Compliance with Applicable Laws 64

EXHIBITS

Exhibit A	Scope of Work
Exhibit B-1	Schedule of Values
Exhibit B-2	Form of Request for Payment
Exhibit B-3	Unit Rates for Additional Work
Exhibit B-4	Deliverables List
Exhibit C-1	Project Schedule Key Milestones
Exhibit C-2	Payment Schedule
Exhibit C-3	Guaranteed Milestone Dates
Exhibit C-4	Performance Testing
Exhibit C-5	Performance Guarantee and Performance Liquidated Damages
Exhibit D	Major Equipment Provider Technical Specifications, Manuals and Standards
Exhibits D-1 to D-5	Major Equipment Warranties
Exhibit E	Design Drawing and Specification Index
Exhibit F	Geotechnical Reports
Exhibit G-1	Site Map
Exhibit G-2	Summary of Land Owner Requirements
Exhibit H	Owner & Contractor Permits
Exhibit I	List of Approved Subcontractors or Suppliers
Exhibit J-1	Contractor-Provided Training
Exhibit J-2	Spare Parts List
Exhibit K	Site Control Agreement
Exhibit L	Contractor Site Safety Plan, Drug, and Alcohol Abuse Policy
Exhibit M	Form of Change Order
Exhibit N	Form of Quality Assurance and Quality Control Manual
Exhibit O-1	Form of Contractor's Partial Lien Waiver and Release
Exhibit O-2	Form of Subcontractor's Partial Lien Waiver and Release
Exhibit O-3	Form of Contractor's Final Lien Waiver and Release

Exhibit O-4	Form of Subcontractor's Final Lien Waiver and Release
Exhibit P-1	Insurance Requirements
Exhibit P-2	Contractor's Insurance Certificates
Exhibit P-3	Form of Contractor Parent Guaranty
Exhibit Q	Form of Work Completion Certificates
Exhibit R-1	Environmental Assessment
Exhibit R-2	Environmental Permit Matrix
Exhibit S-1	Form of Limited Notice to Proceed
Exhibit S-2	Form of Notice to Proceed

ENGINEERING, PROCUREMENT AND CONSTRUCTION AGREEMENT

THIS ENGINEERING, PROCUREMENT AND CONSTRUCTION AGREEMENT (this "Agreement"), is made, entered into and is effective as of _____, 2016 (the "Effective Date"), by and between _____("Owner"), and _____ ("Contractor").

RECITALS

Owner is developing a renewable energy generation facility (defined as the Project below) and all services and utilities related thereto, all to be located near the town of _____in ____ County, _____.

In connection with such Project, Owner desires to obtain and Contractor desires to provide certain work, including, among other things, procurement, installation, construction and related services for the Project, all for the Contract Price (as hereinafter defined).

NOW, THEREFORE, the Parties agree as follows:

ARTICLE I

DEFINITIONS

1.1 Definitions. As used in this Agreement, the following terms have the meanings indicated:

"AAA" means the American Arbitration Association.

"AAA Procedures" has the meaning set forth in Section 14.2.

"Affiliate" means, in relation to any Person, any other Person, who: (a) directly or indirectly controls, or is controlled by, or is under common control with, such Person; or (b) directly or indirectly beneficially owns or holds fifty percent (50%) or more of any class of voting stock or other equity interests of such Person; or (c) has fifty percent (50%) or more of any class of voting stock or other equity interests that is directly or indirectly beneficially owned or held by such Person, or (d) either holds a general partnership interest in such Person or such Person holds a general partnership interest in the other Person. For purposes of this definition, the word "controls" means possession, directly or indirectly of the power to direct or cause the direction of the management or policies of a Person, whether through the ownership of voting securities or otherwise.

"Agreement" has the meaning set forth in the preamble hereto, as the same may be amended, supplemented or modified from time to time in accordance with the terms hereof.

"Applicable Laws" means any act, statute, law, regulation, Permit (including Applicable Permits), ordinance, rule, judgment, order, decree, directive, guideline or policy (to the extent mandatory) or any similar form of decision or determination by, or any interpretation or

administration of, any of the foregoing by any Government Authority with jurisdiction over Contractor, Owner, the Project, the Project Site, the performance of the Work or other services to be performed under the Agreement, and includes any of the same as they may be amended or imposed from time to time.

"Applicable Permits" means any and all Permits from or required by any Government Authority that are necessary for the performance of the Work or the completion or operation of the Project.

"As-Built Drawings" means final Drawings for the Work, as revised to reflect the changes in the Work during construction, and shall include as-built drawings that show the physical placement and location of all improvements, including the equipment, roads, overhead electric transmission line, underground collection lines, communication lines (both above and below ground), the Transformer Substation, electric one-line drawings, electric schematics and connection diagrams.

"Builder's Risk Policy" has the meaning set forth in Exhibit P-1.

"Business Day" means every day other than a Saturday, Sunday or a day which is a legal holiday in the state in which the Project is located.

"Change" has the meaning set forth in Section 9.1.

"Change Order" has the meaning set forth in Section 9.1.

"Change Order Request" has the meaning set forth in Section 9.4.

"Confidential Information" has the meaning set forth in Section 16.1.1.

"Consequential Damages" has the meaning set forth in Section 16.2.

"Consumable Parts" has the meaning set forth in Section 2.3.6.

"Contractor" has the meaning set forth in the preamble hereto and includes its legal successors and permitted assignees as may be approved by Owner, in writing, pursuant to the terms of the Agreement.

"Contractor Deliverables" means all Drawings, Job Books, Operating Manuals, all written comments, field changes, and redlined drawings for incorporation into the final As-Built Drawings, and other documents and similar information prepared or modified by Contractor or any of its Subcontractors and delivered or required to be delivered hereunder.

"Contractor Event of Default" has the meaning set forth in Section 12.1.1.

"Contractor Permits" means those Permits required to be obtained by Contractor, as set forth in Exhibit H.

"Contractor Termination for Cause" has the meaning set forth in Section 12.2.

"Contractor's Equipment" means all of the equipment, materials, apparatus, structures, tools, supplies and other goods provided and used by Contractor and its Subcontractors for performance of the Work, but which are not intended to be incorporated into the Project.

"Contractor's Parent" has the meaning set forth in Section 2.12.

"Contractor's Project Manager" means the Person designated by Contractor as having the responsibility, authority and supervisory power of Contractor for design, construction, procurement, testing and start-up of the Work, as well as all matters relating to the administration of the provisions of the Agreement, and who will be primarily located at the Project Site on a daily basis.

"Contractor's Taxes" has the meaning set forth in Section 4.2.1.

"Contract Price" has the meaning set forth in Section 4.1.

"Day" or "day" means a period of twenty-four (24) consecutive hours from 12:00 midnight, and shall include Saturdays, Sundays and all holidays.

"Defect" or "Defective" means, any condition, characteristic or item of the Work that (a) does not conform to the terms or requirements of the Agreement (including Prudent Industry Practices), (b) is not of uniform good quality, free from defects or deficiencies in design, manufacture or workmanship, or (c) would adversely affect (i) the performance of the Project under anticipated operating conditions, (ii) the continuous safe operation of the Project during the Project's design life, or (iii) the structural integrity of the Project.

"Delay Liquidated Damages" has the meaning set forth in Section 6.6.

"Delivery Point" means the Equipment laydown area at the Site, or any other location mutually agreed to in writing by the Parties after the Effective Date.

"Direct Costs" has the meaning set forth in Section 9.5.3(c).

"Dispute" has the meaning set forth in Section 14.1.

"Dollar" or "$" means a dollar of the currency of the United States of America.

"Drawings" means (a) all specifications, calculations, designs, plans, drawings, engineering and analyses, and other documents which determine, establish, define or otherwise describe the scope, quantity, and relationship of the components of the Project, including the structure and foundation thereof, and (b) all technical drawings, specifications, shop drawings, diagrams, illustrations, schedules and performance charts, calculations, samples, patterns, models, operation and maintenance manuals, piping and instrumentation diagrams, underground structure drawings, conduit and grounding drawings, lighting drawings, conduit and cable drawings, electric one-line's, electric schematics, connection diagrams and technical information of a like nature, prepared or modified by Contractor or any of its Subcontractors all of which are and required to be submitted by Contractor or any Subcontractor, from time to time under the

Agreement or at Owner's request which illustrates any of the Equipment or any other portion of the Work, either in components or as completed.

"Effective Date" has the meaning set forth in the preamble to this Agreement.

"Equipment" means all of the equipment, materials, apparatus, structures, tools, supplies, goods and other items required to complete the Project excluding the Contractor's Equipment and Major Equipment. The Parties acknowledge that Contractor will provide, install and incorporate the Equipment into the Project as described in this Agreement.

"Final Completion" has the meaning set forth in Section 6.5.1.

"Final Completion Certificate" means the certificate by this name as described in, and in the form set forth in, Exhibit Q.

"Final Completion Date" means the date on which Final Completion occurs as per Section 6.5.1.

"Final Punch List" has the meaning set forth in Section 6.4.1.

"Force Majeure Event" means any event or circumstance, or combination of events or circumstances, that meets all of the following criteria:

(a) arises after the Effective Date,

(b) was not caused by and is unforeseeable and beyond the reasonable control of the Party claiming the Force Majeure Event,

(c) is unavoidable or could not be prevented or overcome by the reasonable efforts and due diligence of the Party claiming the Force Majeure Event, and

(d) either (i) as with respect to Owner as the impacted Party, has an impact which will actually, demonstrably and adversely affect Owner's ability to perform its obligations (other than payment obligations) in accordance with the terms of the Agreement or (ii) as with respect to Contractor as the impacted Party, has an impact which will actually, demonstrably and adversely affect Contactor's ability to perform Work on the Project Site so as to achieve a Key Milestone by the scheduled completion date for such Key Milestone as set forth in the Project Schedule.

Provided they meet all of the criteria described above, Force Majeure Events may include the following: acts of God, natural disasters, wildfires, earthquakes, tornadoes, lightning, floods, civil disturbances, riots, war and military invasion, physical damage to the Project caused by third parties who are not Subcontractors or representatives, employees or agents of the impacted Party, national, regional and area-wide strikes and other national, regional and area-wide labor disputes (including collective bargaining disputes and lockouts) involving Contractor or Subcontractors and not directed exclusively at Contractor and/or such Subcontractor; a severe inclement weather condition not mentioned above, which prevents or substantially hinders the safe performance of the Work at the Project Site; acts of the public enemy; blockade; acts of

terrorism; insurrection, riot or revolution; sabotage or vandalism; embargoes, and actions of a Governmental Authority (other than in respect of or in relation to or resulting from Contractor's non-compliance with Applicable Laws). Notwithstanding anything in the foregoing to the contrary, in no event shall any of the following constitute a Force Majeure Event: (i) strikes, and other labor disputes (including collective bargaining disputes and lockouts) of the labor force under the control of the Party claiming the Force Majeure Event or its Affiliates or with respect to the Work by a Subcontractor on the Project Site unless the strike is part of a more widespread or general strike extending beyond the Party, Affiliate or Subcontractor; (ii) cost or shortages of labor or manpower; (iii) unavailability, late delivery, failure, breakage or malfunction of equipment or materials unless there is an independent, identifiable Force Majeure Event causing such condition; (iv) events that affect the cost of equipment or materials; (v) economic hardship (including lack of money) of any entity or its affiliates or their respective Subcontractors or suppliers; (vi) delays in transportation (including delays in clearing customs) other than delays in transportation resulting from accidents or closure of roads or other transportation route by Government Authorities; (vii) any weather conditions which are not defined above as Force Majeure Events; (viii) actions of a Government Authority in respect of or in relation to or resulting from Contractor's compliance or non-compliance with Applicable Laws; (ix) any failure by Contractor to obtain and/or maintain any Applicable Permit it is required to obtain and/or maintain hereunder; (x) any other act, omission, delay, default or failure (financial or otherwise) of a Subcontractor or other Personnel of Contractor.

"Force Majeure Notice" has the meaning set forth in Section 8.1.1.

"Geotechnical Survey" means that certain geotechnical reports referenced in Exhibit F.

"Government Authority" means any and all foreign, national, federal, state, county, city, municipal, local or regional authorities, departments, bodies, commissions, corporations, branches, directorates, agencies, ministries, courts, tribunals, judicial authorities, legislative bodies, administrative bodies, regulatory bodies, autonomous or quasi-autonomous entities or taxing authorities or any department, municipality or other political subdivision thereof.

"Grid" means the interconnected high voltage transmission facilities that are a part of the transmission system to which the Project connects.

"Guaranteed Substantial Completion Date" shall be as provided in Exhibit C-3.

"Hazardous Material" means any and all chemicals, constituents, contaminants, pollutants, materials, and wastes and any other carcinogenic, corrosive, ignitable, radioactive, reactive, toxic or otherwise hazardous substances or mixtures (whether solids, liquids, gases), or any similar substances now or at any time subject to regulation, control, remediation or otherwise addressed under Applicable Laws, including those laws, regulations and policies relating to the discharge, emission, spill, release, or threatened release into the environment or relating to the disposal (or arranging for the disposal), distribution, manufacture, processing, storage, treatment, transport, or other use of such substances.

"Indemnified Person" has the meaning set forth in Section 10.2.1.

"Indemnifying Party" has the meaning set forth in Section 10.2.1.

"Intellectual Property Rights" has the meaning set forth in Section 2.11.

"Interconnect Switchyard" means the Utility-owned electric transmission switchyard to be located at the end of the Transmission Corridor, immediately adjacent to the connection to the Grid, including all necessary breakers, protection equipment, metering and associated control buildings and other infrastructure associated therewith.

"Job Book" means all documentation specified in the Scope of Work, which shall include all engineering, design, purchasing and other information relating to the Project, including: (a) a drawing index; (b) a reference index; (c) copies of Contractor's and Subcontractors' Permits; (d) copies of all contracts and purchase orders for Major Subcontractor's equipment (non-priced); (e) Subcontractor information for equipment purchased (as received from Subcontractors) including instruction and maintenance manuals from Subcontractors; (f) one copy of the As-Built Drawings and documentation; (g) training manuals; (h) the Operating Manuals; (i) electrical one-line diagrams for the Project; (j) a cable and raceway schedule for the Project; (k) connection report/loop diagrams for the Project; and (l) a final list and summary of the work performed by all Subcontractors.

"Key Milestones" means the milestones identified as such in the Project Schedule (Exhibit C-1).

"Labor" means the workforce of the relevant Person, including its staff and employee and non-employee and skilled and unskilled workers (and including those provided by Subcontractors).

"Lien" means any lien, security interest, mortgage, hypothecation, encumbrance or other restriction on title or property interest.

"Lien Waiver and Release" means waivers to lien rights and may be conditional or unconditional. Lien Waiver and Releases will follow the form as set forth in Exhibit O-1, Exhibit O-2, Exhibit O-3, and Exhibit O-4, as required.

"Limited Notice to Proceed" or "LNTP" means a written notice, substantially in form as shown in Exhibit S-1, issued by Owner on or after the Effective Date to Contractor in accordance with this Agreement that is signed by both Parties and directing Contractor to commence the Work set forth in the LNTP in accordance with the terms of this Agreement in advance of the Notice to Proceed.

"Major Equipment" shall be as defined in the Scope of Work.

"Major Equipment Warranties" shall be as defined in Section 7.4.

"Major Subcontract" means any agreement or purchase order with a Subcontractor for performance of any part of the Work that has an aggregate value in excess of _____ Dollars ($_____).

"Major Subcontractor" means, any Owner-approved Subcontractor with whom Contractor will enter (or has entered) into a Major Subcontract.

"Mechanical Completion" has the meaning set forth in Section 6.2.

"Mechanical Completion Certificate" means the certificate by this name as described in, and in the form set forth in, Exhibit Q.

"Mechanical Completion Checklist" means the means the checklist by this name as described in Exhibit Q.

"Monthly Progress Report" means a monthly written report that includes a description of the progress and status of the Work compared to the Project Schedule, the Subcontractors' activities, engineering and design progress, a summary of any Change Orders executed by the Parties as of the date of such report and a summary of any events that may affect the Project Schedule (including, without limitation, any Force Majeure Events, Owner-Caused Delays, Liens on the Project Site, or the Project, and any asserted violations of Applicable Laws.

"Notice to Proceed" means a written notice issued by Owner to Contractor pursuant to Section 2.1, and substantially in form as shown in Exhibit S-2, that is signed by both Parties directing Contractor to commence the Work in accordance with the terms of this Agreement.

"Operating Manual" means the complete system instructions and procedures for the operation and maintenance of the Work, which shall comply with the requirements of the Scope of Work, including Contractor's manufacturers', vendors', suppliers' and Subcontractors' recommended list of Spare Parts, all safety information, equipment and maintenance manuals and any precautionary measures therefor.

"Operational Policy" has the meaning set forth in Exhibit P-1.

"Other Owner Contractors" means those Persons, other than Contractor, with whom Owner contracts or subcontracts to perform work in connection with the Project, including the Equipment Provider and the Owner Engineer. Owner Contractors may also include Owner in the event Owner elects to perform any work in connection with the Project.

"Owner" has the meaning set forth in the preamble hereto.

"Owner-Caused Delay" means a delay in Contractor's or a Subcontractor's performance of the Work and/or an increase in Contractor's or a Subcontractor's costs that has been demonstrably caused by the failure of Owner, Other Owner Contractors (other than Equipment Provider) to perform any material obligation of Owner under this Agreement (other than by exercise of rights under this Agreement, including the exercise by Owner of the right to have Defective or nonconforming Work corrected or re-executed) or by the acts or omissions of Owner, Other Owner Contractors (other than Equipment Provider). Any delay that is due in part to Contractor's or any of its Subcontractors' actions or inactions shall not be an Owner-Caused Delay.

"Owner Engineer" means _____.

"Owner Event of Default" has the meaning set forth in Section 12.2.

"Owner Indemnified Party" has the meaning set forth in Section 10.1.1.

"Owner Permits" means those Permits required to be obtained by Owner, as set forth on Exhibit H.

"Owner's Project Manager" means the individual appointed by Owner to act on its behalf in connection with this Agreement.

"Owner's Taxes" has the meaning set forth in Section 4.2.2(b).

"Parent Guaranty" has the meaning set forth in Section 2.12.

"Party" or "Parties" means, respectively, a party or both parties to this Agreement.

"Payment and Performance Bond" has the meaning set forth in Section 2.12.

"Permit" means any waiver, exemption, variance, certificate, franchise, permit, approval, exemption, authorization, clearance, license, consent, or similar order of or from, or filing or registration with, or notice to, any Government Authority.

"Person" means any individual, corporation, partnership, limited liability company, association, joint stock company, trust, unincorporated organization, joint venture, or Government Authority or other entity of whatever nature.

"Personnel" means, with respect to a Party or entity, such Party's or entity's employees, agents, personnel, representatives, invitees, subcontractors, vendors and any other third party independent contractors with whom such Party or entity has contracted, and its agents', personnel's, representatives', invitees', subcontractors', vendors' or third party independent contractors' respective employees, agents, personnel, representatives, invitees, subcontractors, vendors or third party independent contractors.

"Pre-Existing Hazardous Material" means any Hazardous Material (a) that existed on or in the Project Site prior to the date when Contractor or any of its Subcontractors or other representatives is present thereon following the Effective Date and/or (b) brought to the Project Site by Owner, any Other Owner Contractor or any third party other than Contractor or its Personnel after the Effective Date.

"Project" means the electric generation project that is the subject of this Agreement, as described in the Scope of Work.

"Project Schedule" means the schedule of dates and milestones (including Key Milestones) for timely completion of the Work as set forth in Exhibit C-1 with specific start and end dates for each activity comprising (or relating to) the Work.

"Project Site" means all those parcels of land subject to the Real Property Rights in favor of Owner including the Transmission Corridor on which the Work will be located as shown in Exhibit G-1.

"Project Substantial Completion" has the meaning set forth in Section 6.3.1.

"Project Substantial Completion Date" means the date on which the Project achieves Project Substantial Completion, per Section 6.3.2.

"Prudent Industry Practices" means, in connection with the design and construction of renewable energy power generation systems of a type and size and having geographical and climatic attributes similar to the Project, those practices, methods, specifications and standards of safety, performance, dependability, efficiency and economy generally recognized by industry members in the United States as good and proper, and such other practices, methods or acts which, in the exercise of reasonable judgment by those reasonably experienced in the industry in light of the facts known at the time a decision is made, would be expected to accomplish the result intended at a reasonable cost and consistent with Applicable Laws, reliability, safety and expedition. Prudent Industry Practices are not intended to be limited to the optimum practices, methods or acts to the exclusion of all others, but rather to be a spectrum of good and proper practices, methods and acts.

"Punch List" means any punch list as described in Section 6.4.1, as applicable.

"Quality Assurance Procedures" means the quality assurance and quality control procedures as set forth in Exhibit N.

"Real Property Requirements" means the applicable covenants, agreements, restrictions, limitations, or requirements of the Real Property Rights imposed upon Owner or its assignees, contractors, licensees, or invitees regarding the use and possession of the Project Site, the construction, operation, and maintenance of the Project on the Project Site, and any other activities on or over the Project Site, a summary of which is attached hereto as Exhibit G-2.

"Real Property Rights" means all rights in or to real property (such as leasehold or other rights to use or access the Project Site), leases, agreements, Permits, easements, including licenses, private rights-of-way, and utility and railroad crossing rights required to be obtained or maintained by Owner in connection with construction of the Project on the Project Site, transmission of electricity to the Grid, performance of the Work, or operation of the Project.

"Request for Payment" means the written requests from Contractor to Owner for payment, as described in Exhibit B-2.

"Retainage" has the meaning set forth in Section 4.4.1.

"Safety Plan" has the meaning set forth in Section 2.3.14(a).

"Schedule of Values" means that payment schedule set forth in Exhibit B-1 which shall contain a breakdown of milestones for completion of the Work that corresponds to the Project Schedule and is in reasonable detail as approved by the Owner, and an allocation of the Contract Price to the milestones.

"Scope of Work" means the services and work to be provided, or caused to be provided, by or through Contractor under the Agreement, as more particularly described in Exhibit A, and

the other obligations of Contractor under the Agreement, as the same may be amended from time to time in accordance with the terms hereof.

"Spare Parts" has the meaning set forth in Section 2.3.10.

"Subcontract" means an agreement between Contractor and any Subcontractor.

"Subcontractor" means any Person other than Contractor performing any portion of the Work, including every tier of subcontractor, vendor or supplier of equipment, materials or services to Contractor or any subcontractor of any Person engaged or employed by Contractor or any subcontractor in connection with the performance of the Work, whether or not incorporated into the Project.

"Termination for Cause" has the meaning set forth in Section 12.1.2.

"Termination Payment" has the meaning set forth in Section 12.4.1.

"Termination Without Cause" has the meaning set forth in Section 12.3.

"Third Party Controversy" has the meaning set forth in Section 14.4.

"Transmission Corridor" means, as part of the Project Site, those connected parcels of land subject to the Real Property Rights in favor of Owner on which certain Project, including transmissions lines, electrical works and the Interconnect Switchyard, will be located.

"Equipment Provider" means _____.

"Unforeseen Subsurface Condition" has the meaning set forth in Section 2.4.1(b).

"Warranty" has the meaning set forth in Section 7.1.1.

"Warranty Period" has the meaning set forth in Section 7.1.2.

"Warranty Service" has the meaning set forth in Section 7.1.3.

"Work" has the meaning set forth in Section 2.1 and includes Contractor Deliverables, the Project, the Equipment, and any other product or result of the Work, and further described in Exhibit A.

"Working Day" means the hours from 7:00 am to 7:00 pm, Monday through Saturday, excluding holidays, at the Project Site.

1.2 Rules of Interpretation. Unless otherwise required by the context in which any term appears: (a) unless otherwise specified, references to "Articles," "Sections," or "Exhibits" (if any) shall be to Articles, Sections, or Exhibits (if any) of this Agreement, as the same may be amended, supplemented or replaced from time to time hereunder; (b) all references to a Person shall include a reference to such Person's successors and permitted assigns; (c) references to any agreement, document or instrument shall mean a reference to such agreement, document or instrument as the same may be amended, modified, supplemented or

replaced from time to time; (d) the use of the word "including" or "include" in this Agreement to refer to specific examples shall be construed to mean "including, without limitation" and shall not be construed to mean that the examples given are an exclusive list of the topics covered; and (e) the headings contained herein are used solely for convenience and should not be used to aid in any manner to construe or interpret this Agreement. The Parties collectively have prepared this Agreement, with advice of legal counsel; none of the provisions hereof shall be construed against one Party on the ground that such Party is the author of this Agreement or any part hereof.

1.3 Order of Precedence. In the event of any inconsistencies in this Agreement, the following order of precedence in the interpretation hereof or resolution of such conflict hereunder shall prevail:

(a) Amendments, addenda or other modifications to the Agreement (including Change Orders) duly signed and issued after the signing of this Agreement, with those of a later date having precedence over those of an earlier date;

(b) This Agreement (excepting Exhibits hereto);

(c) Exhibit A through Exhibit S;

(d) Drawings produced and delivered pursuant hereto (in respect of which, precedence shall be given to drawings of a larger scale over those of smaller, figured dimensions on the drawings shall control over scaled dimensions, and noted materials shall control over undimensioned graphic indications).

Notwithstanding the foregoing provisions of this Section, if a conflict exists within a part of the Agreement as listed in a lettered subclause above, or between or among the Agreement and Applicable Laws, the Real Property Requirements, then the more stringent or higher quality requirements shall control. Where a conflict exists among codes and standards applicable to the Project or Contractor's performance of the Work, the most stringent provision of such codes and standards shall govern.

ARTICLE II

RETENTION OF CONTRACTOR; CONTRACTOR RESPONSIBILITIES

2.1 Work to be Performed. Commencing on the date specified in the Notice to Proceed, or earlier with respect to Work authorized pursuant to the Limited Notice to Proceed ("LNTP"), and except as otherwise expressly set forth in Article V or elsewhere in this Agreement as being the responsibility of Owner or Equipment Provider, Contractor shall perform or cause to be performed all necessary work and services (the "Work") required in connection with (a) the design, procurement, engineering, specified permitting, construction, assembly, installation and, where applicable, the start-up and testing, of the Project to Final Completion, (b) the provision, management and supervision of all Labor, transportation, administration and other services as required in connection with any of the foregoing, (c) the inspection and furnishing of all materials, equipment, machinery, tools, temporary structures, temporary utilities as required in connection with the foregoing including the performance

obligations described in this Article II and the Scope of Work, and (d) the performance of Contractor's warranty obligations hereunder. Owner hereby retains Contractor, and Contractor hereby agrees to be retained by Owner, to perform or cause to be performed the Work in accordance with the terms and conditions of this Agreement. Contractor hereby represents that it has ascertained the nature and location of the Work, the general character and accessibility of the Project Site, the existence of known obstacles to construction, the location and character of existing or adjacent work or structures, and other general and local conditions including Applicable Laws, and the availability of Labor which might affect its performance of the Work or the cost thereof and that, based upon the same, but subject to Section 9.5.1, commits that it can complete the Work for the Contract Price in accordance with the Project Schedule.

2.2 Project.

2.2.1 General. Contractor shall construct the Project and all other components of the Work that are set forth in Exhibit A as part of Contractor's Scope of Work.

2.2.2 Interconnection to Grid. As further described in the Scope of Work and Contractor shall be responsible for all interconnection up to and including provision of and connection to the Interconnect Switchyard. Contractor shall coordinate with and permit the Utility to install the interconnection works between such point and the Grid.

2.2.3 Start-up and Testing of Project. Contractor shall perform the start-up and testing of the Project, including the calibration and functional testing of all controls and equipment in accordance with Exhibit A. If the Scope of Work requires that any item comprising the Project be tested by Contractor, Contractor shall notify Owner in writing at least ten (10) Business Days prior to the commencement of any such test. Contractor shall coordinate with Owner the scheduling of any test and Owner shall coordinate such test with Equipment Provider, so as not to interfere, in either case, with either Party's obligations with respect thereto. Owner shall witness such tests and will, within three (3) Business Days after receipt of written results of such tests, deliver to Contractor a written notice either (a) accepting such tests as having been passed, or (b) rejecting such tests as having demonstrated that the tested item failed to comply with the performance requirements therefor under this Agreement. Any rejection shall include a detailed description of the basis for rejection.

2.3 Further Work Responsibilities and Commitments.

2.3.1 Site Clearance and Preparation.

(a) Topography. Contractor has surveyed the general surface conditions of the Project Site topography and represents that, subject to Unforeseen Subsurface Conditions, the same are sufficient for Contractor to construct the Project and perform the Work. Contractor will be responsible for clearance of the Project Site, including the removal of obstructions. Contractor will be responsible for access road construction as described in the Scope of Work. Contractor shall provide for the procurement of or disposal of, as necessary, all soil, gravel and similar materials required for the performance of or otherwise in connection with the Work. Contractor will provide adequate treatment of and protection against water runoff resulting from Contractor's and its Subcontractor's work. Contractor will provide for the

collection, treatment and disposal of groundwater resulting from Contractor's and its Subcontractors' work.

(b) Geotechnical Survey; Subsurface Risk. "Unforeseen Subsurface Conditions" shall mean: (i) subsurface or latent physical conditions at the Project Site, differing materially from those indicated in the Geotechnical Survey, or (ii) previously unknown physical conditions at the Project Site of an unusual nature (including unknown and unexpected archaeological or religious sites, places, monuments or areas) or conditions that differ materially from those ordinarily encountered and generally recognized as inherent in work similar to the Work or which should have been known or discoverable Contractor based upon the information in the Geotechnical Survey If Contractor encounters any condition that Contractor believes is or may be an Unforeseen Subsurface Condition, Contractor shall notify Owner of the same promptly, but in any event no later than three (3) days after becoming aware of the condition. If the condition at issue is indeed an Unforeseen Subsurface Condition as defined herein and Contractor has delivered such notice within such time period, then Contractor will be entitled to a Change Order to the extent so provided in Section 9.5.1(d). If Contractor fails to notify Owner of such a condition within such three (3) day period, then Contractor shall not be entitled to and will thereby be deemed to have waived its rights to receive any Change Order as with respect to such condition.

2.3.2 Storage. At all times prior to the date of Project Substantial Completion, Contractor shall provide appropriate storage for the Consumable Parts, Equipment, and all other materials, supplies and other equipment utilized in connection with the Work and all other personal property owned or leased by Contractor or any Subcontractor located at the Project Site. At a minimum, Contractor shall comply with all Equipment manufacturer recommendations and requirements and shall comply with requirements in the Scope of Work

2.3.3 Transportation and Delivery Specification ***[To Be Discussed as appropriate to equipment.]***

2.3.4 Drawings and Documents.

(a) Ownership of Drawings. All drawings, specifications and other documents prepared by or for Contractor in respect of the Project and all drawings, specifications, calculations, memoranda, data, notes and other materials containing information supplied by Owner which shall come into Contractor's possession during its performance hereunder, shall be the property of Owner, and such Owner documents and other materials shall be returned to Owner upon the earlier of the Project Substantial Completion Date or termination of this Agreement. Owner shall have the right to retain a reproducible set of all Contractor's proprietary drawings, specifications and other documents for use in respect of the Project. Review (or lack thereof) by Owner or its designees of any Project documents provided by Contractor, and the fact that Owner has not discovered any errors reflected in such Project documents, shall not relieve or release Contractor of any of its duties, obligations or liabilities under the terms of this Agreement.

(b) As-Built Drawings. During construction, Contractor shall keep on file one set of current as-built drawings reflecting all field deviations from the design drawings.

As a condition to Final Acceptance, Contractor shall provide to Owner, for Owner's approval, a set of as-built drawings which have been fully conformed to the construction records as of the completion of the Work. Drawings shall be provided in AutoCAD DWG/DWF and Adobe PDF format.

2.3.5 Religious and Archaeological Resources. If any archaeological or religious sites, places, monuments or areas are discovered or identified by Contractor during the performance of Work under the Agreement, Contractor shall leave such sites untouched and protected by fencing and shall immediately stop any Work affecting the area and shall comply with any applicable Real Property Requirements. Contractor shall notify Owner of any such discovery as soon as practicable, and Contractor shall carry out Owner's reasonable instructions for dealing with the same. All fossils, coins, articles of value or antiquity and structures and other remains or things of geological, archaeological, historical, religious, cultural or similar interest discovered on the Project Site shall, as between Owner and Contractor, be deemed to be the property of Owner. Contractor shall prevent its and its Subcontractors' Labor from removing or damaging any such article or thing.

2.3.6 Equipment, Consumables, Construction Utilities and Related Services. Except to the extent provided by Owner or Equipment Provider as described in Article V or as part of the Work, Contractor shall procure and supply, at its own expense, all Equipment required to complete the Work, including without limitation all Equipment as necessary for performance and completion of its obligations under this Agreement (whether on or off the Project Site). Contractor shall inspect or cause to be inspected all such Equipment and shall reject those items determined not to be in compliance with the requirements of this Agreement. Contractor shall be responsible, at its sole expense, for furnishing and installation of all temporary utilities, telephone, data lines, cabling and wiring necessary for all activities associated with the completion of the Work. All Equipment provided by Contractor shall be new and of suitable grade for its intended purpose. With the exception of those consumable items expressly stated to be provided by Equipment Provider as described in Exhibit D, Contractor shall supply all consumable parts and supplies required for the Work including, but not limited to, cable ties, cable wraps, splices, wire nuts, lubricants, greases and other consumable materials (collectively, the "Consumable Parts").

2.3.7 Obtaining, Maintaining and Identifying Permits. Contractor shall timely obtain and maintain all Contractor Permits. In addition, Contractor shall provide all assistance reasonably requested by Owner in connection with Owner's efforts to obtain and maintain the Owner Permits. If any Applicable Permit is required for the Project or to perform the Work that is not identified in Exhibit H, Contractor or Owner, as applicable, shall promptly, after it becomes aware of the need for such Applicable Permit, notify the other Party that such Applicable Permit is required. If such Applicable Permit is of a nature typically obtained by contractors in similar projects, Contractor shall, at its sole cost and expense, be obligated to obtain and maintain such Applicable Permit. Otherwise, Owner shall obtain and maintain such Applicable Permit. All Applicable Permits (other than any building permits) designated as either "To be issued in the name of Owner" or "To be issued in the name of the Owner and Contractor" on Exhibit H shall be issued in the name of Owner or Owner and Contractor, as required, to the best of Contractor's ability unless otherwise required by Applicable Law or such Applicable Permit. If any Contractor Permit (or application therefor) is in the name of Owner or otherwise

requires action by Owner, Owner shall, upon the request of Contractor, sign such application or take such action as reasonably appropriate. Owner reserves the right to review any such application of Contractor; provided, however, that Owner's exercise of such right shall not under any circumstances, be considered an approval of the necessity, effect or contents of such application or related Permit nor shall it be allowed to unreasonably delay the submittal of such application. Contractor shall deliver to Owner true and complete copies of all Permits obtained by Contractor upon its receipt thereof.

2.3.8 Real Property Requirements and Real Property Rights. Contractor shall comply with those Real Property Requirements as summarized in Exhibit G-2. In addition, Contractor shall provide such assistance as may be reasonably requested by Owner in connection with Owner's efforts to observe and maintain the Real Property Requirements, including efforts to obtain any necessary revisions or adjustments thereof. As of the date hereof, subject to Section 2.4.1(b) as regards Unforeseen Subsurface Conditions, Contractor represents and warrants that it has inspected and is fully familiar with the Project Site, including the boundaries thereof, and that (a) they are sufficient for Contractor to undertake and complete that portion of the Work to be located thereon in accordance with the Agreement, the Real Property Requirements and Applicable Laws, and (b) Contractor has not discovered any conditions that in Contractor's reasonable judgment would be a basis for claiming a Change. In the performance of the Work, Contractor and its Subcontractors shall abide by any restrictions in regard to the location of facilities that are part of the Real Property Requirements. Owner shall enforce the Real Property Requirements for the benefit of Contractor and shall indemnify Contractor with respect to any claims by the Real Property Owners other than those claims caused by Contractor or its Personnel. Contractor shall indemnify Owner from any claims or expenses arising out of the failure of Contractor or its Subcontractors to comply with the Real Property Requirements. Contractor shall provide all necessary information and documents and use all reasonable efforts to assist Owner in obtaining any Real Property Rights that Owner at any time is seeking within the Project Site. Contractor shall notify Owner upon the occurrence, or likely occurrence, of a dispute, conflict, confrontation, or other similar problem, or potential problem, involving one or more owners or occupiers of land so situated as to potentially result in a situation that may have a material adverse effect upon the performance of the Work. Contractor shall, at Owner's expense, cooperate with Owner in resolving all such problems.

2.3.9 Environmental Compliance. Contractor shall comply with all Environmental Assessment requirements applicable to Contractor and/or the Work as set forth in Exhibit R-1 and the Environmental Permit Matrix as set forth in Exhibit R-2.

2.3.10 Spare Parts. Set forth in Exhibit J-2 is a list of spare parts that are necessary to operate and maintain the Project (the "Spare Parts"). Owner may at any time prior to Project Substantial Completion notify Contractor in writing that Owner wishes to purchase certain Spare Parts, and therein request pricing for the Spare Parts in question and the quantities desired. Contractor will supply the pricing for such identified Spare Parts to Owner as soon as practicable after such request. Owner may thereafter order those of such Spare Parts as Owner desires. Contractor shall thereafter deliver such Spare Parts Duty Paid (DDP) (Incoterms 2000) Project Site), using commercially reasonable efforts to complete such delivery within two (2) weeks after Owner's placement of such order. Title and risk of loss to such Spare Parts will transfer to Owner upon such delivery. After such delivery is completed, Contractor will invoice

Owner for the Spare Parts (based upon the quoted pricing), and the undisputed portions of such invoice shall be payable by Owner within thirty (30) days after Owner's receipt of such invoice. Should a component of the Equipment fail during commissioning, start-up or testing, Contractor may utilize a Spare Part of that component from Owner's inventory in order to return the Equipment to operating condition. Contractor shall at its cost promptly replace any such Spare Parts so utilized.

2.3.11 Operating Manuals and Job Books.

(a) Operating Manuals. Within 30 days after finalizing the equipment selection the Contractor shall prepare and deliver to the Customer the following documents: (i) O&M Manuals in an electronic draft version, (ii) recommended spare parts list, and (iii) lubrication schedule. Prior to commencing commissioning activities, Contractor shall prepare and deliver to Owner the documentation as required in the Scope of Work. In the event of total or partial rejection or revisions of the draft Operating Manuals by Owner, within fifteen (15) days after receipt of notice of such revisions or rejection Contractor shall make appropriate changes to the drafts to respond to Owner's revisions or reasons for rejection and shall resubmit such draft to Owner or shall explain why such revisions are not necessary. Such procedure shall be repeated until receipt of Owner's written approval therefore. Upon the earlier of Final Completion and thirty (30) days after Project Substantial Completion, Contractor shall prepare in individually numbered bound volumes and deliver to Owner two (2) sets of such approved Operating Manuals (which may be combined with the other Operating Manuals) and shall also provide three (3) copies of the Operating Manuals to Owner in electronic format.

(b) Job Books. As a condition to Project Substantial Completion, Contractor shall deliver to Owner two (2) copies of the semi-final draft of the Job Books, either in job book format or in form and format then available as a result of the design and construction process, as appropriate. A semi-final draft shall mean a draft that does not contain final As-Built Drawings and documentation, but is as reasonably complete as available information will allow, containing at a minimum sufficient information to permit the conduct of operator training and operation, repair and modification of the Project by Persons generally familiar with machinery and equipment similar to that comprising the same. Upon the earlier of Final Completion and thirty (30) days after Project Substantial Completion, Contractor shall provide one (2) original hard copy and three (3) electronic copies (on CD Roms) of the final and complete Job Books to Owner. Where any of the information in the Job Books was produced by computer-aided design and is available to Contractor or any Subcontractor, Contractor shall provide or cause to be provided to Owner an electronic copy of such information.

2.3.12 Contractor-Provided Training. Commencing at least thirty (30) days prior to the then-scheduled date for achievement of Mechanical Completion, Contractor shall provide, at its own expense, a training program in the operation and maintenance of the Project for Owner's Project Personnel and the operation and maintenance contractor's Project Personnel (collectively, "O&M Personnel"). The training program provided by Contractor shall be as described on Exhibit J-1 and shall (a) include classroom and field training, (b) include all educational materials necessary for such training, and (c) establish quality controls so that O&M Personnel are suitably trained and capable of operating and maintaining the Project after Project Substantial Completion. Contractor shall make every reasonable effort to use the O&M

Personnel during start-up and initial operation of the Project; provided, however, Owner shall not be obligated to supply (i) O&M Personnel for the construction of the Project or (ii) provide during Project start-up and initial operation more O&M Personnel than the number of O&M Personnel Owner an O&M contractor would use during normal Project operation as determined by Owner. Contractor shall remain solely responsible for performing the Work in accordance with this Agreement, including Contractor's obligation to achieve Project Substantial Completion, and achieve Final Completion, subject to Contractor's right to a Change Order in the event of an Owner-Caused Delay. The cost of the O&M Personnel's salary, travel, lodging, food and other living expenses shall be borne by Owner.

2.3.13 Labor and Personnel.

(a) Engagement of Labor. Contractor shall provide and manage and transport all Labor and Personnel required in connection with the performance of the Work and of its obligations hereunder. Contractor shall retain only such Labor and Personnel that have experience with the equipment and who are competent to perform their assigned duties in a safe and secure manner, including: (i) Contractor's Project Manager; (ii) lead project engineer and field engineers, cost and schedule engineers. Contractor shall require its Subcontractors to adhere to the same standard with respect to their Labor. Where required by Applicable Law, Contractor shall employ only licensed Personnel in good standing with their respective trades and licensing authorities to perform engineering, design, architectural and other professional services in the performance of the Work. All such professional services shall be performed with the degree of care, safety, skill and responsibility customary among such licensed Personnel provided such performance is in accordance with Applicable Law and Prudent Industry Practices. To the extent required by Applicable Law and Prudent Industry Practices, all Labor shall have received formal documented training in their area of expertise and certification.

(b) Owner Review of Labor. Upon Owner's request, Contractor shall provide Owner with the resumes of all management and supervisory Personnel employed in connection with the Work and Owner may require the replacement of any Personnel, at Contractor's sole expense if, in Owner's reasonable opinion, such Person is (i) endangering life or limb on or near the Project Site or violates or breaches the Real Property Requirements, thereby adversely affecting Owner's relationship with the land owners, (ii) incompetent, or (iii) violating or has violated this Agreement, particularly the Safety Plan and Sections 2.4.12(c) through (e). Rejection of Contractor's Personnel by Owner shall not relieve Contractor of any of its obligations hereunder or be construed as a waiver by Owner of any of its rights under the Agreement.

(c) Alcohol and Drugs. Contractor shall comply with Owner's policies and practices regarding alcohol and drugs and shall not possess, consume, import, sell, give, barter or otherwise dispose of any alcoholic beverages or drugs (excluding drugs for proper medical purposes and then only in accordance with Applicable Law) at the Project Site, or permit or suffer any such possession, consumption, importation, sale, gift, barter or disposal by its Subcontractors, agents or Labor. Subject to requirements of Applicable Law, Contractor shall perform random drug and alcohol testing on Persons employed by its Subcontractors and shall perform a drug and alcohol test on any Person employed by a Subcontractor who Owner or Contractor reasonably suspects is in possession of or under the influence of any dangerous or

controlled drug, alcohol or other such substance at any time during such Person's performance of any portion of the Work at the Project Site. Subject to requirements of Applicable Law, Contractor shall perform drug and alcohol testing on its Subcontractors, agents and Labor for purposes of such Person's hiring, treatment and/or annual physical. Additionally, Contractor shall perform, or cause its Subcontractors and agents to perform, a drug and alcohol test on each of their respective employees prior to any such employee first entering the Project Site to perform any Work. Contractor shall immediately identify and remove from its or its Subcontractors' employment at the Project Site any Person (whether in the charge of Contractor or any of its Subcontractors) who is in possession of or under the influence of any dangerous or controlled drug, alcohol or other such substance at any time during such Person's performance of any portion of the Work, excluding any Person using a prescription drug under supervision and approval from a medical doctor, or any other Person who does or whose actions may create any unsafe condition or other situation that may cause damage or harm to any Person or property, including any Person using a prescription drug under supervision and approval from a medical doctor. Contractor's Drug and Alcohol Abuse Policy is attached as Exhibit L. This policy does not apply to Owner and its Personnel. Owner shall enforce its own drug and alcohol policy with respect to its Personnel.

(d) Arms and Ammunition. Contractor and its Personnel, shall not possess, give, barter or otherwise dispose of, to any Person or Persons, any arms or ammunition of any kind at the Project Site, or permit or suffer the same as aforesaid and shall at all times assure that the Project Site is kept free from arms and ammunition. No hunting of any kind by Contractor or its Personnel, or other invitees, shall be permitted on the Project Site. Contractor shall immediately identify and remove from its or its Subcontractors' employment at the Project Site any Person that violates this provision.

(e) Disorderly Conduct. Contractor shall be responsible for the conduct and deeds of its Labor and its Subcontractors' Labor relating to the Agreement and the consequences thereof. Contractor shall at all times take all reasonable precautions to prevent any unlawful, riotous or disorderly conduct by or among such Labor and for the preservation of peace, protection and safety of Persons and property in the area of the Project Site against the same. Contractor shall not interfere with any members of any authorized police, military or security force in the execution of their duties.

(f) Labor Disputes. Contractor shall use reasonable efforts to minimize the risk of labor-related delays or disruption of the progress of the Work. Contractor shall promptly take any and all reasonable steps that may be available in connection with the resolution of violations of collective bargaining agreements or labor jurisdictional disputes, including the filing of appropriate processes with any court or administrative agency having jurisdiction to settle, enjoin or award damages resulting from violations of collective bargaining agreements or labor jurisdictional disputes. Contractor shall advise Owner promptly, in writing, of any actual or threatened (in writing) labor dispute, of which Contractor has knowledge, that might materially affect the performance of the Work by Contractor or by any of its Subcontractors. Notwithstanding the foregoing, the settlement of strikes, walkouts, lockouts or other labor disputes shall be at the discretion of the Party having the difficulty.

2.3.14 Safety and Emergencies.

(a) Safety. Contractor shall initiate and maintain safety precautions and programs to conform with Applicable Laws, Applicable Permits, Exhibit A, or other requirements designed to prevent injury to all Persons (including members of the public and the employees, agents, contractors, consultants and representatives of Owner, Contractor and its Subcontractors, and other contractors and subcontractors) and all public and private property (including structures, sewers and service facilities above and below ground, along, beneath, above, across or near the Project Site) that are at or near the Project Site that are in any manner affected by the performance of the Work. Such precautions and programs shall include prevention of damage or injury to local flora and fauna. Contractor shall erect and maintain reasonable safeguards for the protection of Labor and the public. Contractor shall exercise reasonable efforts to eliminate or abate all reasonably foreseeable safety hazards created by or otherwise resulting from performance of the Work. Contractor shall, and shall cause all of its Labor, agents, invitees, and Subcontractors to follow the safety plan set forth in Exhibit L (the "Safety Plan") and to follow all other reasonable safety measures and procedures implemented by the Owner at the Project Site.

(b) Compliance with Safety Plan. Contractor shall be responsible for and shall notify Owner as soon as Contractor becomes aware of any injury resulting from a failure of its agents, invitees, Labor, or Subcontractors to abide by the requirements of the Safety Plan set forth in Exhibit L, in each case in connection with performance of the Work.

(c) Emergencies. In the event of any emergency endangering Persons or property during performance of the Work, Contractor shall take such action as may be reasonable and necessary to prevent, avoid or mitigate injury, damage or loss and shall, as soon as practicable, report any such incidents, including Contractor's response thereto, to Owner. Whenever Contractor has not taken reasonable precautions for the safety of the public or the protection of the Work or of structures or property on or adjacent to the Project Site, Owner may, but shall be under no obligation to, upon reasonable advance notice to Contractor and a reasonable opportunity to cure, take such action as is reasonably necessary under the circumstances. The taking of such action by Owner or Owner's failure to do so shall not limit Contractor's obligations or liability hereunder. Provided Contractor fails to timely act, Contractor shall reimburse Owner for any reasonable costs incurred by Owner in taking such actions in the event of an emergency.

2.3.15 Security. Contractor shall take reasonable precautions, consistent with Prudent Industry Practices, to provide for the security and protection: (a) of the equipment, machinery and components comprising the Equipment and the Project through the date of Project Substantial Completion, and (b) for the other property owned or leased by Contractor or any Subcontractor located at the Project Site at areas thereon provided by Owner or stored or warehoused off the Project Site through the date of Final Completion. Contractor shall use the same care to protect any of Owner's and Equipment Provider's property at any time in its possession or under its control while performing the Work as it does with its own property and shall be responsible for damage to such property resulting from Contractor's failure to take such precautions or use such care.

2.3.16 Clean-up. Contractor shall at all times keep the Project Site reasonably free from waste materials, rubbish and Hazardous Materials produced by the Work. As part of

the Work, Contractor will arrange and pay for disposal of sewage and wastes generated by Contractor or its Personnel as necessary to enable Contractor to perform the Work. Contractor shall maintain the Project Site in a neat and orderly condition throughout the performance of the Work. Prior to the Final Completion Date or as soon as practicable after the termination of this Agreement by Owner in accordance with the provisions of Article XII, Contractor shall (i) remove all Contractor equipment from the Project Site, (b) tear down and remove all temporary structures on the Project Site built by it or its Subcontractors and restore such areas to a condition consistent with that of a newly constructed plant (including the re-grading and/or re-seeding of disturbed areas, which re-seeding may occur after Final Completion if Owner reasonably approves), (c) reclaim, in accordance with the applicable Real Property Requirements, laydown areas, and other construction areas as required by the applicable Real Property Requirements, and (d) remove and dispose of all waste and rubbish generated by Contractor and its Subcontractors from and around the Project Site. Contractor shall provide to Owner all legally required waste disposal manifests, if any, upon request.

2.3.17 Damage to Roads. Contractor shall abide by the maintenance provisions set forth in the Road Maintenance Agreement (Exhibit K) and shall be responsible for (i) all damage it and its Subcontractors cause to state roads and highways (other than Township roads) in violation of Applicable Law, (ii) all damage Contractor or its Subcontractors cause to County roads, (iii) all damage caused by it and its Subcontractors to private roads or property of third parties, in each case in connection with performance of the Work.

2.3.18 Fire Prevention. Contractor shall be responsible for providing adequate fire prevention and protection at the Project Site and shall take all reasonable precautions to minimize the risk of fire at the Project Site. Contractor shall provide instruction to the Labor in fire prevention control. Contractor shall provide appropriate fire-fighting and fire protection equipment and systems at the Project Site in a manner consistent with those as would be provided by a prudent contractor constructing a comparable project in comparable terrain and climate to that of the Project. Notwithstanding the foregoing sentence, this Agreement shall not, and does not obligate Contractor's or any of its Subcontractors' employees to fight any fires. In the event of a fire, Contractor's or any of its Subcontractors' employees shall immediately take steps to ensure the safety of themselves and others and shall contact the local fire department to report such fire and to determine the appropriate actions. Contractor shall promptly collect and remove combustible debris and waste material from the Project Site and shall not permit such debris and material to accumulate.

2.3.19 Other Work. As part of the Work (and except as otherwise stated in the Scope of Work, Article V or elsewhere in this Agreement as being the responsibility of Owner or Equipment Provider), Contractor shall provide any other services or items not specifically described in this Agreement if providing such additional work or item is necessary to make the Project operable, free from Defects and capable of performing as specified in this Agreement.

2.4 Prudent Industry Practices for the Work/Compliance. Contractor shall perform the Work in a manner that is (a) in conformance with Prudent Industry Practices and the Quality Assurance Procedures; (b) in compliance with the terms of the Agreement, and all interconnection requirements attached hereto; (c) compliant with all Applicable Laws, Applicable Permits; and (d) in compliance with and not in violation of the terms of the Real

Property Requirements, including such that Owner would be in violation of the Real Property Requirements. In no event will references in any provision of this Agreement to one or more of the standards, guidelines, practices, regulations, laws, or Permits contained in this Section 2.5 be interpreted to limit the applicability of all such standards, guidelines, practices, regulations, laws, and Permits to such provision.

2.5 Commencement of Work; Project Schedule; Acceleration.

2.5.1 Access to Project Site. Contractor will commence performance of all off-site Work promptly after the Effective Date and upon receipt of an LNTP, including ordering "long lead time" Equipment. Contractor will not perform any clearing Work on the Project Site until Owner issues to Contractor a Notice to Proceed.

2.5.2 Project Schedule; Monthly Progress Reports.

(a) Contractor shall perform the Work in accordance with the Project Schedule.

(b) Contractor shall provide Owner with Monthly Progress Reports as further defined in Exhibit A which shall include progress reports, as compared to the Project Schedule, including the incorporation of delay and acceleration analyses where appropriate. Such Monthly Progress Reports shall be presented electronically and shall address all material elements of the Work. Contractor shall provide Owner with appropriate work and meeting facilities at the Site and shall conduct weekly and monthly project meetings at mutually agreeable locations or by telephone between representatives of Owner, Equipment Provider and Contractor to review the status of the Work. Contractor shall promptly notify Owner in writing at any time that Contractor has reason to believe that there will be a material deviation in the Project Schedule and shall set forth in such notice the corrective action planned by Contractor. Delivery of such notice shall not relieve Contractor of its obligations under Article VI.

2.5.3 Acceleration of Work. If, at any time or from time to time, Contractor fails to achieve or is reasonably likely to fail to achieve a Key Milestone by the date required therefor in the Project Schedule for any reason not otherwise excused under the terms of this Agreement, then, upon written request of Owner, Contractor shall promptly, but in any event within five (5) Business Days of such date, submit a written recovery plan with specific steps, tasks and subcontractor actions necessary to complete all necessary Work to the extent reasonably practicable by the dates for the remaining Key Milestones. Owner shall promptly submit reasonable suggestions to such written recovery plan. To the extent reasonable and feasible, Contractor shall incorporate such suggestions to such recovery plan or shall provide explanation for why such suggestions were not incorporated, which may include alternative Work acceleration proposals. Contractor shall diligently prosecute the Work in accordance with such recovery plan. Neither approval by Owner of such recovery plan nor Contractor's prosecution of the Work in compliance with such recovery plan shall (i) be deemed in any way to have relieved Contractor of its obligations under the Agreement relating to the failure to timely achieve any Key Milestone by the date required therefor, or (ii) be a basis for a Change Order or any other compensation or an increase in the Contract Price. Contractor shall not be entitled to a Change

Order or any other compensation or increase in the Contract Price in connection with the implementation of a recovery plan or any acceleration thereunder.

2.6 Hazardous Materials.

2.6.1 Contractor Duties. Contractor shall, and shall cause its Subcontractors to, comply with all Applicable Laws relating to Hazardous Material. Without limiting the generality of the foregoing: (a) Contractor shall, and shall cause its Subcontractors to, have a release prevention and response plan to contain and clean up any spills or emissions of Hazardous Materials by Contractor or its Personnel (such plan to be made available to Owner upon Owner's request); (b) Contractor shall, and shall cause its Subcontractors to apply for, obtain, comply with, maintain and renew all Applicable Permits required of Contractor by Applicable Laws regarding Hazardous Material that are necessary, customary or advisable for the performance of the Work; (c) Contractor shall, and shall cause its Subcontractors to have an independent Environmental Protection Agency identification number for disposal of Hazardous Material generated by Contractor if and as required under Applicable Laws; (d) Contractor shall conduct its activities under the Agreement, and shall cause each of its Subcontractors to conduct its activities, in a manner designed to prevent pollution of the environment or any other release of any Hazardous Material by Contractor and its Subcontractors in a manner or at a level requiring remediation pursuant to any Applicable Law; (e) neither Contractor nor its Subcontractors shall cause the release or disposal of Hazardous Material at the Project Site, bring Hazardous Material to the Project Site, or transport Hazardous Material from the Project Site, except as required for performance under the Agreement and in accordance with Applicable Law; (f) Contractor shall be responsible for the management of and proper disposal of all Hazardous Material released, brought onto or generated at the Project Site by it or its Subcontractors, if any; (g) if any spillage, discharge, emission, or release should occur through Contractor's actions, Contractor shall immediately notify Owner and take all reasonable steps necessary to: (1) stop and contain the spillage, discharge, emission, or release, (2) make any report(s) of the spillage, discharge, emission, or release as required under Applicable Law, and (3) clean-up the spillage, discharge, emission, or release as required by the applicable Government Authority; (h) Contractor shall cause all such Hazardous Material released, brought onto or generated at the Project Site by it or its Subcontractors, if any, (1) to be transported only by carriers maintaining valid Hazardous Materials transportation permits (as required) and operating in compliance with such permits and laws regarding the transportation of Hazardous Material and only pursuant to manifest and shipping documents identifying only Contractor as the generator of waste or Person who arranged for waste disposal, and (2) to be treated and disposed of only at treatment, storage and disposal facilities maintaining valid permits (as required) regarding Hazardous Material; (i) Contractor shall submit to Owner a list of all Hazardous Material to be brought onto or generated at the Project Site prior to bringing or generating such Hazardous Material onto or at the Project Site; and (j) Contractor shall keep Owner informed as to the status of all Hazardous Material on the Project Site and disposal of all Hazardous Material from the Project Site.

2.6.2 Environmental Releases.

(a) If Contractor or any of its Subcontractors releases any Hazardous Material on, at, or from the Project Site, or becomes aware of any Person who has stored, released or disposed of Hazardous Material on, at, or from the Project Site during the Work,

Contractor shall notify Owner in writing within one hour of becoming aware of such circumstance. If Contractor's Work is involved in the area where such release occurred, Contractor shall immediately stop any Work affecting the area.

(b) Contractor shall, at its sole cost and expense, diligently proceed to take all necessary and desirable remedial action to clean up and remediate fully and dispose of, in accordance with Applicable Laws and to Owner's reasonable satisfaction, any contamination caused by (i) any negligent release by Contractor or any of its Subcontractors of any Pre-Existing Hazardous Material (the Parties agree that simply discovering any Pre-Existing Hazardous Material or accidentally disturbing previously unknown Pre-Existing Hazardous Material is not a negligent release of such Pre-Existing Hazardous Material, but that Contractor will act reasonably and prudently with respect to same upon discovery), and (ii) any Hazardous Material that was brought onto or generated at the Project Site by Contractor or any of its Subcontractors, whether on or off the Project Site.

(c) If Contractor discovers any Pre-Existing Hazardous Material that has been stored, released or disposed of at the Project Site, Contractor shall immediately notify Owner in writing. If Contractor's Work involves the area where such a discovery was made, Contractor shall immediately stop any Work affecting the area and Owner shall determine a reasonable course of action. Contractor will not thereafter resume performance of the Work in the affected area except with the prior written permission of Owner. If and when Contractor is instructed to resume performance of the Work (after disposal or other decision by Owner regarding treatment of such Hazardous Substance), Contractor will be entitled to a Change Order as set forth in Section 9.5.1(g). Contractor shall not, and shall cause its Subcontractors to not, take any action that may exacerbate any such contamination.

(d) In addition to Contractor's obligations as set forth above, if Owner desires Contractor to perform all or part of any clean up and/or remediation that may become necessary as a result of the discovery of any such Pre-Existing Hazardous Material as described in Section 2.7.2(c) above, the clean up and remediation of which is not the responsibility of Contractor as set forth in Section 2.7.2(b)(i) above, it shall request a Change Order pursuant to Section 9.2. Further, if so requested by Owner, Contractor shall cooperate with and assist Owner in making the Project Site available for taking necessary remedial steps to clean-up/remediate any such contamination at Owner's expense as determined in accordance with Article IX; provided, however, that under no circumstances shall Contractor be required to participate in such clean-up/remediation of a Pre-Existing Hazardous Material if such release is not the responsibility of Contractor as set forth in Section 2.7.2(b)(i) above.

2.6.3 Recordkeeping. Contractor shall minimize the use of Hazardous Materials in performance of the Work and shall not utilize, or permit or cause any Subcontractor to utilize, such Hazardous Materials as are prohibited under Applicable Laws from being imported into or used in the United States. Contractor shall maintain an updated file of all safety data sheets for all Hazardous Materials used in connection with performance of the Work or at or near the Project Site or at any construction area related to the Project and shall update such file at least monthly and make it available on site in accordance with Applicable Law. Contractor shall maintain an accurate record and current inventory of all Hazardous Materials used in performance of the Work on at or near the Project Site or at any construction area related to the

Project and the record shall identify quantities, location of storage, use and final disposition of such Hazardous Materials.

2.6.4 Owner's Self-Help Rights. If Contractor fails or refuses to remove from the Project Site (or any areas adjacent thereto or any other areas where Contractor performs the Work) or properly dispose of such Hazardous Materials as required pursuant to Section 2.7, Owner may, after providing Contractor with reasonable notice and opportunity to cure, at its discretion perform such removal and/or disposal as it may deem to be reasonably necessary or appropriate and charge Contractor with the full cost of performing such work either directly or by offset of such cost from any payment then or thereafter due to Contractor. The taking of any action by Owner in connection with the removal or disposal of such Hazardous Materials shall not relieve Contractor of its obligations under this Agreement and any Applicable Laws or Applicable Permits.

2.7 Owner's Right to Inspect; Correction of Defects.

2.7.1 Right to Inspect. Owner and its authorized representatives shall have the right to inspect the Work and Contractor's records of inspections and quality control/quality assurance and shall have the right to maintain Personnel at the Project Site for such purpose, subject in all cases to Contractor's Safety Plan. Contractor shall use commercially reasonable efforts to include rights in all Subcontracts to permit Owner and any of their authorized representatives to audit, inspect, test and observe the Equipment at the facilities of any Subcontractor and the manufacturer of Equipment, and, if permitted, Contractor shall ensure reasonable, adequate and safe access to such facilities for such purposes, subject to any reasonable safety rules or restrictions imposed by such Subcontractor. If any portion of the Work should be covered contrary to the timely request of Owner or contrary to requirements specifically expressed in the Agreement, such portion of the Work shall, if requested by Owner, be uncovered for observation and shall be replaced at Contractor's expense. If any other portion of the Work has been covered which Owner has not specifically requested to observe prior to being covered, Owner may request to see such Work and Contractor shall uncover it. If such other portion of the Work is found not to be in accordance with the requirements of this Agreement, the cost of uncovering, replacement and re-covering shall be charged to Contractor. If such other portion of the Work is found to be in accordance with the requirements of this Agreement, Owner shall pay such costs pursuant to an appropriate Change Order in accordance with Article IX. Such inspection of any part of the Work shall in no way relieve Contractor of its obligation to perform the Work in accordance with this Agreement. If Contractor covers any portion of the Work after offering Owner the opportunity to inspect, then if Owner later requests Contractor to uncover such Work then Owner shall pay the costs to uncover unless such Work is found to contain a Defect.

2.7.2 Correction of Defects. Contractor shall, at its own cost and expense, correct or replace any Work that contains a Defect, or is not otherwise in compliance with the terms and requirements of the Agreement. Defective Equipment that has been replaced, if situated on the Project Site, shall be removed by Contractor at Contractor's sole cost and expense. If Contractor fails within a reasonable period of time, not to exceed ten (10) Business Days after it knows of such Defect or noncompliance or neglects to commence and continue correction of such Defect or noncompliance with diligence and promptness, Owner may upon

notice to Contractor, without prejudice to other remedies Owner may have under the Agreement, correct such Defect or noncompliance. In such event, an appropriate Change Order shall be issued deducting from payments then or thereafter due to Contractor the cost of correcting such Defect or noncompliance, including compensation for the costs to enforce this provision (including attorneys' fees) and any consultant's additional services and expenses made necessary by such neglect or failure. If payments then or thereafter due to Contractor are not sufficient to cover such amounts, Contractor shall pay the difference to Owner within ten (10) Business Days from Owner's request.

2.8 Inspection Not Approval. Owner will not be responsible for and will not have control over or charge of construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, and Owner will not be responsible for Contractor's failure to carry out the Work in accordance with this Agreement. Owner will not be responsible for or have control or charge over the acts or omissions of Contractor, any Subcontractor, or any of their agents or employees. No inspection made, failure to inspect, acceptance of Work, payment of money or approval given by Owner shall relieve Contractor of its obligations for the proper performance of the Work in accordance with the terms hereof. Owner may reject any Work with Defects or which is not in accordance with the requirements of the Agreement, regardless of the stage of completion, the time or place of discovery of error, and whether Owner previously accepted any or all of such Work through oversight or otherwise, except to the extent such discovery occurs after expiration of the Warranty Period. No approval given by Owner, in and of itself, shall be considered as an assumption of risk or liability by any such Person. Any such approval shall mean that the Person giving the approval has no objection to the adoption or use by Contractor of the matter approved at Contractor's own risk and responsibility. Contractor shall have no claim relating to any such matter approved, including any claims relating to the failure or inefficiency of any method approved.

2.9 Liens. Provided that Owner has paid Contractor in accordance with the requirements of this Agreement, Contractor shall, at Contractor's sole expense, discharge and cause to be released, whether by payment or posting of an appropriate surety bond in accordance with Applicable Law, within ten (10) days after receipt of a written demand from Owner, any Lien in respect to the Work, the Equipment, the Project Site, or any fixtures or personal property included in the Work (whether or not any such Lien is valid or enforceable) created by, through or under, or as a result of any act or omission (or alleged act or omission) of, Contractor or any Subcontractor, or other Person providing services or materials within the scope of Contractor's Work. Upon the failure of Contractor to promptly discharge or cause to be released any Lien as required by this Section 2.9, within ten (10) days after notice to Contractor, Owner may, but shall not be obligated to, pay, discharge or obtain a surety bond for such Lien and, upon such payment, discharge or posting of surety bond therefore, shall be entitled to immediately recover from Contractor the amount thereof together with all expenses incurred by Owner in connection with such payment, discharge or posting, or set off all such amounts against any sums owed by Owner to Contractor. Contractor shall notify Owner of the filing of any Lien against the Project, the Equipment, the Project Site, or any fixtures or personal property included in the Work promptly upon learning of the existence or filing of such Lien. Acceptance by Contractor of the final payment shall constitute a release by Contractor of Owner, Affiliates and every officer and agent thereof from all Liens (whether statutory or otherwise and including mechanics' or

suppliers' Liens), claims and liability hereunder with respect to any Work performed or furnished in connection with this Agreement, or for any act or omission of Owner or of any Person relating to or affecting this Agreement, except claims for which Contractor has delivered a Dispute Notice to Owner. No payment by Owner shall be deemed a waiver by Owner of any obligation of Contractor under this Agreement.

2.10 Cooperation.

(a) Contractor shall be responsible for coordinating work on the Project Site. Owner shall use commercially reasonable efforts to cause all Other Owner Contractors and Equipment Provider to comply with the reasonable coordination requirements imposed by Contractor, which coordination shall be intended to optimize completion of construction of the Project in a timely manner.

(b) Contractor shall cooperate with Owner in connection with Owner's efforts to obtain the approvals, certificates, financing and Permits for the Project.

(c) Contractor acknowledges that work may be performed by others at the Project Site during the execution of Work. Contractor further acknowledges that Owner, through itself or through its employees, Subcontractors or agents, will continue to work and perform activities in connection therewith at and around the Project Site during the execution of the Work. Contractor shall cooperate and cause its Subcontractors, and Owner shall use commercially reasonable efforts to cause the Other Owner Contractors to cooperate with Contractor, to assure that no Party unreasonably hinders or increases, or makes more difficult than necessary the work being done by the other Parties. Contractor shall perform the Work in full cooperation with such others (provided the Other Owner Contractors reasonably cooperate with Contractor) and to permit, without charge, reasonable access to, and use of, the Project Site, by others or by Owner, when such access or use is necessary for the performance and completion of the work of others.

(d) All material and labor shall be furnished, and the Work performed, will be properly coordinated and completed in accordance with the applicable schedules and the times of completion required by the Agreement with priority given in all instances to activities necessary to achieve Key Milestones in accordance with the Project Schedule, subject to Contractor's right to a Change Order in the event of a Force Majeure Event or Owner-Caused Delay.

(e) Contractor shall use reasonable efforts, and cause its Subcontractors to use their reasonable efforts, to assist Owner in creating, assessing and carrying out programs which shall, during all phases of the Work, minimize the impacts upon the Project Site caused by the Work. To the extent they do not materially adversely affect costs or the achievement of Key Milestones on or prior to the scheduled completion dates for such Key Milestones, as set forth in the Project Schedule, such programs shall include: (i) minimizing the impacts of noise and dust at and around the Project Site; and (ii) using local Labor and other resources whenever possible, to the extent such Labor is qualified and cost competitive.

2.11 Intellectual Property Rights. Contractor shall obtain and, to the extent described below, maintain all trade secrets, patents, copyrights, trademarks, proprietary rights or information, licenses or other intellectual property rights (collectively, the "Intellectual Property Rights") necessary for performance of the Work and the operation and maintenance of the Project. Contractor hereby grants to Owner an irrevocable, non-exclusive, perpetual, royalty-free license under all Intellectual Property Rights whether now existing or developed for the Work, now or hereafter owned, licensed to or controlled by Contractor or any of its Affiliates, to use the same to the extent necessary for the ownership, completion, operation, maintenance, repair, rebuilding, alteration and expansion of the Work (provided such alteration or expansion is within the Scope of Work for this Project) and all subsystems and components thereof. To the extent that the license granted to Owner above is predicated upon Intellectual Property Rights held by Contractor, Contractor will maintain those Intellectual Property Rights throughout the life of the Project.

2.12 Credit Support. Within thirty (30) Days following the Effective Date, but in any case no later than the date on which Notice to Proceed is issued, Contractor shall furnish to Owner a combination of ***[Payment and Performance Bond, Letter of Credit or Guaranty from Contractor's ultimate parent company ("Contractor's Parent")]***, with a limitation of liability of not less than the Contract Price (the "Parent Guaranty"), substantially in the form set forth in Exhibit P-3. Such Parent Guaranty shall remain in place until all the expiration of the Warranty Term. Contractor shall not be entitled to any increase in the Contract Price for the provision of such Parent Guaranty.

ARTICLE III

SUBCONTRACTORS

3.1 Subcontractors. Owner acknowledges that Contractor intends to have portions of the Work accomplished by Subcontractors qualified to perform such Work pursuant to written subcontracts between Contractor and such Subcontractors. Exhibit I sets forth a list of approved Major Subcontractors. Owner agrees to Contractor's use and engagement of Subcontractors; provided Contractor may not enter into any Major Subcontract with any Person not listed in Exhibit I or approved by Owner in writing (which approval shall not be unreasonably conditioned, withheld or delayed). Except as otherwise expressly provided in the Agreement, Contractor shall be solely responsible for engaging, managing, supervising and paying all Subcontractors and Persons directly or indirectly employed by them. Contractor shall require that all Work performed and all Equipment provided by Subcontractors be received, inspected and otherwise furnished in accordance with the Agreement. Contractor shall be solely liable for all acts, omissions, liabilities and Work (including Defects therein) of its Subcontractors and whenever this Agreement refers to the negligence, fault or omission of Contractor, it shall include the negligence, fault or omission of Contractor's employees, Subcontractors and their agents and employees, and other persons performing portions of the Work under a contract with Contractor.

3.2 Subcontracts. All contracts with Subcontractors shall be consistent with the terms and provisions of the Agreement. At a minimum, all subcontracts shall require the Subcontractors to comply with Applicable Laws, and shall provide that Owner has the right of

inspection as provided hereunder and require such Subcontractors to (a) be subject to the Labor obligations hereunder as well as the safety and security provisions of the Agreement, (b) provide guarantees and warranties with respect to its portion of the Work and the Equipment and (c) obtain, maintain and keep in force throughout the time during which they are engaged by Contractor such insurance coverages as are required of Contractor under this Agreement. All subcontracts shall preserve and protect the rights of Owner, shall not prejudice such rights and shall require each Subcontractor to use reasonable efforts to enter into similar agreements with other Subcontractors. Contractor shall require and shall cause all Subcontractors to perform their portions of the Work in accordance with the requirements of this Agreement. Contractor shall ensure that Contractor's rights and obligations under each Subcontract may be, without requiring the prior consent of the relevant Subcontractor, in whole or in part, assigned and delegated by Contractor to Owner. Each Subcontract shall provide that upon notification to the Subcontractor from Owner, that: (a) the Agreement has been terminated; (b) Contractor's right to proceed with the Work has been terminated; and (c) Owner will thereafter be assuming Contractor's obligations under such Subcontract, then such Subcontractor shall continue to perform its responsibilities under such Subcontract for the benefit of Owner and shall recognize Owner as being vested with all the rights and responsibilities of Contractor under such Subcontract. Notwithstanding the foregoing, it is specifically understood and agreed (and each Subcontract shall clarify) that no Subcontractor shall have any right to look to Owner for the performance of Contractor's obligations under any Subcontract unless and until such Subcontractor has received such notice from Owner. Each Major Subcontract shall require the Subcontractor to execute an acknowledgment of, and agreement to, the provisions of this Section 3.2. Contractor will deliver to Owner a copy of each such executed acknowledgment and agreement within forty-eight (48) hours after each Subcontractor's execution of its Subcontract.

3.3 Owner as Third Party Beneficiary. No Subcontractor is intended to be nor shall it be deemed a third party beneficiary of this Agreement. Nothing contained herein shall obligate Owner to pay any Subcontractor and Contractor shall be solely responsible for paying each Subcontractor in accordance with the applicable Subcontract or purchase order between Contractor and the Subcontractor; provided, however, each agreement between Contractor and a Subcontractor with respect to the Work shall name Owner as an intended third-party beneficiary.

3.4 Subcontractor Warranties. Without in any way derogating Contractor's representations and warranties and other testing requirements and guarantees set forth herein with respect to all of the Work, Contractor will require all Subcontractors to provide product and service warranties at a minimum equal to the Warranties in Article VII. Contractor shall use reasonable efforts to obtain from all Subcontractors any representations, warranties, guarantees, and obligations offered by such Subcontractors and to negotiate the longest reasonably practicable warranty periods at no additional cost with respect to design, materials, workmanship, Equipment, tools, supplies, and other items furnished by such Subcontractors. Contractor shall assign all representations, warranties, guarantees, and obligations of all Subcontractors at the request and direction of Owner, and without recourse to Contractor, to Owner upon default by Contractor or termination or expiration of this Agreement; provided, however, that, notwithstanding such assignment, Contractor shall be entitled to enforce each such representation, warranty, guaranty, and obligation so long as Contractor has any liability under this Agreement. To the extent assignable, Contractor hereby assigns to Owner, effective

as of the end of the Warranty Period for the Project, all representations, warranties, guaranties and obligations of all Subcontractors.

ARTICLE IV

CONTRACT PRICE

4.1 Contract Price. As full consideration to Contractor for the complete performance of the Work and Contractor's other covenants in this Agreement, Owner will, subject to the provisions of this Article IV and the Schedule of Value attached hereto as Exhibit B-1, pay Contractor [_____] Dollars ($_____) (the "Contract Price"). The Contract Price may be adjusted only pursuant to a Change Order issued in accordance with the provisions of Article IX. Subject to the terms and conditions of this Article IV, the Contract Price shall be paid by Owner to Contractor, in accordance with the procedures set forth in Exhibit C-2, by way of (a) monthly progress-based payments, and (b) milestone payments.

4.2 Taxes Contractor Taxes.

(a) Contractor shall be responsible for all Taxes, transportation fees, freight, packing costs, custom duties, personnel fees and all other costs associated with the performance of the Work and any other of its duties and responsibilities under this Agreement, unless otherwise stated in this Agreement. The Parties agree that the Contract Price, as stated in Section 4.1, includes all Taxes, excluding materials that are tax exempt under Applicable Law.

(b) To the extent Owner indicates to Contractor that it will obtain an exemption which is thereby factored into the original Contract Price and Contractor complies with Owner's reasonable instructions for implementing such exemption for purposes of avoiding payment of sales and use taxes to Subcontractors or Suppliers for goods and services subject to such exemption, then Owner shall reimburse Contractor for the amount of any sales or use taxes that Contractor is required to pay, to the extent excluded from the original Contract Price, notwithstanding the applicability of such exemption; provided, however, Contractor shall procure and provide to Owner such documents evidencing payment of such taxes as Owner may be reasonably required to enable Owner to obtain a refund of such paid taxes.

(c) At any time and from time to time upon Owner's reasonable request, Contractor will allow Owner and its designees the opportunity to review all purchases by Contractor and its Subcontractors (and will in this regard provide all relevant information regarding the same (including separate break-out pricing for goods and services, if reasonably available)) for the purpose of determining whether such exemptions or rebates apply and have been or should have been granted.

(i) If Owner directs Contractor to seek an exemption or rebate and Contractor fails to seek such exemption or rebate for an item, Owner will be relieved of its obligation under Section 4.2.2(a) to reimburse Contractor for the taxes on such item.

(ii) If Contractor seeks exemption or rebate on an item in accordance with the foregoing, but the same is not granted, Owner shall reimburse Contractor for the disallowed amount, and Contractor will assign to Owner its right to seek a refund of, or

rebate in connection with, the amount in question and will reasonably cooperate with Owner to seek such refund and/or rebate. If such assignment is not allowed under Applicable Law, then Contractor will, at Owner's direction and expense, seek such refund and, if received, pay over such refund to Owner, and all costs of seeking a refund or appealing the denial of an exemption, refund or rebate shall be borne by Owner.

(iii) Any rebates received by Contractor or its Subcontractors in connection with any Contractor Taxes reimbursed by Owner under Section 4.2.2 from the purchase of any materials, supplies or equipment in connection with the Work shall be immediately paid over to Owner.

(d) Contractor shall promptly provide Owner with notice of any audits, assessments or challenges by any Governmental Authority with respect to Contractor's Taxes, which are to be reimbursed by Owner. In the event of any such audit, assessment or challenge, Owner shall have the right to receive copies of all correspondence and documents relating thereto, to attend and participate in all meetings with the Governmental Authority and to participate in and control all mediation, and litigation related thereto, provided the cost thereof is borne by Owner and Owner indemnifies, defends and holds Contractor harmless with respect thereto.

(e) To the extent Owner is obligated under Applicable Laws to pay any of Contractor's Taxes, Contractor shall: (i) furnish to Owner all information and reports required to be furnished to the appropriate taxing authorities in connection with all such Contractor's Taxes; and (ii) reimburse Owner for the full amount of such Contractor's Taxes paid by Owner that are not otherwise required to be reimbursed by Owner to Contractor under Section 4.2.2. Contractor will have no responsibility for property taxes assessed on the Work or the Project Site.

4.2.2 Owner Taxes.

(a) If Contractor is assessed any taxes, for tangible personal property and services purchased for the purpose of and in conjunction with constructing of the Project despite having complied with the requirements of Section 4.2.1, Contractor will invoice Owner for reimbursement of such assessment as part of each applicable Request for Payment, and shall include therewith all documentation necessary to evidence Contractor's and Subcontractor's payment of such taxes. For the avoidance of doubt, Owner will not be responsible: (i) to reimburse Contractor for those Contractor's Taxes as described in Section 4.2.1(a); or (ii) for any penalties or interest related to non-payment or late payment of any required Contractor's Taxes, unless such non-payment or late payment is due to or caused by the instruction of Owner to Contractor, as provided in Section 4.2.1(c)(ii).

(b) Owner shall administer and pay all sales, use, gross receipts, income, value-added and withholding taxes and duties, and any other similar taxes and/or contributions (including penalties and interest related to such taxes), imposed by any taxing authority: (i) that are measured by Owner's sale of electricity from the Project; and (ii) upon services or labor provided by Owner or any Other Owner Contractors in connection with the

Project (collectively "Owner's Taxes"). Owner shall furnish to the appropriate taxing authorities all required information and reports in connection with all such Owner's Taxes.

(c) To the extent Contractor is legally obligated to pay any of Owner's Taxes, Owner shall: (i) furnish to Contractor all information and reports required to be furnished to the appropriate taxing authorities in connection with all such Owner's Taxes; and (ii) reimburse Contractor for the full amount of such Owner's Taxes paid by Contractor.

4.3 Disputed Invoices. If there is any dispute about any amount invoiced by Contractor, the amount not in dispute shall be promptly paid.

4.4 Retainage.

4.4.1 Retainage. Owner shall withhold, as retainage (the "Retainage") an amount equal to ten percent (10%) of all payments made to Contractor under this Agreement.

4.4.2 Use of Retainage. The Retainage shall be held by Owner as security for the performance of Contractor's obligations hereunder and any interest thereon shall accrue for the account of Owner and not Contractor. The Parties acknowledge that because the Retainage shall constitute security, Owner may utilize the same to, among other things, cure any Contractor Event of Default, offset Delay Liquidated Damages, pay unpaid Contractor suppliers, remove Liens filed by Subcontractors and cover any expenses associated therewith, and/or offset against any other amounts payable by Contractor to Owner under this Agreement.

4.4.3 Release of Retainage. Within fifteen (15) days after the Project Substantial Completion Date, subject to Section 4.5 Owner shall release to Contactor all cash Retainage, except for a cash amount equal to two hundred percent (200%) of the projected costs to complete any remaining items on the Punch Lists, as such cost is reasonably estimated by Owner. Within fifteen (15) days after the Final Completion Date, Owner shall release the remaining cash Retainage (less any amount utilized by Owner to perform any Punch List items).

4.5 Conditions of Payment. Contractor's right to receive any payment to be paid to it hereunder is conditioned upon its submitting a Request for Payment to Owner in the form set forth as Exhibit B-2, which shall be based upon completion for milestones in the Schedule of Values and an updated projection of the amount of anticipated monthly Requests for Payment for the remainder of the project duration. With each such Request for Payment, Contractor will submit evidence reasonably acceptable to Owner of performance of the Work for which payment is sought that demonstrates the claimed completion of milestones in the Schedule of Values, and written waivers and releases in the form of Exhibit O-1, Exhibit O-2, Exhibit O-3 and Exhibit O-4 (as applicable) duly executed by Contractor and all Major Subcontractors. Within forty five (45) Days after its receipt of a Request for Payment, provided Contractor has satisfied the foregoing conditions, Owner shall pay to Contractor the amount that remains after the deduction from the amount requested in the applicable Request for Payment of the following amounts: (a) any portion thereof that Owner in good faith disputes as not being due and owing, (b) any overpayment made by Owner for any previous period, (c) any Delay Liquidated Damages payable by Contractor, (d) any amounts withheld pursuant to Sections 4.6 and 4.8 and (e) any costs incurred by Owner in enforcing any provision hereof (including attorneys' and other

consultants' fees) regardless of whether such provisions expressly provide for withholding or set-off. Contractor may only submit one (1) Request for Payment per calendar month.

4.6 Deductions from Payments. Notwithstanding any other provision to the contrary contained herein, Owner may withhold and shall have no obligation to make payments to Contractor hereunder and Owner may decide not to certify payment or may nullify the whole or a part of a certification for payment made pursuant to a previous Request for Payment to such extent as may be reasonably necessary to protect Owner from loss because of (a) Defects in the Work not timely remedied; (b) third-party claims filed against Owner, (c) Liens filed (that have not been bonded off as described in Section 2.9 or are not covered by insurance maintained hereunder); (d) failure of Contractor to make undisputed payments when due to Subcontractors; (e) damage to Owner or another contractor, including damage to the property of Owner or any of its Affiliates, to the extent the costs of such damages are not covered by insurance maintained hereunder; (f) damages caused by Contractor or its Personnel; or (g) Contractor's failure to deliver a recovery plan as set forth in Section 2.6.3 or the failure of Contractor to diligently proceed with the recovery plan. Contractor shall not have any rights of termination or suspension hereunder as a result of Owner's exercise or attempted exercise of its rights under this Section 4.6 Owner shall release payments withheld pursuant to this Section 4.6 within thirty (30) days from the date when Contractor cures all such events or breaches to the reasonable satisfaction of Owner.

4.7 Effect of Payment. Payment of the Contract Price shall not constitute Owner's approval of any portion of the Project or the Work which has been determined not to be, or subsequently is determined not to have been, performed in accordance with the requirements of this Agreement.

4.8 Set off. Owner may deduct and set off against any part of the balance due or to become due to Contractor under this Agreement or against any Retainage (a) any Liquidated Damages due or accrued but not paid from Contractor to Owner hereunder that are not then the subject of dispute resolution under Section 14.2, or (b) any other amounts that are due from Contractor to Owner under or in connection with this Agreement.

4.9 No Payment if Default. Notwithstanding any other provision to the contrary contained herein, Owner shall have no obligation to make any payment to Contractor at any time when a Contractor Event of Default has occurred and is continuing.

4.10 Interest. Any sums not timely paid shall accrue interest at Prime Rate plus two percent (2%) from the date due until paid.

ARTICLE V

OWNER RESPONSIBILITIES

In addition to Owner's other duties and responsibilities under and pursuant to this Agreement, Owner shall have the following general obligations and responsibilities:

5.1 Project Site Access. As required by Project Schedule, Owner shall provide access to the Project Site to Contractor, Subcontractors and their Personnel as necessary to perform the Work.

5.2 Permits. Owner shall, with Contractor's reasonable assistance, timely obtain and maintain, at its own cost and expense, all Owner Permits, copies of which shall be delivered to Contractor upon its request. In addition, Owner shall execute such applications as Contractor may reasonably request in connection with obtaining any of Contractor Permits.

ARTICLE VI

STAGES OF COMPLETION OF THE WORK

6.1 Work Completion. Contractor shall complete the Work in strict compliance with the Project Schedule (Exhibit C-1) and shall certify completion of such portions of the work in accordance with the process required in Exhibit Q (Form of Work Completion Certificates).

6.1.1 Commencement of Construction Liquidated Damages. Owner and Contractor acknowledge and agree that any failure of Contractor to Commence Construction (as such term is defined in the US Tax Code) to occur on or before _____will directly cause substantial damage to Owner, which damage cannot be ascertained with reasonable certainty. Thus, if such failure occurs, Contractor shall pay to Owner, as liquidated and agreed damages and not as a penalty, the following amounts (collectively, "Commencement of Construction Liquidated Damages") ***[To be discussed depending on technology and Bidder's tax credit assumptions.]***

6.1.2 Substantial Completion Delay Liquidated Damages. Owner and Contractor acknowledge and agree that any failure of Contractor to cause Project Substantial Completion to occur by the applicable Guaranteed Substantial Completion Date will directly cause substantial damage to Owner, which damage cannot be ascertained with reasonable certainty. Thus, if such failure occurs, Contractor shall pay to Owner, as liquidated and agreed damages and not as a penalty, the following amounts (collectively, "Substantial Completion Liquidated Damages"):

Days that Project Substantial Completion is Delayed Beyond Guaranteed Substantial Completion Date	**Substantial Completion Liquidated Damages**
Day 1 to Day ___	$_____ per Day
Day ___ and beyond.	$_____ per Day

6.1.1Contractor shall not be relieved from the obligation to meet the Guaranteed Substantial Completion Dates except to the extent any such date is extended pursuant to a Change Order or a written notice from Owner.

6.2 Project Mechanical Completion. ***[Definition to be determined by Bidder's technology, Certificate of Mechanical Completion and Mechanical Completion Checklist in Exhibits.]***

6.3 Project Substantial Completion.

6.3.1 Conditions of Project Substantial Completion. "Project Substantial Completion" shall be achieved when each of the following conditions has been satisfied:

(a) all Equipment comprising the Project has been installed as required;

(b) the Project has been connected to and synchronized with the Grid, and is capable of operating as a fully-integrated electricity generating plant that safely and continuously generates electric power in accordance with the requirements of all Applicable Laws and this Agreement;

(c) Contractor and Owner have agreed upon the Final Punch List for all Work, as described in Section 6.7.1(d);

(d) Contractor has fully completed all Work (including all Work on or comprising all remaining Project for the Project), except those items on the agreed upon the Final Punch List;

(e) any Defects found have been corrected;

(f) Contractor (i) has demonstrated through Performance Testing in accordance with Exhibit C-4 that the Project has achieved the Performance Guarantee, or (ii) has demonstrated through Performance Testing results in accordance with Exhibit C-4 that the Project has not achieved the Performance Guarantee and that Contractor has paid all applicable Performance Liquidated Damages accordance with Exhibit C-5.

(g) Contractor has provided Owner with copies of all Contractor Permits;

(h) all Spare Parts requested by Owner under Section 2.4.9 have been delivered by Contractor to the Project Site in accordance with Section 2.4.9; provided that any Spare Parts requested by Owner within two (2) weeks prior to the date of submittal of the Project Substantial Completion Certificate which have not been delivered by such date will be added to the Final Punch List;

(i) Contractor has paid all Delay Liquidated Damages due under this Agreement, if any;

(j) Contractor has delivered to Owner copies of all test reports and electrical schematics related to the Work;

(k) Contractor has delivered draft copies of the Operating Manual and Job Books in accordance with Sections 2.4.10(b) and (e);

(l) Contractor has delivered to Owner all interim progress payment or final, as the case may be, waivers of mechanic's and materialman's Liens from all Subcontractors for Work completed through such date; and

(m) Owner has confirmed or is deemed to have confirmed in writing that the conditions set forth hereinabove have occurred, pursuant to Section 6.6.2.

6.3.2 Confirmation of Project Substantial Completion. When Contractor believes it has satisfied all of the requirements for Project Substantial Completion, Contractor shall notify Owner in writing. Within five (5) Business Days of receipt of such notice, Owner shall notify Contractor in writing whether Owner agrees that Contractor has fulfilled the requirements of Project Substantial Completion. If Owner believes Contractor has not fulfilled such requirements, Owner shall specify in such notice to Contractor in reasonable detail the reasons that such requirements have not been met. Contractor shall promptly act to correct such deficiencies so as to achieve Project Substantial Completion as soon as practicable. Following any such remedial action, Contractor shall deliver to Owner a new notice and the provisions of this Section 6.6.2 shall apply with respect to such new notice in the same manner as they applied to the original notice. If Owner fails to respond within seven (7) Business Days to the Project Substantial Completion Certificate provided by Contractor, Project Substantial Completion shall be deemed to have been achieved; provided, however, such deemed Project Substantial Completion shall not relieve Contractor from any of its obligations hereunder, including Contractor's obligations to achieve Project Substantial Completion. For all purposes of this Agreement, Project Substantial Completion Date shall be the date the Project Substantial Certificate is ultimately accepted by Owner or, if applicable, deemed accepted by Owner.

6.4 Punch List for Project.

6.4.1 Development of Punch List. Prior to submittal of the initial Project Substantial Completion Certificate, Contractor will prepare and deliver to Owner a written list setting forth all of the items that remain to be performed in order to complete the Work, provided such items of Work on such list shall only be items that are (i) minor in nature, and (ii) not related to the functionality, utility, operation or restoration Work, and (iii) not related to the compliance of any such Work with any Applicable Laws or Applicable Permits. Such list shall also state the proposed time limits within which Contractor will complete each of such remaining Work items. Upon its receipt of such list, Owner will reasonably review the same and notify Contractor of any proposed revisions thereto. Owner's Project Manager and Contractor's Project Manager will then meet and consult in good faith to agree upon the definitive, final version of such list (including the approved time limits within which Contractor will perform such remaining Work items) (such final list, as agreed to by Owner, the "Final Punch List").

6.4.2 Completion of Punch List Items. Once any Punch List hereunder is agreed upon, Contractor will promptly begin the items thereon. Contractor's Work on such Punch Lists shall be performed in a manner that does not unreasonably interfere with the commercial

operation of the Project. Owner will provide Contractor with reasonable access to the Project Site so that Contractor may perform the Work on the Punch Lists.

6.5 Final Completion.

6.5.1 Conditions of Final Completion. "Final Completion" will be achieved when each of the following conditions has been met:

(a) Project Substantial Completion has occurred;

(b) Contractor has completed performance of all of the Work, including all Punch List items, except for those items that Owner and Contractor agree are to be completed by Owner (and Contractor has paid all amounts due Owner in connection therewith);

(c) Owner has received a final list and summary of the work performed by all Subcontractors and verification of the payment thereof;

(d) Contractor has provided to Owner all Lien releases as required under Section 4.5 (provided that Contractor's Final Lien Waiver and Release, in substantially the form of Exhibit O-3 attached hereto from Contractor and Subcontractor's Final Lien Waiver and Release in the form of Exhibit O-4 attached hereto from each Major Subcontractor, shall be given concurrently with Final Completion and payment of amounts due by Owner in connection therewith);

(e) all documentation, including data points and redlines, as necessary to accurately reflect the Project as constructed in the As-Built Drawings shall have been delivered to, and accepted by, Owner;

(f) all sets of the final Operating Manuals and final Job Books have been delivered to Owner as required under Section 2.4.10; and

(g) Owner has confirmed or is deemed to have confirmed in writing that the conditions set forth hereinabove have occurred, pursuant to Section 6.8.2.

6.5.2 Confirmation of Final Completion. When Contractor believes that it has satisfied all of the requirements for Final Completion, Contractor shall notify Owner in writing. Within five (5) Business Days of receipt of such notice, Owner shall notify Contractor in writing whether Owner agrees Contractor has fulfilled the requirements of Final Completion. If Owner believes Contractor has not fulfilled such requirements, Owner shall specify in such notice to Contractor in reasonable detail the reasons that such requirements have not been met. Contractor shall promptly act to correct such deficiencies so as to achieve Final Completion as soon as practicable. Following any such remedial action, Contractor shall deliver to Owner a new notice and the provisions of this Section 6.8.2 shall apply with respect to such new notice in the same manner as they applied to the original notice. If Owner fails to respond within five (5) Business Days to the Final Completion Certificate provided by Contractor, Contractor shall provide a second Final Completion Certificate, which will include a reference to the previously provided certificate and a statement to the effect that failure to respond to such second certificate shall result in Final Completion being deemed to have been achieved. If Owner fails to respond to the

second Final Completion Certificate within seven (7) Business Days following receipt of such second certificate, Final Completion shall be deemed to have been achieved; provided, however, such deemed Final Completion shall not relieve Contractor from any of its obligations hereunder, including Contractor's obligations to achieve Final Completion. For all purposes of this Agreement, the date of achievement of Final Completion shall be the date the on which the relevant completion notice accepted by Owner or, if applicable, deemed accepted by Owner.

6.6 Reasonable Amount; Exclusive Remedy. The Parties agree that the sum of the amounts fixed as Construction Commencement Liquidated Damages and Substantial Completion Liquidated Damages ("Delay Liquidated Damages") are fair and reasonable, considering the damages that Owner would sustain in the described event, and that these amounts are agreed upon and fixed as liquidated damages because of the difficulty of ascertaining the exact amount of damages that would be sustained. Except as set forth in Article XII, collection of Delay Liquidated Damages shall constitute Owner's exclusive remedy and Contractor's exclusive liability for Contractor's failure to cause, as applicable, Project Substantial Completion to occur by the Guaranteed Substantial Completion Date, as such date may be extended by any executed Change Order. The foregoing sentence shall not relieve Contractor from its obligations (nor limit Owner's ability to seek other available remedies in connection with Contractor's failure to comply with its obligations) to perform the Work in accordance with this Agreement or from its Warranty or other obligations under this Agreement.

6.6.1 Limitation of Liability for Delay Liquidated Damages. Contractor's aggregate liability for Delay Liquidated Damages shall not exceed an amount equal to _____percent (___%) of the Contract Price.

6.6.2 Offset Rights; Security for Obligations. Owner shall have the right to offset any amounts owing to Owner under this Article VI against payments or other amounts owing to Contractor and to exercise its rights against any security provided by or for the benefit of Contractor, in such order as Owner may elect in its sole discretion.

ARTICLE VII

WARRANTIES

7.1 Warranty Provisions.

7.1.1 Warranty. As the "Warranty," Contractor warrants to Owner that: (a) all Equipment and Spare Parts shall be new, unused and undamaged when installed, (b) all such Equipment, Spare Parts and all Work shall (i) be free from Defects, (ii) conform to all applicable requirements of all Applicable Laws, Applicable Standards and the Agreement and (iii) be in strict compliance with the Scope of Work; (c) the services comprising the Work will be performed with Contractor's best skill and judgment in a good and workmanlike manner; (d) the Work will conform to, and be performed in accordance with, all Applicable Laws, Prudent Industry Practices, and the other terms and requirements of the Agreement; and (e) none of the Work and other services rendered by or through Contractor hereunder, nor the use of the Work by Owner, nor any license granted hereunder, infringes, violates or constitutes a misappropriation of any Intellectual Property Rights.

7.1.2 Warranty Period; Extensions. The Warranty shall commence on the Project Substantial Completion Date and shall continue for a period of _____ (__) years after Project Substantial Completion Date (the "Warranty Period"); *provided, however*, that if any component of the Work is repaired or replaced pursuant to the Warranty Service, then the Warranty Period with respect to such component shall be continued for a period that is the longer of (a) the remainder of the original Warranty Period, or (b) one (1) year from the date of completion of the repair or replacement or re-performance thereupon, *provided*, *further*, that if fifteen percent (15%) or more of any type of component of the Work requires repair or replacement within the Warranty Period, then the Warranty Period for that type of component shall be automatically extended for all such components of that type for an additional one (1) year from the later of (i) the date of expiration of the Warranty Period or (ii) the date of the completion of Warranty Service to correct the failure that caused the percentage of failures to reach fifteen percent (15%). At expiration of the Warranty Period, any unexpired warranties relating to the Work shall be assigned to Owner (and Contractor will promptly execute such documents as may be necessary to cause such assignment to occur).

7.1.3 Correction of Deficiencies. If the Work or Equipment or Spare Part is in breach of any Warranty set forth in this Section 7.1, Contractor shall promptly cure such breach as promptly as practicable upon being given written notice thereof ("Warranty Service"). Owner shall provide Contractor with reasonable access to the Project in order to perform its obligation under this Article VII and the Parties shall schedule such work as necessary so as to minimize disruptions to the operation of the Project. Owner shall have the right to operate and otherwise use the Equipment until such time as Owner deems prudent to suspend such operation or use in order to accommodate Contractor's Warranty Services. If Equipment has been placed in service, Contractor shall perform such Warranty Service as soon as Owner deems it prudent to remove the same from service for any Warranty Service by Contractor; provided that the Warranty Period will continue until Contractor has completed such Warranty Service. Neither payment by Owner, nor any other provision of this Agreement, nor partial or entire use or possession of the Work by Owner shall relieve Contractor of liability with respect to the Warranty contained in this Article VII. Contractor shall bear all costs and expenses directly associated with the Warranty Services, including, all costs of services and equipment and of any necessary disassembly, removal, replacement, transportation, reassembly, reinstallation, and retesting, as well as reworking, repair or replacement of such Work, and reassembly of structures, electrical work, machinery, Equipment, or any other obstruction as necessary to give access to the non-conforming item for correction, and for removal, repair and/or replacement of any damage to other work or property that arises from the breach of Warranty and any applicable insurance deductibles. Upon completion of Warranty Service, all Equipment shall be returned or restored to its proper condition (subject to normal wear and tear), including but not limited to fit alignment, adjustment, operability and finish. If Contractor is obligated to repair, replace or renew any Equipment, item or portion of the Work hereunder, Contractor will undertake a technical analysis of the problem and correct the "root cause" unless Contractor can demonstrate to Owner's reasonable satisfaction that there is no material risk of the reoccurrence of such problem. Contractor's obligations under this Section 7.1 shall not be impaired or otherwise adversely affected by any actual or possible legal obligation or duty of any vendor or Subcontractor to Contractor or Owner. No correction or cure shall be considered complete until Owner has reviewed and accepted such remedial work. So long as Contractor has been notified of a breach of Warranty prior to the end of the Warranty Period, the obligation of Contractor to

provide Warranty Service to correct such noncompliance, Defect or breach of Warranty shall survive the expiration of the Warranty Period.

7.1.4 Conformance of Warranty Service to Warranty. Contractor warrants that all materials incorporated into the Work as part of repairs to and replacements of the Work by Contractor or any Subcontractor, and repairs to and replacements of the Work pursuant to the Warranty Service shall conform to the requirements of this Agreement and the Warranty. Contractor shall perform, at its cost and expense, such tests as Owner may reasonably request to verify that any correction, repair, replacement or re-performance of the Work pursuant to the Warranty Service complies with the requirements of the Warranty.

7.2 Delay. Contractor shall perform the Warranty Service as promptly as reasonably possible after being notified of the noncompliance by Owner, and in any event shall commence performance of the Warranty Service no later than two (2) Business Days after such notice. If, after notification of a Defect or breach of Warranty, Contractor delays past such date in commencing, or shall fail to continue performing or completing, Warranty Service with respect to such Defect or breach of Warranty, Owner may correct such breach of Warranty so that the Work and Equipment comply with the Warranty after giving Contractor three (3) Business Days written notice, and Contractor shall be liable for all reasonable direct costs, charges and expenses incurred by Owner in connection with the same and shall pay the same to Owner upon receipt of invoices with supporting documentation from Owner. Such correction of a breach of Warranty condition shall be deemed to be Warranty Service performed by Contractor and the Warranty Period for such corrected Work shall be extended in accordance with Section 7.1.2. No correction of a Defect or breach of Warranty pursuant to this Section 7.2 shall void the Warranty.

7.3 Subcontractor Warranties. Contractor shall be responsible for enforcing the warranties of all Subcontractors through the Warranty Period unless Owner requests that any such warranties be assigned to it at an earlier date. At the end of the Warranty Period, Contractor will assign to Owner its rights under any and all such Subcontractor warranties that continue past the end of the Warranty Period, including the Major Equipment Warranties. Contractor will secure such assignment from each Subcontractor, and Contractor will deliver to Owner copies of all Subcontracts providing for warranties enforceable by Owner. Contractor will not, and Contractor will ensure that Contractor's Personnel do not, take any action which could release, void, impair or waive any Subcontractor warranties. Contractor shall provide reasonable assistance to Owner without cost to Contractor in connection with the enforcement by Owner of any Subcontractor warranty after such assignment provided those warranties are in are excess of those set forth in Section 7.1.

7.4 Major Equipment Warranties. The following components of the Facility have Equipment warranties from manufacturers or suppliers (the "Major Equipment Warranties"):

7.4.1 [_____], Appendix D-1;

7.4.2 [_____], Appendix D-2;

7.4.3 [_____], Appendix D-3;

7.4.4 [_____], Appendix D-4; and

7.4.5 [_____], Appendix D-5.

7.6 Proprietary Rights. Without limiting any of the provisions of the Agreement and notwithstanding any provision herein to the contrary, if Owner or Contractor is prevented from completing the Work (or any part thereof) in accordance with the Agreement or from the use, operation, repair, maintenance, alteration, expansion, rebuilding or enjoyment of the Work (or any part thereof) as a result of a claim, action or proceeding by any Person for unauthorized disclosure, infringement or use of Intellectual Property Rights arising from Contractor's performance (or that of its Subcontractors) under the Agreement or any Intellectual Property Right or Contractor Deliverable transferred or licensed to Owner hereunder, Contractor shall promptly, but in no event later than thirty (30) days from the date of any action or proceeding, take all actions necessary to remove such impediment, including (a) secure termination of the injunction and procure for Owner or its assigns, as applicable, the right to use such materials, Equipment or Contractor Deliverable in connection with the completion, repair, operation, maintenance, alteration, rebuilding or expansion of the Work without obligation or liability; or (b) replace such materials, Equipment, or Contractor Deliverable, with a non-infringing equivalent, or modify same to become non-infringing, all at Contractor's sole expense, but subject to all the requirements of the Agreement.

7.7 NO IMPLIED WARRANTIES. THE WARRANTIES SET FORTH IN THIS AGREEMENT ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED. THERE ARE NO OTHER WARRANTIES, AGREEMENTS, ORAL OR WRITTEN, OR UNDERSTANDINGS WHICH EXTEND BEYOND THOSE SET FORTH IN THIS AGREEMENT WITH RESPECT TO THE WARRANTED WORK, MATERIALS AND EQUIPMENT. The foregoing sentence is not intended to disclaim any other obligations of Contractor set forth herein.

7.8 Survival of Warranties. The provisions of this Article VII shall survive the expiration or termination of this Agreement.

ARTICLE VIII

FORCE MAJEURE; OWNER-CAUSED DELAYS

8.1 Force Majeure.

8.1.1 Notice. If a Party believes that an event constituting a Force Majeure Event has occurred that has or will prevent or delay the performance of its obligations under this Contract, then such Party shall give the other Party written or electronic notice within ten (10) Days after the Party became aware of such event (the "Force Majeure Notice"). The Force Majeure Notice need only be given to the other Party's on-site manager or supervisor (Owner's Project Manager), but shall be in writing or via email. Within thirty (30) Days after the Force Majeure Notice, the Party claiming a Force Majeure shall, to the extent practicable; (i) specify the length of the delay occasioned by, and additional costs incurred by reason of such Force

Majeure Event; (ii) describe the particulars of the cause and nature of the Force Majeure Event; and (iii) provide evidence of the occurrence of such Force Majeure Event. At all times after the Force Majeure Notice, the affected Party shall continue to furnish timely regular reports with respect thereto during the continuation of the Force Majeure Event.

8.1.2 Excuse of Non-Performance. So long as the conditions set forth in this Section 8.1.2 are satisfied, except with regard to payment obligations, neither Party shall be responsible or liable for or deemed in breach of this Agreement because of any failure or delay in complying with its obligations under or pursuant to the Agreement to the extent that such failure has been caused, or contributed to, by one or more Force Majeure Events or its effects or by any combination thereof; provided that in such event:

(a) any liability of either Party which arose before the occurrence of the Force Majeure Event causing the suspension of performance shall not be excused as a result of the occurrence;

(b) the affected Party shall continually exercise all commercially reasonable efforts to alleviate and mitigate the cause and effect of such Force Majeure Event, remedy its inability to perform, and limit damages to the other Party;

(c) the affected Party shall use all reasonable efforts to continue to perform its obligations hereunder and to correct or cure the event or condition excusing performance; and

(d) when the affected Party is able to resume performance of the affected obligations under the Agreement, that Party shall give the other Party written notice to that effect, and the affected Party promptly shall resume performance under the Agreement, provided that in the event that a Force Majeure Event causes a prolonged delay to the Project, Owner may elect to terminate this Agreement pursuant to Section 12.3.

8.1.3 Change Order Rights. If Contractor desires a Change Order for a Force Majeure Event, Contractor shall comply with the Force Majeure Notice requirements contained in Section 8.1.1. If Contractor does so, it will be entitled to a Change Order to the extent so provided in Section 9.5.1(a). If Contractor fails to comply with such notice requirements, then Contractor will be deemed to have waived its right to receive a Change Order for the subject Force Majeure Event.

8.1.4 Burden of Proof. The burden of proof as to whether a Force Majeure Event has occurred and whether the Force Majeure Event excuses a Party from performance under this Section 8.1 shall be upon the Party claiming such Force Majeure Event.

8.2 Owner-Caused Delay.

8.2.1 Nature of Owner-Caused Delays. Without limiting the definition of Owner-Caused-Delays, notwithstanding anything in this Agreement to the contrary, in any case where this Agreement states that Owner "shall cause" the Other Owner Contractors to take or not to take a certain action, the Parties agree that if the Owner fails to meet that obligation, such failure shall exclusively constitute an Owner-Caused Delay and shall not constitute an Owner

Event of Default, and Contractor's sole and exclusive remedies as a result thereof will be as set forth in this Section 8.2 and Section 9.5.1(c).

8.2.2 Notice. If Contractor believes an Owner-Caused Delay has occurred, then Contractor shall give Owner's Project Manager written or electronic notice describing the alleged Owner-Caused Delay within ten (10) Days following the date on which Contractor became aware of the occurrence of an event Contractor believes is or may be an Owner-Caused Delay and Contractor's notice shall describe the details of the Owner-Caused Delay and any effects on Contractor's performance of its obligations under this Agreement.

8.2.3 Excuse of Non-Performance. So long as the conditions set forth in this Section 8.2 are satisfied, Contractor shall not be responsible or liable for or deemed in breach of the Agreement because of any failure or delay in completing the Work in accordance with the Project Schedule or achieving any Key Milestone to the extent that such failure has been caused by one or more Owner-Caused Delays, provided that: (a) such suspension of performance and extension of time shall be of no greater scope and of no longer duration than is required by the effects of the Owner-Caused Delay; (b) Contractor provides timely notice of the Owner-Caused Delay, and (c) Contractor provides all assistance reasonably requested by Owner, at Owner's cost, for the elimination or mitigation of the Owner-Caused Delay.

8.2.4 Change Order Rights. If Contractor desires a Change Order for an Owner-Caused Delay, Contractor shall comply with the notice requirements contained in Section 8.2.2. If Contractor does so, it will be entitled to a Change Order to the extent so provided in Section 9.5.1(c). If Contractor fails to comply with such notification requirements, Contractor will be deemed to have waived its right to receive a Change Order for the subject Owner-Caused Delay.

8.3 No Effect on Obligation to Pay Delay Liquidated Damages. Adjustments to the Project Schedule (including the Guaranteed Substantial Completion Date) may occur as a result of any of the events described in this Article VIII. Unless dates for performance are adjusted by an executed Change Order, the obligation to pay Delay Liquidated Damages on the Guaranteed Substantial Completion Date shall not be affected.

ARTICLE IX

CHANGES

9.1 Changes. Except to the extent provided in this Article IX, there shall be no change to the Work, the Contract Price or the Project Schedule except to the extent provided in a written instrument signed by Owner and Contractor (a "Change Order") stating their mutual agreement upon all of the following: (a) a change in the Work, if any; (b) the amount of the adjustment in the Contract Price, if any; and (c) the extent of the adjustment in the Project Schedule, if any (any of the foregoing, a "Change").

9.2 Changes at Owner's Request. Owner may, from time to time, without invalidating this Agreement, order or approve by notification in writing to Contractor (a) Changes in all or a portion of the Work and/or (b) acceleration of the Work, including to recover from delays caused by an Owner-Caused Delay, a Force Majeure Event or suspension of the

Work by Owner in accordance with Section 12.6. Contractor shall review and consider any request from Owner for such a Change and shall make a written response thereto within seven (7) days after receiving such request. If giving effect to any Change so requested by Owner will increase or decrease its cost of performing the Work, shorten or lengthen the time needed for completion of the Work, require modification of its warranties in Article VII or require a modification of any other provisions of the Agreement, the Parties shall agree to issue Change Order adjusting the Contract Price upwards or downwards and the Project Schedule accordingly (including any amendments to the Agreement). Each Change Order shall constitute a final settlement of all items covered therein, including any compensation for impact on, or delay or acceleration in, performing the Work.

9.3 No Unapproved Changes. Contractor shall not perform any Changes to the Work until Owner has approved in writing the proposed adjustments or has expressly authorized Contractor in writing to perform the Change prior to such approval. If Owner does not approve the proposed adjustments and Contractor and Owner are unable mutually to agree upon alternative adjustments, Owner may by written notice to Contractor cancel the Change. Upon receiving from Owner a written approval or written authorization to perform, Contractor shall diligently perform the Change in accordance with and subject to all of the terms of this Agreement. Contractor shall not suspend, in whole or in part, performance of this Agreement during any Dispute over any Change Order unless directed to do so by Owner, and if directed to proceed with a Change or disputed item pending review and agreement upon adjustments, Contractor shall (without waiving any rights with respect to such Change or disputed item) do so.

9.4 Changes Initiated by Contractor. Promptly after Contractor becomes aware of any circumstances which Contractor has reason to believe may necessitate a Change, Contractor will issue to Owner a "Change Order Request". All Change Order Requests shall include documentation sufficient to enable Owner to determine: (a) the factors necessitating the possibility of a Change; (b) the impact which the Change is likely to have on the Contract Price; (c) the impact which the Change is likely to have on the timely achievement of the activities set forth in the Project Schedule (including the Guaranteed Substantial Completion Dates); and (d) such other information which Owner may request in connection with such Change. Owner may, but except as provided in Section 9.5 below, shall not be obligated to, issue a Change Order pursuant to a Change Order Request.

9.5 Required Change Orders.

9.5.1 Contractor Right to Change Orders. Provided that Contractor has notified Owner as required and has used all reasonable efforts to avoid and mitigate any potential delays to the Project Schedule and/or increased Direct Costs resulting from such events, Contractor will, to the extent described in Sections 9.5.2 and 9.5.3, be entitled to receive Change Orders as and for the events described in this Section 9.5.1.

(a) Change Order Due to Force Majeure Event. Subject to Sections 8.1, and 9.5.1, if and to the extent that a Force Majeure Event causes Contractor to suffer a delay in its performance of the Work, Owner will issue a Change Order extending the Project Schedule to the extent required under Section 9.5.2. Subject to Sections 9.5.1, 8.1, and 13.3, in the event one or more Force Majeure Events occurring at the Project Site, directly cause delays in the

Work exceeding thirty (30) days in the aggregate, Owner will, via Change Order, increase the Contract Price to the extent required under Section 9.5.3. Such Change Orders shall be Contractor's sole and exclusive remedy for any increased costs associated with delays caused by any Force Majeure events, and Contractor will not be entitled to any additional payment, damages and/or costs or other compensation in connection with any such delays.

(b) Change Order Due to Suspension of Work by Owner. Subject to Section 9.5.1, if after the Effective Date Owner suspends the Work pursuant to the provisions of Section 12.6, then: (A) Owner shall issue a Change Order extending the Project Schedule to the extent required under Section 9.5.2; and (B) to the extent that such suspension increases Contractor's Direct Costs in performing the Work, Owner will, via Change Order, increase the Contract Price to the extent required under Section 9.5.3. Such Change Order shall be Contractor's sole and exclusive remedy for any increased costs and delays resulting from such suspension of Work by Owner, and Contractor will not be entitled to any additional payment, damages or other compensation in connection with any such delays.

(c) Change Order Due to Owner-Caused Delay. Subject to Section 9.5.1 and Section 8.2, (i) if and to the extent that an Owner-Caused Delay causes Contractor to suffer a delay in the performance of the Work, Owner will issue a Change Order extending the Project Schedule to the extent required under Section 9.5.2, and (ii) if and to the extent that such Owner-Caused Delay increases Contractor's Direct Costs in performing the Work, Owner will, via Change Order, increase the Contract Price to the extent required under Section 9.5.3. Such Change Order(s) shall be Contractor's sole and exclusive remedy for any delays and increased costs resulting from an Owner-Caused Delay, and Contractor will not be entitled to any payment, damages or other compensation in connection with any such delays or increased costs.

(d) Change Order Due to Unforeseen Subsurface Condition. Subject to Section 9.5.1 and Section 2.4.1(b), (i) if and to the extent that an Unforeseen Subsurface Condition causes Contractor to suffer a delay in the performance of the Work, Owner will issue a Change Order extending the Project Schedule to the extent required under Section 9.5.2, and (ii) if and to the extent that such Unforeseen Subsurface Condition increases Contractor's Direct Costs in performing the Work, Owner shall, via Change Order, increase the Contract Price to the extent required under Section 9.5.3. Such Change Order(s) shall be Contractor's sole and exclusive remedy for any delays and increased costs resulting from an Unforeseen Subsurface Condition, and Contractor will not be entitled to any payment, damages or other compensation in connection with any such delays or increased costs.

(e) Change Order Due to Pre-Existing Hazardous Materials. Subject to Section 9.5.1, if and to the extent that Contractor discovers any Pre-Existing Hazardous Material that has been stored, released or disposed of at the Project Site, and, as required under Section 2.7, Contractor stops performance of the Work in that area, then, once such Work is re-commenced, Owner will issue a Change Order extending the Project Schedule to the extent required under Section 9.5.2. Subject to Section 9.5.1, if and to the extent that such cessation of Work increases Contractor's Direct Costs in performing the Work, Owner shall, via Change Order, increase the Contract Price to the extent required under Section 9.5.3. Such Change Order(s) shall be Contractor's sole and exclusive remedy for any delays and increased costs

resulting from any such cessation of the Work, and Contractor will not be entitled to any payment, damages or other compensation in connection with any such delays or increased costs.

9.5.2 Changes Involving Schedule Extensions. To the extent that Contractor demonstrates that an event for which it is entitled to a Change as described in Section 9.5.1 is the sole cause of critical path delay to Contractor's ability to perform the Work despite Contractor's use of reasonable efforts to mitigate and avoid any such delay, Owner shall issue a Change Order to extend the dates in the Project Schedule as necessary to accommodate such delay. Contractor's demonstration of the impact on the critical path of the Work must be made on a basis that analyzes the actual impacts of the given event on the then-current schedule for completion of the Work. In no event will Contractor be entitled to an extension of time under this Section 9.5.2 to the extent that the performance of the Work for which the extension is sought would have been suspended, delayed or interrupted by the concurrent fault, actions or omissions of Contractor.

9.5.3 Changes to the Contract Price.

(a) Except as set forth in Section 9.5.3(b), with respect to any Change Order required to be issued to increase the Contract Price as a result of an event described in Section 9.5.1, unless the Parties agree otherwise in writing, such Change Order will, on a retrospective basis, increase the Contract Price by an amount equal to the Direct Costs incurred by Contractor solely in connection with such event, plus a mark-up. The mark-up is not to exceed _____ percent (__%) in the aggregate, including all Subcontractor and Contractor mark-ups solely in connection with such Change.

(b) In no event will Contractor be entitled to payment for Direct Costs hereunder to the extent that such costs would have occurred notwithstanding such event, due to the concurrent fault, actions or omissions of Contractor or its Subcontractors.

(c) For purposes hereof, "Direct Costs" shall mean only the actual costs that are directly incurred by Contractor as a result of the event giving rise to the Change Order for the following items: (i) compensation for labor utilized and in the direct employ of Contractor at the Facility Site, at the rates as set forth in Exhibit B-6; (ii) cost of materials and permanent equipment; (iii) payments properly made by Contractor to Subcontractors; (iv) rental charges of necessary machinery and equipment (but excluding hand tools) used at the Project Site; (v) Permit fees; (vi) compensation of engineers or other design professionals employed directly by Contractor; and (vii) reasonable costs of mobilization and/or demobilization. Notwithstanding the foregoing, "Direct Costs" shall not include (t) salaries or other compensation (including costs of contributions, assessments, fringe benefits or taxes based on salaries or compensation) of Contractor's Personnel at Contractor's principal office and branch offices (except as provided in the previous sentence); (u) expenses of Contractor's principal and branch offices; (v) Contractor's profit, overhead or general expenses of any kind; (w) any replacement, repair or other costs or liabilities arising from any loss of or damage to any equipment, tools or other property owned or used by Contractor or its Subcontractors; (x) costs to correct or reperform any components of such Work as a result of the acts or omissions of Contractor or its Personnel; (y) any fines or penalties assessed against Contractor or its Personnel in connection with such Work that were assessed due to the fault of Contractor or its Personnel;

(z) any Builder's All Risk deductibles; or (aa) any costs or expenses other than those specifically set forth above as Direct Costs.

9.5.4 Taxes. The Parties acknowledge that the provisions of Section 4.2 will apply to any additional Work covered by any Change Order.

9.5.5 Offsets. If Owner so requests, Contractor will in good faith work with Owner to enable a reduction in any required schedule extension hereunder via a Change Order directing and paying for achievable acceleration.

ARTICLE X

INDEMNIFICATION

10.1 Indemnities.

10.1.1 Contractor's General Indemnity. Contractor shall defend, indemnify, reimburse and hold harmless, Owner, the financing parties and each of their subsidiaries and Affiliates, and the directors, officers, agents, employees, successors and assigns of each of them, and the owners of the real property comprising the Project Site (each of the foregoing, an "Owner Indemnified Party") from and against any and all losses, costs, damages, injuries, liabilities, claims, demands, penalties, assessments, interest and causes of action, expenses, including reasonable attorney's fees, incurred by or asserted against any Owner Indemnified Party as a result of any and all of the following:

(a) any bodily injury, death or damage to property caused by any negligent act or omission (including strict liability) or willful misconduct relating to or arising out of the performance of the Work or any curative action under any warranty related to the Work, following performance of the Work by Contractor or any Affiliate thereof, any Subcontractor, or anyone directly or indirectly employed by any of them, or anyone for whose acts such Person may be liable;

(b) any claims resulting from bodily injury, death or property damage arising out of Defects or breach of Warranty;

(c) claims by any Government Authority for any Contractor's Taxes;

(d) any pollution or contamination that may originate from sources in Contractor's or its Subcontractors' possession, use and control or caused by the negligence of Contractor, any Subcontractor or anyone directly or indirectly employed by any of them, or anyone for whose acts such Person may be liable (including as a result of the negligent release of Pre-Existing Hazardous Materials, the negligent exacerbation of Pre-Existing Hazardous Materials or negligent rendering of removal or remediation of Pre-Existing Hazardous Material more costly), including from Hazardous Material, industrial hazards, bilge and garbage;

(e) any Lien on the Work, Equipment, the Project, the Project Site, or any fixtures or personal property included in the Work (whether or not any such Lien is valid or enforceable) to the extent Owner has paid all amounts due relating to the Work that is the subject

of such Lien, created by, through or under, or as a result of any act or omission (or alleged act or omission) of, Contractor or any Subcontractor or other Person providing services, equipment or materials in connection with the Work;

(f) any claim, action or proceeding by any Person for unauthorized disclosure, infringement or use of any Intellectual Property Right arising from or related to (i) Contractor's performance (or that of its Affiliates, Subcontractors) under the Agreement, (ii) the design, construction, use, operation or ownership of the Work (including the Equipment, Contractor Deliverables or any portion of any of them), or (iii) Owner's use of any license granted hereunder. Without limiting the provisions of Section 7.4, if Owner is enjoined from completing the Project or any part thereof, or from the use, operation or enjoyment of the Project or any part thereof, as a result of such claim or legal action or any litigation based thereon, Contractor shall, in addition to its indemnification obligations hereunder, promptly use commercially reasonable efforts to have such injunction removed at no cost to Owner. Contractor shall timely notify Owner in writing of any claims which Contractor may receive alleging infringement of patents or other proprietary rights that may affect Contractor's performance of the Work, provided that in the event that such efforts are not effective within a period of sixty (60) days after the imposition of such injunction, Owner may take such steps as may be necessary to remove the injunction, including obtaining any necessary license, at Contractor's sole expense;

(g) any cancellation or invalidation of any insurance policy or part thereof procured under Article XI as a result of Contractor's failure to comply with any of the requirements set forth in such policy or any other act by Contractor or any Subcontractor (but only to the extent Contractor knows the requirements and they are attached hereto);

(h) any failure of Contractor to comply with, or failure of the Work to comply with, or be capable of operating in compliance with, Applicable Laws, the conditions or provisions of Applicable Permits, Prudent Industry Practices, any applicable Real Property Requirements; or

(i) any claims with respect to employer's liability or worker's compensation filed by any employee of Contractor or any of its Subcontractors, except to the extent caused by the negligent acts or omissions of Owner, Equipment Provider or Other Owner Contractors.

10.1.2 Owner's Indemnity. Owner shall defend, indemnify and hold harmless, Contractor and its directors, officers, agents, employees, successors and assigns from and against any and all losses, costs, damages, injuries, liabilities, claims, demands, penalties, assessments, interest and causes of action, expenses, including reasonable attorney's fees, incurred by or asserted against any such Person (a) as a result of the injury or death of any Person, including employees of Owner, Contractor or any Person employed by any of them for whose acts any of them may be liable, but only to the extent caused by Owner's negligent acts or omissions, (b) as a result of any loss of or damage to property, but only to the extent caused by from Owner's negligent acts or omissions, (c) any claims by any Governmental Authority for any Owner Taxes or for any claims directly arising from following Owner's direction to seek exemptions or rebates for certain taxes as described in Section 4.2.1(b); or (d) as a result of any release of a Pre-

Existing Hazardous Material, except to the extent Contractor has an indemnification obligation with respect thereto pursuant to Section 10.1.1.

10.2 Indemnification Procedure.

10.2.1 Notice of Proceedings. The Person claiming to be indemnified under the terms of this Article X (the "Indemnified Person") shall give the Party from which indemnification is sought (the "Indemnifying Party") written notice of commencement of any legal action or of any claims against such Indemnified Person in respect of which indemnification will be sought, together with a copy of such claim, process or other legal pleading. Failure of the Indemnified Person to give such notice will not reduce or relieve the Indemnifying Party of liability hereunder unless and to the extent that the Indemnifying Party was precluded from defending such claim, action, suit or proceeding as a result of the failure of the Indemnified Person to give such notice. In any event, the failure to so notify shall not relieve the Indemnifying Party from any liability that it may have to the Indemnified Person otherwise than under this Article X.

10.2.1 Conduct of Proceedings. Each Party and each other Indemnified Person shall have the right, but not the obligation, to contest, defend and litigate any claim, action, suit or proceeding by any third party alleged or asserted against it arising out of any matter in respect of which it is entitled to be indemnified hereunder and the reasonable costs and expenses thereof (including reasonable attorneys' fees and expert witness fees) shall be subject to the said indemnity; provided that the Indemnifying Party shall be entitled, at its option, to assume and control the defense of such claim, action, suit or proceeding at its expense upon its giving written notice thereof to the Indemnified Person, and such Indemnifying Party shall conduct with due diligence and in good faith the defense of any claim against such party, whether or not the Indemnifying Party shall be joined therein, and the Indemnified Person shall cooperate with the Indemnifying Party in such defense. The Indemnified Person may elect to participate through separate counsel in the defense of any such claim, but the fees and expenses of such counsel shall be at the expense of such Indemnified Person unless (a) there exists a material conflict of interest between the Indemnifying Party and such Indemnified Person in the conduct of the defense of such claim or (b) the Indemnifying Party did not employ counsel to assume the defense of such claim within a reasonable time after notice of the commencement thereof or (c) the Indemnified Person reasonably concludes and specifically notifies the Indemnifying Party that there may be specific defenses available to it which are different from or additional to those available to the Indemnifying Party. In each of such cases the Indemnifying Party shall not have the right to control the defense or settlement of such claim and the reasonable fees and expenses of counsel engaged by the Indemnified Person shall be at the expense of the Indemnifying Party. Indemnifying Party shall give prompt written notice to Indemnified Person of any proposed settlement of a Indemnified Claim. Indemnifying Party may not, without Indemnified Person's prior written consent, settle or compromise any claim or consent to the entry of any judgment regarding which indemnification is being sought hereunder unless such settlement, compromise or consent (i) includes an unconditional release of Indemnified Person from all liability arising out of such claim, (ii) does not contain any admission or statement suggesting any wrongdoing or liability on behalf of Indemnified Person, and (iii) does not contain any equitable order, judgment or term (other than the fact of payment or the amount of such payment) that in any

manner affects, restrains or interferes with the business of Indemnified Person or any of its Affiliates.

10.2.2 Contributory Negligence. If the joint, concurring, comparative or contributory fault or negligence of the Parties gives rise to damages for which the Parties are entitled to indemnification under this Article X, then such damages shall be allocated between the Parties in proportion to their respective degrees of fault or negligence contributing to such damages.

10.2.3 Survival of Indemnities. The indemnities set forth in this Article X shall survive the termination or expiration of this Agreement.

ARTICLE XI

INSURANCE

From the first to occur of the LNTP Date or the Notice to Proceed Date through and including the Final Completion Date, except as otherwise specified, Owner and Contractor shall procure and maintain, or cause to be procured and maintained, the insurance coverages set forth in Exhibit P-1 and identified therein as Owner's or Contractor's responsibility with one or more duly licensed insurance carrier(s).

ARTICLE XII

DEFAULT, TERMINATION AND SUSPENSION

12.1 Contractor Default.

12.1.1 Contractor Events of Default. The occurrence of any one or more of the following events shall constitute an event of default by Contractor hereunder ("Contractor Event of Default"):

(a) any of the following occurs (i) Contractor consents to the appointment of or taking possession by, a receiver, a trustee, custodian, or liquidator of itself or of a substantial part of its assets, or fails or admits in writing its inability to pay its debts as they become due, or makes a general assignment for the benefit of creditors; (ii) Contractor files a voluntary petition in bankruptcy or a voluntary petition or an answer seeking reorganization in a proceeding under any applicable bankruptcy or insolvency laws or an answer admitting the material allegations of a petition filed against it in any such proceeding, or seeks relief by voluntary petition, answer or consent, under the provisions of any now existing or future bankruptcy, insolvency or other similar law providing for the liquidation, reorganization, or winding up of corporations, or providing for an agreement, composition, extension, or adjustment with its creditors; (iii) a substantial part of Contractor's assets is subject to the appointment of a receiver, trustee, liquidator, or custodian by court order and such order shall remain in effect for more than thirty (30) days; or (iv) Contractor is adjudged bankrupt or insolvent, has any property sequestered by court order and such order shall remain in effect for more than thirty (30) days, or has filed against it a petition under any bankruptcy, reorganization,

arrangement, insolvency, readjustment of debt, dissolution or liquidation law of any jurisdiction, whether now or hereafter in effect, and such petition shall not be dismissed within sixty (60) days of such filing;

(b) Contractor fails, for any reason, (i) to pay when due Delay Liquidated Damages as required herein or (ii) to make any other payment or payments required to be made to Owner under the Agreement within ten (10) Business Days after receipt of written notice from Owner of Contractor's failure to make such other payment or payments (except to the extent Contractor disputes such other payment or payments in good faith and in accordance with the terms of this Agreement);

(c) Contractor fails to comply with any material provision of any Applicable Law, Applicable Permit, or applicable Real Property Requirement, the effects of which have not been cured to Owner's reasonable satisfaction within ten (10) Business Days after notice from Owner, provided, if such failure to comply is not capable of being cured within ten (10) Business Days, Contractor shall not be in default so long as Contractor commences to cure within ten (10) Business Days and thereafter diligently proceeds to cure such breach in a manner reasonable satisfactory to Owner;

(d) either of the following occurs: (i) Contractor fails to make payments when due to Subcontractor for services, materials or equipment beyond applicable notice and cure periods, unless such payments are reasonably disputed by Contractor and any Liens relating to such disputed payments are satisfied or bonded off by Contractor; or (ii) Contractor suspends performance of a material portion of the Work resulting in the Work not progressing substantially in accordance with the Project Schedule (other than as permitted under Article VIII or pursuant to a Change Order); and in each instance as described in each of sub-clauses (i) and (ii) of this Section 12.1.1(d), the impacts of such condition remain un-remedied for five calendar days following written notice thereof to Contractor;

(e) any material breach by Contractor of any representation or warranty contained in Article XV, the impacts of which have not been cured to Owner's reasonable satisfaction within ten (10) Business Days after notice from Owner;

(f) Contractor fails to: (i) provide a written recovery plan as required in Section 2.6.3; or (ii) implement the recovery plan in a diligent and timely manner.

(g) Contractor reaches the limitations of Delay Liquidated Damages set forth in Section 6.10.2 before Contractor achieves all of the Key Milestones;

(h) the transfer by Contractor of (i) all or a substantial portion of the rights and/or obligations of Contractor hereunder, except for an assignment permitted hereunder, or (ii) all or a substantial portion of the assets or obligations of Contractor;

(i) any failure by Contractor to maintain the insurance coverages required of it in accordance with Article XI, the impacts of which have not been cured to Owner's reasonable satisfaction within ten (10) Business Days after notice from Owner;

(j) Contractor fails to provide and maintain in effect the ***[Parent Guarantee and/or Payment and Performance Bond]*** as required under Section 2.12 by the date that is three (3) Days after the Effective Date; or

(k) Contractor is in breach of any provision of this Agreement or has failed to perform its obligations under the Agreement (other than those breaches specified in this Section 12.1.1 (a) through (l)) and (i) such breach is not cured by Contractor within thirty (30) days after notice thereof from Owner, or (ii) if such breach is not capable of being cured within such thirty (30) day period, Contractor (A) fails to commence to cure such breach within such thirty (30) day period, or (B) fails to thereafter diligently proceed to cure such breach in a manner reasonably satisfactory to Owner in its sole discretion.

12.1.2 Termination for Cause. Upon the occurrence and during the continuation of any Contractor Event of Default hereunder, Owner, in addition to its right to pursue any other remedy given under this Agreement or now or hereafter existing at law or in equity or otherwise, shall have the right to terminate this Agreement by written notice to Contractor (a "Termination for Cause"). A Termination for Cause shall be effective upon delivery of Owner's notice with respect thereto. In the event of a termination by Owner under this Article 12, Owner shall have the right to take possession of and use all Contractor Deliverables and all of the equipment owned by Contractor or an Affiliate and located at the Job Site on the date of such termination for the purpose of completing the Work (provided that Owner will bear the risk of loss or damage to the same thereafter, until turnover back to Contractor or the Affiliate) and may employ any other Person to complete the Work by whatever method that Owner may deem necessary. In addition, Owner may make such expenditures as in Owner's sole judgment will accomplish the timely completion of the Work in accordance with the terms hereof. Owner shall, within a reasonable period of time after the Work is finally completed by the work of one or more replacement contractors, determine the total cost to Owner for completing the Work in accordance with the Scope of Work, and the other requirements of this Agreement, including all sums previously paid or then owed to Contractor pursuant to this Agreement. In contracting with such replacement contractors, Owner shall, to the extent practicable, cause the Work to be completed in accordance with the Agreement and shall employ reasonable efforts to mitigate the costs incurred in connection with completion of the Work. If the Contract Price is less than the sum of (i) all costs and expenses incurred by Owner to engage a substitute contractor to complete (or cure deficiencies in) the Work, including overhead and legal, engineering and other professional expenses, (ii) all other costs, expenses and damages suffered by Owner as a result of a default or breach by Contractor of the requirements of this Agreement and the termination of the of the Agreement as a result thereof, and (iii) all amounts previously paid to Contractor pursuant to this Agreement, Contractor shall pay to Owner on demand the amount of such difference. Any amount owed by Owner to Contractor for the completion of the Work shall be retained by Owner until after completion of the Work and applied by Owner to pay any amounts and damages owed by Contractor pursuant to this Section 12.1.2 or otherwise. Any excess of the amount retained over the amount due under this Section 12.1.2 shall be remitted to Contractor within sixty (60) days after the Final Completion Date.

12.1.3 Other Owner Remedies. Upon the occurrence and during the continuance of a Contractor Event of Default but prior to termination of this Agreement by Owner, Owner may, without prejudice to any of its other rights or remedies, (a) seek performance by any

guarantor or surety of Contractor's obligations hereunder, (b) seek equitable relief to cause Contractor to take action or to refrain from taking action pursuant to this Agreement, or to make restitution of amounts improperly received under this Agreement, (c) make such payments or perform such obligations as are required to cure such Contractor Event of Default, make a claim against any security provided pursuant to this Agreement and/or offset the cost of such payment or performance against payments otherwise due to Contractor under this Agreement, provided that Owner shall be under no obligation to cure any such Contractor Event of Default, or (d) otherwise seek damages, including proceeding against any bond, guarantee, letter of credit, or other security given by or for the benefit of Contractor for its performance under this Agreement.

12.2 Owner Default. Owner's failure to pay to Contractor any required payment that is not in dispute, which failure continues for thirty (30) Days after written notice of failure has been received by Owner from Contractor, shall constitute an event of default by Owner hereunder (an "Owner Event of Default"). Upon any Owner Event of Default, Contractor may terminate this Agreement thirty (30) Days after giving written notice thereof to Owner so long as the amount owed by Owner (other than any amount disputed in accordance with the terms of this Agreement) is not paid within such thirty (30)-day period (a "Contractor Termination for Cause"). In the event of a Contractor Termination for Cause, Contractor shall be entitled to recover an amount equal to the Termination Payment. Unless Contractor terminates this Agreement pursuant to the foregoing provisions, Contractor shall not suspend or delay performance of the Work because of any Owner Event of Default. Contractor shall continue performance of the Work during any dispute over payment, so long as Owner continues to pay all undisputed amounts. Other than as stated above, Contractor will have no right to terminate this Agreement, and Contractor acknowledges that its sole and exclusive remedies for any failure of Owner to comply with its obligations under this Agreement (other than nonpayment as described above) are limited to receipt of a Change Order as described in Section 9.5.

12.3 Termination Without Cause. Owner may for its convenience terminate this Agreement after giving notice to Contractor in which event Contractor shall be entitled to be paid the Termination Payment under Section 12.4. As a condition to any termination by Owner pursuant to this Section 12.3 (a "Termination Without Cause"), Owner must provide written notice to Contractor of the Termination Without Cause at least three (3) Business Days prior to the effective date of such termination. If, at the date of termination under this Section 12.3, Contractor has properly performed services or purchased, prepared or fabricated off the Project Site any materials or Equipment for subsequent incorporation at the Project Site, Owner shall have the option of having such materials or Equipment delivered to the Project Site or to such other place as Owner shall reasonably direct.

12.4 Termination Payment.

12.4.1 Termination Payments Due to Contractor. Upon a termination of this Agreement pursuant to Section 12.2 or Section 12.3 and subject to Owner's rights under Sections 4.6 and 4.8 Contractor shall be entitled to a payment (the "Termination Payment"), which shall equal the sum of the following, without duplication: (a) that portion of the Contract Price that is applicable to Work completed up to the date of termination that has not previously been paid to Contractor (as determined below); (b) the expenses reasonably incurred by Contractor in withdrawing Contractor's Equipment and Personnel from the Project Site and in otherwise

demobilizing plus ten percent (10%) of such expenses; and (c) the expenses reasonably incurred by Contractor in terminating contracts with Subcontractors pertaining to the Work (excluding fees of any Affiliates of Contractor) plus ten percent (10%) of such expenses, except to the extent Owner has instructed Contractor not to terminate such contracts, in which event such contract will be assigned to Owner, subject to Owner's assumption of same and, if required, Owner's adequate assurance to such Subcontractors regarding Owner's ability to pay. The Termination Payment shall not include any costs incurred by Contractor after the date of the event giving rise to such termination that Contractor reasonably could have mitigated. Contractor shall use all reasonable, diligent efforts to mitigate the costs associated with termination of this Agreement, including identifying and pursuing other uses for Equipment or supplies manufactured or obtained pursuant to this Agreement.

12.4.2 Payment of Termination Payment. Contractor shall submit an invoice to Owner for the Termination Payment with the supporting information and documentation of any fees or expenses claimed by Contractor pursuant to Section 12.4.1. Upon review and agreement that such invoice is proper, Owner shall pay such invoice within thirty (30) days after its receipt of same unless it disputes in good faith certain elements thereof, in which event only the undisputed portion of the Termination Payment need be made within such thirty (30) day period; provided, that payments for termination under Section 12.3 shall be due Contractor within thirty (30) days after receipt of a substantiated invoice and Owner's receipt of any and all Equipment and Work under Sections 12.3 and 12.5. As a condition precedent to receiving any Termination Payment, Contractor shall comply with Section 12.5 in its entirety.

12.4.3 Termination Payment Contractor's Sole Remedy. Payment of the Termination Payment shall be the sole and exclusive liability of Owner, and the sole and exclusive remedy of Contractor, with respect to termination of this Agreement under Section 12.2 or Section 12.3, and in such event Owner shall have no further liability to Contractor notwithstanding the actual amount of damages that Contractor may have sustained in connection with such termination. Calculation of the Termination Payment has been agreed upon and fixed hereunder because of the difficulty of ascertaining the exact amount of such damages Contractor will actually sustain in the event of a termination of this Agreement pursuant to Section 12.2 or Section 12.3, and Owner and Contractor agree that the calculation of the Termination Payment is reasonable.

12.5 Actions Required Following Termination.

12.5.1 Discontinuation of Work. Upon termination of this Agreement under Sections 12.1 or 12.3, Owner shall be immediately released from any and all obligations to Contractor (except for Owner's obligation to pay any amount specified in Section 12.4, if applicable), Contractor shall follow Owner's directions for the orderly turnover of the Project Site and the Work, and except as directed by Owner, Contractor shall remove from the Project Site its Personnel, all Contractor's Equipment, waste, rubbish and Hazardous Material brought onto the Project Site by Contractor or its Subcontractors or for which Contractor is otherwise responsible, and Owner shall be entitled to take exclusive possession of the Work, the Project Site, and any and all Equipment (including materials delivered or en route to the Project Site). Contractor immediately shall take such steps as are reasonably necessary to preserve and protect

Work completed and in progress and to protect materials, equipment and supplies at the Project Site, stored off-site, or in transit.

12.5.2 Cancellation and Transfer of Subcontracts and Other Rights. If requested by Owner in the event of termination of this Agreement, Contractor will cancel existing contracts with Subcontractors upon terms as directed by Owner. Any payments to be made to a Subcontractor as a result of any such termination shall be paid by Contractor (subject to Section 12.4, in the event of a termination under Section 12.3). In the event of termination of this Agreement Contractor shall also, as and to the extent requested by Owner, (a) irrevocably assign and deliver to Owner such Subcontracts, purchase orders, bonds, warranties and options made by Contractor in performance of the Work (but in no event shall Owner be liable for any action or default of Contractor occurring prior to such delivery and assignment), (b) provide to Owner without charge a license to use all rights to patented copyrighted, licensed or proprietary materials of Contractor and Subcontractors in connection with the Work, except as otherwise restricted herein, and (c) deliver to Owner originals of the Agreement, originals of all Drawings, to the extent available, Contractor Deliverables in process (except that Contractor may keep for its records copies, and, if sufficient originals exist, an original set, of the Agreement executed by Owner), all other materials relating to the Work, and all papers and documents relating to Applicable Permits, orders placed, bills and invoices, Lien releases and financial management under this Agreement. All deliveries hereunder shall be made free and clear of any Liens, security interests or encumbrances, except such as may be created by Owner. Except as provided herein, no action taken by Owner or Contractor after the termination of this Agreement shall prejudice any other rights or remedies of Owner or Contractor provided by Applicable Laws, the Agreement or otherwise upon such termination. In addition, Contractor shall assist Owner in preparing an inventory of all Equipment in use or in storage at the Project Site, and Contractor shall take such other action as required hereunder upon termination of this Agreement.

12.5.3 Surviving Obligations. This Article XII shall survive the termination or expiration of this Agreement.

12.6 Suspension by Owner for Convenience. Owner may suspend all or a portion of the Work to be performed under the Agreement at any time for any reason in its sole discretion by giving written notice thereof to Contractor. Such suspension shall continue for the period specified in the notice of suspension; provided that Contractor agrees to resume performance of the Work promptly upon receipt of notice from Owner. Upon receiving any such notice of suspension, unless the notice requires otherwise, Contractor shall: (a) immediately discontinue the Work on the date and to the extent specified in the notice; (b) place no further orders or subcontracts for Equipment, services or materials with respect to suspended Work, other than to the extent required in the notice; (c) promptly make every reasonable effort to obtain suspension, with terms satisfactory to Owner, of all orders, subcontracts and rental agreements to the extent they relate to performance of suspended Work; (d) continue to protect and maintain the Work performed, including those portions on which Work has been suspended; and (e) take any other reasonable steps to minimize costs and expenses associated with such suspension. Contractor shall use reasonable commercial efforts to include a suspension for convenience provision with terms similar to the foregoing in all subcontracts. After the conclusion of any suspension hereunder, Contractor will be entitled to a Change Order to the

extent described in Section 9.5.1(b). If a suspension of Work continues for more than one hundred and eighty (180) days in the aggregate, Contractor may terminate this Agreement, which termination shall be deemed a Termination Without Cause.

ARTICLE XIII

TITLE AND RISK OF LOSS

13.1 Title to Project and the Work. Contractor warrants and guarantees that legal title to and ownership of the Work (including all Equipment) shall pass to Owner, free and clear of any and all Liens upon the earlier of (a) payment to Contractor of the portion of the Contract Price attributable to such Work and Equipment, and (b) in the case of Equipment, the delivery of such Equipment to the Project Site; provided that for all Equipment, title shall pass to Owner upon such payment only if title has previously been transferred to Contractor, otherwise, title shall pass to Owner at such time as Contractor has acquired title to the Equipment, but in no event later than delivery of such Equipment to the Project Site.

13.2 Title to Contractor Deliverables. Except as otherwise provided in this Article XIII, title to Contractor Deliverables, specifications and like materials (including the Job Books contents) which are owned by Contractor shall be transferred to Owner upon creation and delivered to Owner upon Project Substantial Completion. In addition, Contractor grants to Owner an irrevocable, royalty free, non-exclusive license to use and reproduce such Contractor Deliverables, specifications and other design documentation to which Contractor does not have title but has the right to grant sub-licenses for the purpose of completing, repairing, operating, maintaining, rebuilding and expanding the Project. Owner shall have the right to assign the benefit of such license to any financing parties in connection with granting a security interest in the Project, to a purchaser in connection with a transfer of the Project, or to any subsequent purchaser or assignee of same. Any such purchaser or assignee shall acquire such license subject to the same terms and restrictions as stated in this Section 13.2. Owner may retain the necessary number of copies of all such documents for purposes of construction, operation, maintenance and repair of the Project. Any costs to register such licenses in the United States shall be paid by Owner.

13.3 Risk of Loss. Notwithstanding passage of title as provided in Section 13.1, from the date hereof until the Project Substantial Completion Date, Contractor hereby assumes the risk of loss for all Equipment upon Delivery and the Work, including: (a) all Work completed on or off the Project Site and (b) all Work in progress. If any loss, damage, theft or destruction occurs to the Work or other items, on or off the Project Site, for which Contractor has so assumed the risk of loss hereunder, Contractor shall, at the option of Owner and at Contractor's cost, promptly repair or replace the property affected thereby. In such event, Contractor shall have access to Owner's Builder's All Risk Policy, provided that in the event of a covered loss, Contractor shall pay any applicable deductible amount. Risk of loss for the Project and the Work shall pass to Owner (excluding Contractor's Equipment and other items to be removed by Contractor, which shall remain the responsibility of Contractor) on the Project Substantial Completion Date, provided, however, Contractor shall continue to be responsible for claims, physical loss or damage to the Work to the extent resulting from Contractor's or its Personnel's negligent acts or omissions, and/or failure to comply with the requirements of the Agreement.

Notwithstanding the foregoing, if Contractor is obligated by the terms of this Agreement to perform additional Work subsequent to the date of completion for such Work, Contractor shall bear the risk of loss and damage with respect to such Work until such additional Work is complete.

ARTICLE XIV

DISPUTE RESOLUTION

14.1 Referral to Senior Management. In the event of any controversy, claim or dispute between the Parties arising out of or related to this Agreement ("Dispute"), the Parties' Project representatives will first attempt to resolve the Dispute informally through negotiation and consultation. If they are unable to do so, then within three (3) Business Days following the date of delivery of a written request by either Party, (i) each Party shall appoint as its representative a senior officer, and (ii) such senior officers shall meet, negotiate and attempt in good faith to resolve the Dispute quickly, informally and inexpensively.

14.2 Mediation. Any Dispute that is not resolved pursuant to Section 14.1 may be submitted for mediation before a single mediation in accordance with the provisions contained herein and in accordance with the Commercial Mediation Procedures of the AAA in effect at the time of the mediation ("AAA Procedures"); provided, however, that in the event of any conflict between the procedures herein and the AAA Procedures the procedures herein shall control. The mediator will be named by mutual agreement of the Parties or by obtaining a list of five (5) qualified Persons from the Parties and alternately striking names. All mediation shall be administered by the AAA. All mediation shall take place in the City of Portland, Oregon, unless otherwise agreed to by the Parties. Each Party shall be required to exchange documents to be used in the mediation not less than five (5) Business Days prior to the mediation. The Parties shall use all commercially reasonable efforts to conclude the mediation as soon as practicable. All aspects of the mediation shall be treated as confidential. Neither the Parties nor any mediator may disclose the content or results of the mediation, except as necessary to comply with legal, audit or regulatory requirements. Before making any such disclosure, a Party shall give written notice to the other Party and shall afford such Party a reasonable opportunity to protect its interests. Each Party shall be responsible for its own expenses and one-half of any mediation expenses incurred to resolve the dispute. The mediator will provide the Parties with a fee and expense schedule in advance of mediation. Mediation will terminate by: (a) written agreement signed by both Parties, (b) determination by the mediator that the Parties are at an unresolvable impasse, or (c) two unexcused absences by either Party from the mediation sessions. The mediator will never participate in any claim or controversy covered by this Article as a witness, collateral contract, or attorney and may not be called as a witness to testify in any proceeding involving the subject matter of mediation. O.R.S. §§ 36.100 to 36.238 will apply to the entire process of mediation.

14.3 Legal Action. If the Parties are still unable to resolve their differences after good faith consideration of a resolution through mediation pursuant to Section 14.2, then each of the Parties hereby irrevocably consents and agrees that any legal action or proceedings with respect to this Agreement may be brought in any of the courts of the State of Oregon located in the City of Portland or the courts of the United States of America for the District of Oregon

having subject matter jurisdiction. By execution and delivery of this Agreement and such other documents executed in connection herewith, each Party hereby (a) accepts the exclusive jurisdiction of the aforesaid courts, (b) irrevocably agrees to be bound by any final judgment (after any and all appeals) of any such court with respect to such documents, (c) irrevocably waives, to the fullest extent permitted by law, any objection it may now or hereafter have to the laying of venue of any action or proceeding with respect to such documents brought in any such court, and further irrevocably waives, to the fullest extent permitted by law, any claim that any such action or proceeding brought in any such court has been brought in any inconvenient forum, (d) agrees that services of process in any such action or proceeding may be effected by mailing a copy thereof by registered or certified mail (or any substantially similar form of mail), postage prepaid, to such Party at its address set forth in Section 16.4, or at such other address of which the Parties have been notified

14.4 Waiver of Jury Trial. EACH PARTY IRREVOCABLY WAIVES, TO THE FULLEST EXTENT PERMITTED BY APPLICABLE LAW, ANY AND ALL RIGHTS TO TRIAL BY JURY IN ANY LEGAL PROCEEDING ARISING OUT OF OR RELATING TO THIS AGREEMENT OR THE TRANSACTIONS CONTEMPLATED HEREBY.

14.5 Attorneys' Fees. If either Party institutes any legal suit, action or proceeding against the other party arising out of or relating to this Agreement, including, but not limited to, contract, equity, tort, fraud and statutory claims, the prevailing party in the suit, action or proceeding will be entitled to receive, in addition to all other remedies to which the prevailing party may be entitled, the costs and expenses incurred by the prevailing party in conducting the suit, action or proceeding, including reasonable attorneys' fees and expenses, court costs and other legal expenses such as expert witness fees, and all fees, taxes, costs and expenses incident to appellate, bankruptcy and post-judgment proceedings

14.6 Survival. The provisions set forth in this Article XIV shall survive the termination or expiration of this Agreement.

ARTICLE XV

REPRESENTATIONS AND WARRANTIES

15.1 Contractor Representations. Contractor represents and warrants the following:

15.1.1 Organization. It is a corporation duly organized, validly existing and in good standing under the laws of the state of its organization, and is duly authorized and qualified to do business in the State where the Project is located, and all other jurisdictions in which the nature of the business conducted by it makes such qualification necessary and where failure to so qualify would have a material adverse effect on its ability to perform any of its obligations under this Agreement.

15.1.2 No Violation of Law; Litigation. It is not in violation of any Applicable Laws or Applicable Permits or judgments entered by any Government Authority which violations, individually or in the aggregate, would affect its performance of any of its obligations

under this Agreement. Except as Contractor has disclosed in writing to the Owner prior to the Effective Date, there are no legal, administrative or arbitration proceedings or actions, controversies, investigations, actions or other proceedings, now pending or (to the best knowledge of Contractor) threatened against Contractor which, if adversely determined, could reasonably be expected to effect on the ability of Contractor to perform any of its obligations under this Agreement. Contractor does not know of any basis for any such proceedings, controversies, actions or investigations.

15.1.3 Licenses. It is the holder of all governmental consents, licenses, permissions and other authorizations and Permits required to operate and conduct its business now and as contemplated by this Agreement.

15.1.4 No Breach. None of the execution, delivery and performance of this Agreement, the consummation of the transactions herein contemplated, or compliance with the terms and provisions hereof, shall conflict with or result in a violation or breach of the terms, conditions or provisions of, or require any consent under, the charter or by-laws of Contractor, or any Applicable Law or regulation, order, writ, injunction, award, judgment or decree of any court, or any agreement, contract, indenture or other instrument to which Contractor is a party or by which it or its assets is bound or to which it or its assets is subject, or constitute a default under any such agreement or instrument.

15.1.5 Corporate Action. It has all necessary power and authority to conduct its business, own its properties and to execute, deliver and perform its obligations under this Agreement; the execution, delivery and performance by Contractor of this Agreement have been duly authorized by all requisite corporate action; and this Agreement has been duly and validly executed and delivered by Contractor and constitutes the legal, valid and binding obligation of Contractor enforceable in accordance with its terms, except as the enforceability thereof may be limited by bankruptcy, insolvency, reorganization or moratorium or other similar laws relating to the enforcement of creditors' rights generally and by general equitable principles.

15.1.6 Experience. It has by itself and through its Subcontractors, full experience and proper qualifications to perform the Work, including to construct the Project and to erect and install the equipment.

15.1.7 Intellectual Property. It owns or has the right to use all Intellectual Property Rights necessary to perform the Work without conflict with the rights of others.

15.1.8 Solvency. It is financially solvent, able to pay its debts as they mature, and possessed of sufficient working capital to complete its obligations under this Agreement.

15.1.9 Certifications. All Persons who will perform any portion of the Work have and will have all business and professional certifications required by Applicable Law to perform their respective services under this Agreement.

15.1.10 Site Access. The access rights granted to or obtained by Contractor to the Project Site are adequate for the performance of the Work and operation of the Project.

15.2 Owner Representations. Owner represents and warrants that:

15.2.1 Organization. It is a _____company duly formed, validly existing and in good standing under the laws of the State of _____, and is duly authorized and qualified to do business in the State where the Project is located and all other jurisdictions in which the nature of the business conducted by it makes such qualification necessary and where failure to so qualify would have a material adverse effect on its ability to perform this Agreement.

15.2.2 No Breach. None of the execution and delivery of this Agreement, the consummation of the transactions herein contemplated, or compliance with the terms and provisions hereof and thereof, conflicts with or will result in a breach of, or require any consent under, the limited liability company agreement of Owner, or any Applicable Law or regulation, order, writ, injunction or decree of any court, or any agreement or instrument to which Owner is a party or by which it is bound or to which it is subject, or constitute a default under any such agreement or instrument.

15.2.3 Corporate Action. It has all necessary power and authority to conduct its business, own its properties and to execute, deliver and perform its obligations under this Agreement; the execution, delivery and performance by Owner of this Agreement have been duly authorized by all requisite limited liability company action; and this Agreement has been duly and validly executed and delivered by Owner and constitutes the legal, valid and binding obligation of Owner enforceable in accordance with its terms, except as the enforceability thereof may be limited by bankruptcy, insolvency, reorganization or moratorium or other similar laws relating to the enforcement of creditors' rights generally and by general equitable principles.

15.3 Survival of Representations and Warranties. The representations and warranties of Contractor herein shall survive execution and termination of this Agreement.

ARTICLE XVI

MISCELLANEOUS PROVISIONS

16.1 Confidentiality and Publicity.

16.1.1 Confidential Information and Permitted Disclosures. Each Party shall hold in confidence (a) any information provided or supplied by the other Party or its Personnel that is marked to be confidential, including such information as may have been provided or supplied prior to the Effective Date, (b) the commercial terms of any leases or other documents related to the Real Property Rights, and (c) the contents of this Agreement (collectively, "Confidential Information"). Both Parties shall inform their Affiliates, Subcontractors, suppliers and Personnel of their obligations under this Section 16.1 and require such Persons to adhere to the provisions hereof. Notwithstanding the foregoing, the following categories of information will not constitute Confidential Information:

(a) information that was in the public domain prior to receipt thereof by such Party or which subsequently becomes part of the public domain by publication or

otherwise except by a wrongful act of such Party or its Affiliates, Subcontractors, employees, directors, officers, agents, advisers or representatives;

(b) information that such Party can show was lawfully in its possession prior to receipt thereof from the other Party through no breach of any confidentiality obligation;

(c) information received by such Party from a third party having no obligation of confidentiality with respect thereto;

(d) information at any time developed independently by such Party providing it is not developed from otherwise Confidential Information.

16.1.2 Permitted Disclosures. Notwithstanding anything herein to the contrary, a Party may disclose Confidential Information as follows:

(a) Confidential Information may be disclosed pursuant to and in conformity with Applicable Law or in connection with any legal proceedings described in Article XIV, or by Owner to the Oregon Public Utility Commission and/or the independent evaluator retained by PGE and approved by the Oregon Public Utility Commission in connection with the Project, provided that the Party required to disclose such information shall give prior notice to the other Party of such required disclosure and, if so requested by the other Party, shall use all reasonable efforts to oppose the requested disclosure as appropriate under the circumstances or to seek, through a protective order or other appropriate mechanism, to maintain the confidentiality of the Confidential Information;

(b) Confidential Information may be disclosed as required to be disclosed under securities laws applicable to publicly traded companies and their subsidiaries;

(c) Confidential Information may be disclosed to Affiliates, Subcontractors, employees, directors, officers, agents, advisors or representatives of such Party as necessary in connection with the Project; provided that such Persons are informed of the confidential nature of the Confidential Information, and such Party shall be liable to the other for any disclosure by such Person in violation of the terms of this Section; and

(d) Owner may disclose a copy of this Agreement to any actual or potential financing parties and/or insurers.

16.1.3 Consent. Notwithstanding the foregoing, either Party may disclose Confidential Information with the express written consent of the other Party, which consent shall not be unreasonably conditioned, withheld, or delayed.

16.1.4 Publicity. Until expiration of the Warranty Period, neither Party shall issue any press or publicity release or otherwise release, distribute or disseminate any Confidential Information for publication concerning this Agreement or the participation of the other Party in the transactions contemplated hereby without the prior written consent of the other Party; provided, however, that such limitation on disclosure shall not apply to disclosures or reporting required by a Government Authority if the Party seeking disclosure informs the other

Party of the need for such disclosure and, if reasonably requested by the other Party, seeks, through a protective order or other appropriate mechanism, to maintain the confidentiality of Confidential Information.

16.1.5 Right to Relief. It is agreed that each Party shall be entitled to relief both at law and in equity, including injunctive relief and specific performance, in the event of any breach or anticipated breach of this Section, without proof of any actual or special damages.

16.1.6 Ownership of Confidential Information. All right and title to, and interest in, a Party's Confidential Information shall remain with such Party. All Confidential Information obtained, developed or created by or for Contractor exclusively for the Project, including copies thereof, is the exclusive property of Owner whether delivered to Owner or not. No right or license is granted to Contractor or any third party respecting the use of Confidential Information by virtue of this Agreement, except to the extent required for Contractor's performance of its obligations hereunder. Contractor shall deliver the Confidential Information, including all copies thereof, to Owner upon request.

16.1.7 Survival. The Parties' obligations under this Article XVII shall remain in force during the term of this Agreement and for a period of five (5) years after Final Completion.

16.2 Consequential Damages. In no circumstances shall either Party (or the parent companies and affiliates of each, and their respective members, shareholders, officers, directors, agents and employees) be liable to the other Party (or its parent companies and affiliates, and their respective members, shareholders, officers, directors, agents and employees) for any consequential, incidental, indirect, special, exemplary or punitive damages (including loss of power, loss of production, loss of actual or anticipated profits, revenues or product; increased expense of borrowing or financing, claims of Owner's customers and damage to property or equipment, and increased cost of capital) (collectively, "Consequential Damages") arising out of this Agreement; and, regardless of whether any such claim arises out of breach of contract, guarantee or warranty, tort, (including negligence and strict liability), product liability, indemnity, contribution, strict liability or any other legal or equitable theory. Increased expense of borrowing or financing, and increased cost of capital arising by virtue of a contractual obligation owed to an off-taker or purchaser of electricity generated by the Work are agreed for the purposes of this Agreement to be Consequential Damages. For avoidance of doubt, third party indemnification claims for loss of actual or anticipated profits, revenues or product shall not constitute Consequential Damages under this Agreement.

16.3 Limitation on Liability. Notwithstanding anything to the contrary contained in this Agreement, in no event shall Contractor be liable to Owner for any damages, claims, demands, suits, causes of action, losses, costs, expenses and/or liabilities in excess of an amount equal to one hundred percent (100%) of the Contract Price, as adjusted for Change Orders (other than those which reduce the Contract Price related to damages of Owner hereunder), regardless of whether such liability arises out of breach of contract, tort, product liability, contribution, strict liability or any other legal theory; *provided, however*, that the preceding limitation of liability shall not apply to, and no liability amounts shall be apply against such limitation of liability for (a) liabilities resulting from the negligence, fraud, willful misconduct or illegal or unlawful acts of Contractor or its Personnel (including their Labor), (b) liabilities arising out of

Contractor's obligations to indemnify Owner or other indemnitees for third party claims under this Agreement, or (c) costs incurred by Contractor (and, in the event Contractor fails to perform, Owner) in performing Warranty Service, or (d) any taxes payable by Contractor; (e) damages for risks required to be insured by Contractor under this Agreement, or (f) costs incurred by Contractor (and in the event of Contractor Default, Owner) in achieving Project Substantial Completion.

16.4 Notice. All notices and other communications required or permitted by this Agreement or by law to be served upon or given to a Party by any the other Party shall be in writing signed by the Party giving such notice and shall be deemed duly served, given and received (i) when actually received by the Party to whom it is sent, if served personally or if delivered by nationally recognized courier service to the Party to whom notice is to be given, (ii) when received by the Party to whom it is sent, if sent in the form of a signed letter on the sending Party's letterhead, transmitted by email in Portable Document Format (pdf) or similar format; (iii) when received (with confirmation of receipt) if delivered by facsimile or email, or (iv) at the end of the first Business Day following actual delivery, if mailed by first class registered or certified mail, return receipt requested, postage prepaid, addressed to the appropriate Party, at the address and/or facsimile numbers of such Party set forth below (or at such other address as such Party may designate by written notice to the other Party in accordance with the Section):

If to Owner:	**If to Contractor:**
with a copy to :	with a copy to :

16.5 Time of the Essence. Time is of the essence in the performance of the Work in accordance with the requirements of this Agreement.

16.6 No Rights in Third Parties. Except as otherwise set forth herein including in Section 3.2, hereof, with respect to the rights of permitted successors and assigns, and the rights of indemnitees under Article X, (a) nothing in this Agreement nor any action taken hereunder shall be construed to create any duty, liability or standard of care to any Person that is not a Party, (b) no Person that is not a Party shall have any rights or interest, direct or indirect, in this Agreement or the services to be provided hereunder and (c) this Agreement is intended solely for the benefit of the Parties, and the Parties expressly disclaim any intent to create any rights in any third party as a third-party beneficiary to this Agreement or the services to be provided hereunder.

16.7 Entire Agreement. This Agreement contains the entire understanding of the Parties with respect to the subject matter hereof and supersedes all prior agreements, arrangements, discussions, undertakings and commitments (whether written or oral) with respect

thereto. All the Exhibits (Exhibit A-1 through Exhibit T-2) attached hereto are incorporated into and made a part of this Agreement. There are no other oral understandings, terms or conditions and neither Party has relied upon any representation, express or implied, not contained in this Agreement.

16.8 Amendments. No amendment or modification of this Agreement shall be valid or binding upon the Parties unless such amendment or modification shall be in writing and duly executed by authorized officers of both Parties. For the avoidance of doubt, emails between the Parties shall not be considered a writing for purposes of this Section 16.9.

16.9 GOVERNING LAW. THIS AGREEMENT SHALL BE GOVERNED BY AND CONSTRUED IN ACCORDANCE WITH THE LAWS OF THE STATE OF OREGON, WITHOUT REGARD TO CONFLICT OF LAW PRINCIPLES.

16.10 Right of Waiver. No delay, failure or refusal on the part of any Party to exercise or enforce any right under this Agreement shall impair such right or be construed as a waiver of such right or any obligation of another Party, nor shall any single or partial exercise of any right hereunder preclude other or future exercise of any right. The failure of a Party to give notice to the other Party of a breach of this Agreement shall not constitute a waiver thereof. Any waiver of any obligation or right hereunder shall not constitute a waiver of any other obligation or right, then existing or arising in the future. Each Party shall have the right to waive any of the terms and conditions of this Agreement that are for its benefit. To be effective, a waiver of any obligation or right must be in writing and signed by the Party waiving such obligation or right.

16.11 Severability. If any provision of this Agreement is held to be illegal, invalid, or unenforceable under present or future laws, such provision shall be fully severable; this Agreement shall be construed and enforced as if such illegal, invalid or unenforceable provision had never comprised a part of this Agreement; and the remaining provisions of this Agreement shall remain in full force and effect and shall not be affected by the illegal, invalid, or unenforceable provision or by its severance from this Agreement. Furthermore, in lieu of such illegal, invalid or unenforceable provision, there shall be added automatically as a part of the this Agreement a provision as similar in its terms to such illegal, invalid or unenforceable provision as may be possible and be legal, valid and enforceable.

16.12 Successors and Assigns; Assignment. Subject to the following, this Agreement shall be binding upon the Parties, their successors and permitted assigns. Except as set forth herein, this Agreement and all of Contractor's rights, duties and obligations under this Agreement are personal in nature and shall not be assigned, delegated or otherwise disposed of by Contractor without the prior written consent of Owner. Owner may assign this Agreement in whole or in part; provided that Contractor is provided written notice as soon as reasonably possible following such assignment. Contractor agrees and acknowledges that any third party receiving such an assignment provided it assumes all obligations hereunder, in writing, shall be entitled to exercise any and all rights of Owner under this Agreement in accordance with the terms hereof (in its own name or in the name of Owner) and Contractor shall comply in all respects with such exercise. Provided the assignee assumes, in a writing reasonably satisfactory to Contractor, all obligations of Owner hereunder, Owner shall be released upon assignment.

Nothing in this Section 16.13 shall affect Owner's ability to collaterally assign this Agreement to any financing parties.

16.13 Survival. All provisions of the Agreement that are expressly or by implication to come into or continue in force and effect after the expiration or termination of this Agreement, including Articles VII, X and XIII, shall remain in effect and be enforceable following such expiration or termination. The representations and warranties of Contractor contained herein shall survive the execution and delivery hereof and thereof.

16.14 Expenses and Further Assurances. Each Party shall pay its own costs and expenses in relation to the negotiation, preparation execution and carrying into effect this Agreement. Contractor and Owner agree to provide such information, execute and deliver any instruments and documents and to take such other actions as may be necessary or reasonably requested by the other Party (at the cost and expense of the other Party) in order to give full effect to this Agreement and to carry out the intent of this Agreement.

16.15 Counterparts. This Agreement may be executed in any number of counterparts and each counterpart shall represent a fully executed original as if executed by both Parties, with all such counterparts together constituting but one and the same instrument.

16.16 Status of Contractor; No Partnership; No Agency. Contractor shall be an independent contractor with respect to any and all Work performed and to be performed under the Agreement. The Agreement shall not be interpreted or construed to create an association, joint venture or partnership relationship among or between the Parties or any similar relationship, obligations or liabilities. Neither Party shall have any right, power or authority to enter into any agreement or undertaking for, act on behalf of, or to act as or be an agent or representative of, or to otherwise bind or obligate the other Party.

16.17 Compliance with Applicable Laws. Contractor and its Subcontractors are familiar with and shall comply with and observe, all Applicable Laws, including but not limited to the federal Foreign Corrupt Practices Act (15 U.S.C.S. §§ 78a and 78m et seq.) ordinances, rules, regulations, executive orders, all applicable safety orders and all orders or decrees of administrative agencies, courts or other legally constituted authorities having jurisdiction or authority over Contractor and its Subcontractors, Owner or the Equipment which may now or hereafter exist.

[Signatures on following page]

IN WITNESS WHEREOF, the Parties have caused this Agreement to be executed by their duly authorized representatives as of the date and year first above written.

Owner:

By: _____
Name: _____
Title: _____

Contractor:

By: _____

17 Appendix F – Required Bidder Profile

The form below is illustrative of information that will be collected in an online form at: PortlandGeneralRFP.accionpower.com. Please consider the following multi-page form as a guide when preparing your bid, but note that in the event of differences between this form and the electronic version, the electronic version shall control. Check boxes (☐) indicate documents that are likely to be provided as attachments to the form.

For early-stage ownership proposals, including acquisition of project development or natural resource rights, please fill out sections as applicable.

Company Name:		
Name of Contact:		
Title:		
Mailing Address:		
Telephone:	Fax:	E-mail:

Bidder's general background and principal business:

Legal entity that would be the contracting party to a power purchase contract or an asset purchase agreement with PGE. State whether this entity will be formed for the sole purpose of the project and a description of the ownership and debt arrangements:

Bidder's senior unsecured debt rating: ☐ Standard & Poor's ☐ Moody's Investor Services., Inc. ☐ Fitch Ratings ☐ DBRS

18 Appendix G – Required Bid Information

The form below is illustrative of information that will be collected in an online form at: PortlandGeneralRFP.accionpower.com. Please consider the following multi-page form as a guide when preparing your bid, but note that in the event of differences between this form and the electronic version, the electronic version shall control. Check boxes (☐) indicate documents that are likely to be provided as attachments to the form.

For early-stage ownership proposals, including acquisition of project development or natural resource rights, please fill out sections as applicable.

1. Project Description, Transaction Type and Price

Project Summary Information
Project name: Developer: Project Location (County and State): Technology (i.e. Wind, Solar, etc.): Commence construction date: Proposed Commercial Operation Date (COD): Nameplate capacity (MW): Transaction Structure(s) proposed: Federal Tax Benefits obtained: Expected annual energy generation (MWh) for the first 12 months after COD: Annual anticipated degradation (if applicable):

Transaction Structure and Pricing
Elect Transaction Type(s) contemplated for this Project: ❑ Sale of energy (PPA) ❑ Ownership (APA or APA and EPC) ❑ Other
Provide an executive summary of the project and transaction structure(s) proposed. Alternate structures that differ from the core transaction types may be proposed and should be described here as well. (Separate Word document can be uploaded with supporting material.)
Term Sheet and Form Agreement: ❑ Upload the corresponding term sheet with redline changes, if any, to terms. If Bidder is proposing an alternate structure that vastly differs, a new term sheet should be created and uploaded. ❑ Bidders are strongly encouraged to also upload a redline mark-up of the corresponding form agreement.

- ❑ If offering a structure that vastly differs from those proposed, please upload a complete term sheet.

PPA Proposal Pricing and Key Terms

Provide key PPA pricing and terms (may also be provided as part of the term sheet). NOTE: All 3rd party scheduling, integration and forecasting costs must be included as part of the PPA price.

- ❑ Expected Capacity MW:
- ❑ Expected Facility Output (MWh for each Contract Year):
- ❑ Required Capacity (MW):
- ❑ Contract Term (i.e. 20 years)
  - Base Case (Years):
  - Option 2 (Years):
- ❑ Contract Price Flat $/MWh:
  - Base Case $/MWh:
  - Option 2 $/MWh:
- ❑ Contract Price Escalating $/MWh:
  - Base Case Year 1 $/MWh:
  - Base Case Annual Escalation Factor (%):
  - Option 2 Year 1 $/MWh:
  - Option 2 Annual Escalation Factor (%):
- ❑ Point of Delivery:
- ❑ Interconnection Service Designation (check which applies):
  - Network Resource Interconnection Service
  - Energy Resource Interconnection Service
  - Other (please explain):
  - Interconnection Provider
  - Interconnection Request Number:
- ❑ Transmission Service
  - Long-term, Firm, Point-to-Point Transmission Service with roll-over rights
  - Other (please explain):
  - Transmission Provider:
  - Transmission Service Request Number:
- ❑ Performance Assurance
  - Pre-COD Security ($25/kw amount requested):
  - Delivery Period Security (or post-COD) (12 month):
- ❑ Output Guarantee
  - Conforms with Form PPA.
  - Other- Please describe.
- ❑ Firmness of Energy
  - 15-minute firm to schedule consistent with Form PPA
  - Other – Please describe.
- ❑ PPA Contract Extension
  - Please describe whether there is an option to extend the PPA term at a known price. If so, provide pricing proposal, if different from base term Contract Price.

Ownership Proposal Pricing Requirements

- ❑ Provide Asset Purchase Agreement (APA) Price
  - Identify timing and proposed milestone payments if any payments proposed prior to Close of fully-developed asset sale.
  - Identify assets associated with APA (i.e. permits, interconnection agreements, transmission service agreements, environmental studies, lease options, etc.). If any assets would not be provided

❑ Provide Total Engineering Procurement and Construction Price - Provide initial Milestone Payment Schedule and events / completed tasks / equipment / associated with each milestone payment as well as approximate dates. Clarify major equipment manufacturers that are assumed as part of the bid - Milestone payment schedule will be provided electronically through the provided Excel template.
Provide a pro forma forecast for all project construction and operating costs for the expected life of the project. Construction costs must include, but are not limited to, all costs necessary to develop, permit, construct, and place the facility in service. Operating costs must include, but are not limited to, fixed O&M, variable O&M, wheeling and transmission, third-party ancillary services, land leases and royalties, property taxes and local fees, insurance, and capital expenses. Bidders must include all costs in their submission of pro forma forecasts, inclusive of all taxes excluding income tax. Pro forma forecasts will be provided electronically through the provided Excel template.

2. Project Development Criteria and Developer Experience

Project Development
Please supply the following Project Development Criteria whether submitting proposal for ownership or long-term energy purchase consideration or both.
Project name:
Site Control: Site control is an important factor in our RFP evaluation, and should be interpreted to include the site itself, along with all required easements and access required for the site. ❑ Identify the project site by identifying the land parcel(s) contemplated, land owners and status of control of each land parcel (i.e. ownership, lease, option to lease or own, letter of intent, etc.). ❑ Identify the project easements for transmission gen-tie lines, site access or other required easements and identify the status of control of each. ❑ Provide a project map that contains the site and easements mentioned above. ❑ If the Bidder does not have control over the project site and/or easement(s), identify parcel(s) not under control, describe actions already taken to obtain control of these parcels and/or the site as well as next steps and timing to obtain control.
Experience of Developer Team Provide the following information: ❑ Describe the developer's participation in successfully developing power production projects in the U.S., emphasizing projects located in the Pacific Northwest (whether in development or constructed) and those that are similar to the project proposed in the bid. Provide a synopsis of the developer's role (i.e. development, construction, long-term owner for a PPA or seller of asset, etc.). Identify customers of projects and aforementioned structures. Identify suppliers that have been used for projects (i.e. Vestas, General Electric, etc.). ❑ List members of the development and management team and provide a brief, summary resume of each individual (include a description of that individual's training, experience, function(s) performed for the project and area(s) of expertise). ❑ Describe business-related litigation or regulatory investigations in which the developer or development team members were previously (in the last 7 years), are currently, or are expected to be engaged.

Interconnection, Transmission and Point of Delivery

- ❑ Identify the Point of Interconnection for the project.
- ❑ Provide the interconnection agreement, key interconnection dates and all associated studies completed as part of the interconnection process for the project. If not yet obtained, provide the draft interconnection agreement and a summary of the status as well as expected target date for execution. Describe any risks and mitigation strategies for achieving completion of the agreement and the interconnection facilities in order to support timely project COD.
- ❑ Identify the transmission service (preference given to long-term firm point-to-point transmission) secured for delivery to PGE's System and the assignment reference (ARef) number, start date, term, transmission provider, special service conditions (e.g., conditional firm bridge service) and roll-over rights associated with the transmission service. If any re-directs or modifications to service are anticipated, please describe the process, timing and risks.
- ❑ Provide the Transmission Service Agreement(s) (or Precedent Transmission Service Agreement) and all associated agreements, studies, and exhibits and if applicable, identify the timing associated with completion and transmission service. Describe any required upgrades, anticipated costs, and risks to service commencement.
- ❑ Identify the Point of Delivery associated with Project (for PPA or ASA/EPC; identify anticipated points and include transmission plan description to PGE System if not fully secured).

  BPAT.PGE at point:
  - Pearl 230 kV (Sherwood)
  - McLoughlin 230 kV
  - Keeler 230 kV (St. Marys)
  - Rivergate 230 kV
  - Bethel 230 kV
  - Troutdale 230 kV (Blue Lake)

  PACW.PGE at point:
  - Bethel 230 kV
  - Gresham 230 kV
  - Linneman 230 kV
  -)

Scheduling and Integration Services

- ❑ Identify the 3rd Party Scheduling Agent for the project.
- ❑ If the renewable technology is intermittent in nature, describe the plan for the 3rd party integration services in order to provide 15-minute firm schedules required as part of the PPA submission. The description of the plan for integration should include, at minimum, a narrative describing the services being purchased and the service provider (if applicable), the operating characteristics of the resource(s) or system(s) that will be used for integration, and a description of the fueling and transmission plan for the integrating resource(s) or system(s). If offering an alternate firming schedule (i.e. hourly firm), please describe and provide aforementioned information.
- ❑ Provide the 3rd party responsible for providing the forecasts for the firm schedule submission (see PPA term).

Qualification Strategy for Federal Tax Benefits

- ❑ Identify the federal tax benefit (i.e. PTC, ITC) assumed as part of the PPA price submission and/or what can be achieved via the ownership structure.
- ❑ Describe the strategy to capture the applicable federal tax benefit (i.e. commencement of significant construction or safe harbor), the assuredness of this strategy, any risks associated with this strategy, and the plan to mitigate these risks. Provide the name of the tax counsel and/or other entities reviewing the tax strategy for obtaining the federal tax benefit. Has an opinion been obtained from tax counsel?

- ❑ Provide any other relevant details (i.e. upload tax counsel opinion or other materials).

Schedule

- ❑ Provide a Level 1 schedule demonstrating the development and construction (if applicable) of the project, including but not limited to finalization of permits, studies, site control, project design, roads, foundations, substation, transmission, interconnection, fuel supply (if applicable), approvals, major equipment orders, major equipment delivery, pre-construction and construction milestones. Clarify items pending versus completed. Schedule should be presented in Gantt chart form.
- ❑ If bidding an existing project, provide a detailed description of the project, its major components, description of the Operation and Maintenance record, schedule of outages, etc.

Permitting, Environmental and Studies

Please respond to this section as well as the technology specific requested information. If you are offering a technology that is not listed, please provide information of similar detail.

- ❑ List all of the permits, licenses, environmental studies, cultural resources studies and other approvals (regulatory, zoning, etc.) that are required for the construction and operation of the project in a table. Include the jurisdictional entity or entity performing the work and the status. If any have been obtained by the date of the bid submission, provide the date obtained. For those that are still in process, identify the date these are expected and provide a summary of risks and risk mitigation strategies that will be utilized to stay on the anticipated schedule. For status of items not yet complete, consider identifiers such as: "In-process/on-track", "Not yet started", "In-process/delayed", "Application in process", etc. See sample from template below; please complete template provided for submission. Additional materials can be uploaded to supplement if desired.
- ❑ Provide an overview of any opposition that has occurred to date and measures taken to manage this opposition. If any opposition is expected, describe plans to manage these (i.e. community outreach, etc.).

Sample of format for summary of permits, licenses, studies, etc.:

Permit/Study/License/Other	Status	Date	Entity	Risks and Mitigation Strategies
Site Permit	Done	5/1/2016	OEFSC	N/A

Permitting, Environmental and Studies – Wind

Wind Projects Under Development and Existing Wind Resources

- ❑ Please specify the total acres disturbed by your project.
- ❑ Are there any known areas of contamination within the project boundary?
- ❑ Describe how water quality (groundwater and surface water) is affected by the project.
- ❑ Characterize the ambient day and night sound environment in the area surrounding the project site.
- ❑ If the project site or contiguous areas contain any species of plant or animal life identified as threatened or endangered, please list the species and explain mitigation measures.
- ❑ If the project site contains any plants or animals being proposed or considered as candidates for threatened or endangered lists, please list and explain mitigation measures.
- ❑ If the project site contains any animals protected under federal or state law, like under the Migratory Bird Act Treaty, please list and explain mitigation measures.
- ❑ Provide copies of wildlife studies that have been performed for the project.
- ❑ Briefly describe any environmental mitigation methods, both required and volunteered, that are included as part of an operating project or will be included as part of a proposed project.
- ❑ Has the project area been subject to a cultural resources survey?
- ❑ Are there any sites that are listed on the National Register of Historic Places within the project area?
- ❑ Provide copies of cultural resource studies that have been conducted for the project.

- ❑ Please indicate if pertinent Tribal Governments have been notified of the project.
- ❑ Have the area Tribes raised any Traditional Cultural Property (TCP) concerns or other issues?

Wind Projects Under Development

- ❑ Is the proposed project consistent with the recommended uses of adopted local and state land use plans?
- ❑ Will the project need a zoning change?
- ❑ If there is likely to be public controversy related to the proposed project, please explain.
- ❑ Provide estimates for the day and night noise levels of the proposed project. Provide all studies that have been completed.
- ❑ Describe proposed sound attenuation strategies or equipment planned for the project.
- ❑ Give the distance in miles that the project, or its effect, will be visible from state parks, forest preserves, and game refuges; national wildlife refuges, natural landmarks, and park service lands; rivers designated as wild, scenic or recreational; designated wilderness areas; other outstanding natural features.
- ❑ Will the project impact or have the potential to impact an existing archaeological or historic site or structure (i.e. >50 years or older)?
- ❑ Are any visual impacts to existing historic buildings expected from the project?

Existing Wind Projects

- ❑ Describe any ongoing noise issues.
- ❑ Discuss status of compliance with any project permits, plans, and applicable regulations; including but not limited to wildlife and natural resources, cultural resources, waste, etc.
- ❑ Discuss avian mortality at the site and what is being done to minimize it. Please provide reports detailing records of avian mortality.
- ❑ List the number and severity of any regulatory citations in operating the facility.

Permitting, Environmental and Studies – Solar

Solar Projects Under Development and Existing Solar Resources

- ❑ Please specify the total acres disturbed by your project.
- ❑ Are there any known areas of contamination within the project boundary?
- ❑ Describe any water requirements for production, cooling, or cleaning and the water rights/ plans associated with meeting these needs.
- ❑ Describe how water quality (groundwater and surface water) is affected by the project.
- ❑ Describe any type and quantity of wastewater discharge (in gallons per MWh).
- ❑ Characterize the ambient day and night sound environment in the area surrounding the project site.
- ❑ If the project site or contiguous areas contain any species of plant or animal life identified as threatened or endangered, please list the species and explain mitigation measures.
- ❑ If the project site contains any plants or animals being proposed or considered as candidates for threatened or endangered lists, please list and explain mitigation measures.
- ❑ If the project site contains any animals protected under federal or state law, like under the Migratory Bird Act Treaty, please list and explain mitigation measures.
- ❑ Provide copies of wildlife studies that have been performed for the project.
- ❑ Briefly describe any environmental mitigation methods, both required and volunteered, that are included as part of an operating project or will be included as part of a proposed project.
- ❑ Has the project area been subject to a cultural resources survey?
- ❑ Are there any sites that are listed on the National Register of Historic Places within the project area?
- ❑ Provide copies of cultural resource studies that have been conducted for the project.
- ❑ Please indicate if pertinent Tribal Governments have been notified of the project.
- ❑ Have the area Tribes raised any Traditional Cultural Property (TCP) concerns or other issues?

Solar Projects Under Development

- ❑ Is the proposed project consistent with the recommended uses of adopted local and state land use plans?
- ❑ Will the project need a zoning change?
- ❑ If there is likely to be public controversy related to the proposed project, please explain.
- ❑ Provide estimates for the day and night noise levels of the proposed project. Provide all studies that have been completed.
- ❑ Will the project impact or have the potential to impact an existing archaeological or historic site or structure (i.e. >50 years or older)?
- ❑ Are any visual impacts to existing historic buildings expected from the project?
- ❑ Give the distance in miles that the project, or its effect, will be visible from state parks, forest preserves, and game refuges; national wildlife refuges, natural landmarks, and park service lands; rivers designated as wild, scenic or recreational; designated wilderness areas; other outstanding natural features.

Existing Solar Projects

- ❑ Describe any ongoing noise issues.
- ❑ Discuss status of compliance with any project permits, plans, and applicable regulations; including but not limited to wildlife and natural resources, cultural resources, waste, etc.
- ❑ List the number and severity of any regulatory citations in operating the facility.

Permitting, Environmental and Studies – Geothermal

- ❑ Please provide emission amounts (Lbs./MWh) for all permitted emissions.
- ❑ Describe the air pollution controls used on the project, *e.g.*, type, emissions controlled and removal efficiency.
- ❑ Describe whether the proposed project will exceed any criteria of the National Ambient Air Quality Standards (NAAQS) for any pollutant when operating on either primary or backup fuel. Also describe the "Prevention of Significant Deterioration Increment Consumption" due to this project, as applicable.
- ❑ Please specify the total acres disturbed by your project.
- ❑ Is the proposed project consistent with the recommended uses of adopted local and state land use plans?
- ❑ Will the project need a zoning change?
- ❑ If there is likely to be public controversy related to the proposed project, please explain.
- ❑ Are there any known areas of contamination within the project boundary?
- ❑ Describe any water requirements for production, cooling, or cleaning and the water rights/ plans associated with meeting these needs.
- ❑ Describe how water quality (groundwater and surface water) is affected by the project.
- ❑ Please describe the total amount of waste (in lbs. per MWh) directly related to power production.
- ❑ Describe any type and quantity of wastewater discharge (in gallons per MWh).
- ❑ Characterize the ambient day and night sound environment in the area surrounding the project site.
- ❑ Provide estimates for the day and night noise levels of the proposed project. Provide all studies that have been completed.
- ❑ For existing projects, describe any ongoing noise issues.
- ❑ Describe proposed sound attenuation strategies or equipment planned for the project.
- ❑ Give the distance in miles that the project, or its effect, will be visible from state parks, forest preserves, and game refuges; national wildlife refuges, natural landmarks, and park service lands; rivers designated as wild, scenic or recreational; designated wilderness areas; other outstanding natural features.
- ❑ If the project site or contiguous areas contain any species of plant or animal life identified as

threatened or endangered, please list the species and explain mitigation measures.

- ❑ If the project site contains any plants or animals being proposed or considered as candidates for threatened or endangered lists, please list and explain mitigation measures.
- ❑ If the project site contains any animals protected under federal or state law, like under the Migratory Bird Act Treaty, please list and explain mitigation measures.
- ❑ Provide copies of wildlife studies that have been performed for the project.
- ❑ Briefly describe any environmental mitigation methods, both required and volunteered, that are included as part of an operating project or will be included as part of a proposed project.
- ❑ For existing projects, discuss status of compliance with any project permits, plans, and applicable regulations; including but not limited to wildlife and natural resources, cultural resources, waste, etc.
- ❑ For existing projects, list the number and severity of any regulatory citations in operating the facility.
- ❑ Has the project area been subject to a cultural resources survey?
- ❑ Will the project impact or have the potential to impact an existing archaeological or historic site or structure (i.e. >50 years or older)?
- ❑ Are there any sites that are listed on the National Register of Historic Places within the project area?
- ❑ Provide copies of cultural resource studies that have been conducted for the project.
- ❑ Are any visual impacts to existing historic buildings expected from the project?
- ❑ Please indicate if pertinent Tribal Governments have been notified of the project.
- ❑ Have the area Tribes raised any Traditional Cultural Property (TCP) concerns or other issues?

Permitting, Environmental and Studies – Hydroelectric

- ❑ For proposed hydroelectric projects, discuss whether in-stream flow studies will be required, or have been performed, and the results from such studies.
- ❑ For proposed hydroelectric projects, discuss major license conditions affecting resource management including, but not limited to, whether fish passage facilities will be required.
- ❑ Please specify the total acres disturbed by your project.
- ❑ Is the proposed project consistent with the recommended uses of adopted local and state land use plans?
- ❑ Will the project need a zoning change?
- ❑ If there is likely to be public controversy related to the proposed project, please explain.
- ❑ Describe how water quality (groundwater and surface water) is affected by the project.
- ❑ Give the distance in miles that the project, or its effect, will be visible from state parks, forest preserves, and game refuges; national wildlife refuges, natural landmarks, and park service lands; rivers designated as wild, scenic or recreational; designated wilderness areas; other outstanding natural features.
- ❑ If the project site or contiguous areas contain any species of plant or animal life identified as threatened or endangered, please list the species and explain mitigation measures.
- ❑ If the project site contains any plants or animals being proposed or considered as candidates for threatened or endangered lists, please list and explain mitigation measures.
- ❑ If the project site contains any animals protected under federal or state law, like under the Migratory Bird Act Treaty, please list and explain mitigation measures.
- ❑ Provide copies of any applicable studies that have been performed for the project.
- ❑ Briefly describe any environmental mitigation methods, both required and volunteered, that are included as part of an operating project or will be included as part of a proposed project.
- ❑ For existing projects, discuss status of compliance with any project permits, plans, and applicable regulations; including but not limited to wildlife and natural resources, cultural resources, waste, etc.
- ❑ For existing projects, list the number and severity of any regulatory citations in operating the facility.
- ❑ Has the project area been subject to a cultural resources survey?
- ❑ Will the project impact or have the potential to impact an existing archaeological or historic site or structure (i.e. >50 years or older)?
- ❑ Are there any sites that are listed on the National Register of Historic Places within the project area?

- ❑ Provide copies of cultural resource studies that have been conducted for the project.
- ❑ For proposed hydroelectric projects, discuss whether a Cultural Resources Management Plan has been prepared.
- ❑ Are any visual impacts to existing historic buildings expected from the project?
- ❑ Please indicate if pertinent Tribal Governments have been notified of the project.
- ❑ Have the area Tribes raised any Traditional Cultural Property (TCP) concerns or other issues?

Permitting, Environmental and Studies - Biomass, Biogas and Solid Waste

- ❑ Please provide emission amounts (Lbs./MWh) for all permitted emissions.
- ❑ Describe the air pollution controls used on the project, *e.g.*, type, emissions controlled and removal efficiency.
- ❑ Describe whether the proposed project will exceed any criteria of the National Ambient Air Quality Standards (NAAQS) for any pollutant when operating on either primary or backup fuel. Also describe the "Prevention of Significant Deterioration Increment Consumption" due to this project, as applicable.
- ❑ Please specify the total acres disturbed by your project.
- ❑ Is the proposed project consistent with the recommended uses of adopted local and state land use plans?
- ❑ Will the project need a zoning change?
- ❑ If there is likely to be public controversy related to the proposed project, please explain.
- ❑ Are there any known areas of contamination within the project boundary?
- ❑ Describe any water requirements for production, cooling, or cleaning and the water rights/ plans associated with meeting these needs.
- ❑ Describe how water quality (groundwater and surface water) is affected by the project.
- ❑ Please describe the total amount of waste (in lbs. per MWh) directly related to power production.
- ❑ Describe any type and quantity of wastewater discharge (in gallons per MWh).
- ❑ Characterize the ambient day and night sound environment in the area surrounding the project site.
- ❑ Provide estimates for the day and night noise levels of the proposed project. Provide all studies that have been completed.
- ❑ Describe proposed sound attenuation strategies or equipment planned for the project.
- ❑ For existing projects, describe any ongoing noise issues.
- ❑ Give the distance in miles that the project, or its effect, will be visible from state parks, forest preserves, and game refuges; national wildlife refuges, natural landmarks, and park service lands; rivers designated as wild, scenic or recreational; designated wilderness areas; other outstanding natural features.
- ❑ If the project site or contiguous areas contain any species of plant or animal life identified as threatened or endangered, please list the species and explain mitigation measures.
- ❑ If the project site contains any plants or animals being proposed or considered as candidates for threatened or endangered lists, please list and explain mitigation measures.
- ❑ If the project site contains any animals protected under federal or state law, like under the Migratory Bird Act Treaty, please list and explain mitigation measures.
- ❑ Provide copies of wildlife studies that have been performed for the project.
- ❑ Briefly describe any environmental mitigation methods, both required and volunteered, that are included as part of an operating project or will be included as part of a proposed project.
- ❑ For existing projects, discuss status of compliance with any project permits, plans, and applicable regulations; including but not limited to wildlife and natural resources, cultural resources, waste, etc.
- ❑ For existing projects, list the number and severity of any regulatory citations in operating the facility.
- ❑ Has the project area been subject to a cultural resources survey?
- ❑ Will the project impact or have the potential to impact an existing archaeological or historic site or structure (i.e. >50 years or older)?
- ❑ Are there any sites that are listed on the National Register of Historic Places within the project area?

- ❑ Provide copies of cultural resource studies that have been conducted for the project.
- ❑ Are any visual impacts to existing historic buildings expected from the project?
- ❑ Please indicate if pertinent Tribal Governments have been notified of the project.
- ❑ Have the area Tribes raised any Traditional Cultural Property (TCP) concerns or other issues?

Permitting, Environmental and Studies - Wave

- ❑ If there is likely to be public controversy related to the proposed project, please explain.
- ❑ Give the distance in miles that the project, or its effect, will be visible from state parks, forest preserves, and game refuges; national wildlife refuges, natural landmarks, and park service lands; rivers designated as wild, scenic or recreational; designated wilderness areas; other outstanding natural features.
- ❑ If the project site or contiguous areas contain any species of plant or animal life identified as threatened or endangered, please list the species and explain mitigation measures.
- ❑ If the project site contains any plants or animals being proposed or considered as candidates for threatened or endangered lists, please list and explain mitigation measures.
- ❑ If the project site contains any animals protected under federal or state law, like under the Migratory Bird Act Treaty, please list and explain mitigation measures.
- ❑ Provide copies of any applicable studies that have been performed for the project.
- ❑ Briefly describe any environmental mitigation methods, both required and volunteered, that are included as part of an operating project or will be included as part of a proposed project.
- ❑ For existing projects, discuss status of compliance with any project permits, plans, and applicable regulations; including but not limited to wildlife and natural resources, cultural resources, waste, etc.
- ❑ Has the project area been subject to a cultural resources survey?
- ❑ Will the project impact or have the potential to impact an existing archaeological or historic site or structure (i.e. >50 years or older)?
- ❑ Are there any sites that are listed on the National Register of Historic Places within the project area?
- ❑ Provide copies of cultural resource studies that have been conducted for the project.
- ❑ Are any visual impacts to existing historic buildings expected from the project?
- ❑ Please indicate if pertinent Tribal Governments have been notified of the project.
- ❑ Have the area Tribes raised any Traditional Cultural Property (TCP) concerns or other issues?

3. Project Resource Characteristics

Project Resource
Provide Project Resource Information as requested below and additional information that the Bidder deems relevant or pertinent to PGE's evaluation of its proposal.
Project Technical Description ❑ For PPA's and ownership proposals that include construction, provide a description of the facility and its major equipment. Describe the technology used (or planned for use—or if more than one option, identify these) for the generation of electricity, including major manufacturers ❑ For Wind or Solar ownership proposals, confirm that all technical specifications in Appendix H.1 (for Wind proposals) or Appendix H.2 (for Solar proposals) are met. Otherwise, provide a redline mark-up of the technical specifications for the proposal. ❑ Provide a project layout drawing including all major equipment and balance of plant equipment ❑ Provide a project Single Line Diagram
Project Resource Characteristics Depending on technology, provide the required resource characteristics for bid evaluation as identified below. Please note that the Form PPA and PPA term sheet contemplate Output production guarantees; any exceptions to PGE's proposal must be included as part of this submission (see Section 1).
Project Resource – New Wind Project ❑ Provide the proposed site layout that is the basis for the Net Capacity Factor (NCF). Describe the level of work done at this juncture to determine buildable land and describe set-backs that are assumed. ❑ Provide the P50, P75, P90 and P10 annual NCF projection for the project and the turbine and hub-height (etc.) assumed for these projections through the contract term. ❑ Provide a 12X24 profile of the P50 facility NCF in Excel format. ❑ Provide any assessment reports that have been prepared for the project and augment them, if necessary, to include the following information: ❑ Provide source and basis of the wind speed data used in the development of the energy projections for the project, including: ❑ Location of the data collection. ❑ Number of on-site and off-site meteorological stations used and types of meteorological instrumentation. ❑ Heights of measurements and instrument tower design. ❑ Periods of record for each meteorological data source used. ❑ Specific elevations of each on-site meteorological measurement location. ❑ Data quality assurance procedures. ❑ Duration of valid on-site measurements (five or more years strongly preferred). ❑ All available shear observation and calculation data. ❑ Wind Rose for each tower and measurement location. ❑ Long-term reference data, if not publicly available. ❑ Methodology used to develop the estimated long-term, hub-height, average annual wind speed and wind direction frequency distribution(s) for the project site. ❑ Roughness indexes. ❑ Assumed collection losses and distance to nearest integration substation. ❑ Assumed avian and bat curtailment incidence. ❑ Time-of-day, monthly and annual representative hub-height wind speed

frequency distributions at intervals of 0.5 m/s. Provide these tables electronically in an Excel file.

- ❑ List of all adjacent wind facilities, either in operation or proposed, within 20 miles.
- ❑ Describe the equipment to be used and the layout of your wind project. Include the size, technology type and manufacturer of the individual wind turbine units.
- ❑ Provide the warranted or sales power curves (wind speed versus power output) for the wind turbine generators proposed. (Ensure power curve accounts for site specific air density.)
- ❑ Provide the detailed analysis used to estimate the net annual and monthly energy output of the wind project. All sources of losses should be listed and individually quantified, along with the basis for quantification. Consideration of existing or proposed external wind farms waking effects should be specifically addressed. Please provide wake model used in the analysis.

- ❑ Provide hourly (15 minute if available) energy production from the facility over valid period of on-site measurements as an Excel spreadsheet or csv file. The sum of the hourly time series is not expected to equal the annual P50 but should be based on wind measurements recorded on-site and include all losses to represent net hourly production for the project. Please provide a description of the methodology used to apply the hourly losses.

Project Resource - Existing Wind Project

- ❑ Provide a description of the facility, including the year built, the construction contractor, wind turbines used (make, model, hub height, power curve, etc.), major components used in the facility, major maintenance performed over the last years, description of operations and maintenance performed each year, the O&M provider, description of remaining warranty periods for existing equipment, etc.
- ❑ Provide the P50, P75, P90 and P10 Net Capacity Factor projection for the project through the contract term.
- ❑ Provide a 12X24 profile of the P50 facility NCF in Excel format.
- ❑ Project map with elevation, hub height, and ID for each turbine.
- ❑ List of all adjacent wind facilities, either in operation or proposed, within 20 miles.
- ❑ Provide monthly operating reports (MORs) for the period that the project has been in operation. At a minimum, MORs should include system availability, turbine availability, curtailment levels, and metered production.
- ❑ Identify the energy production measurement point and any losses to that point.
- ❑ Provide hourly and 15 minute net energy production records for the period that the project has been in operation in Excel or csv format.
- ❑ Curtailment logs including: facility level curtailment count, event timestamps, and MWh. For each event, specify the nature of curtailment(i.e. transmission curtailment, Oversupply Management Protocol, avian management)
- ❑ Hourly and 15 minute turbine availability for the period the project has been in operation.
- ❑ Hourly and 15 minute average wind speed, MWa, for each turbine for the period the project has been in operation.
- ❑ Provide any assessment reports that have been prepared for the project that utilize historical energy production data to forecast energy production for the remaining project life. Please include long-term reference data used in the assessment report to forecast energy production.
- ❑ Provide any wind assessments reports completed prior to project COD.
- ❑ Time-of-day, monthly and annual wind frequency distributions at intervals of 0.5 m/s from the pre-construction monitoring campaign. Provide these tables electronically in an Excel file.
- ❑ Methodology used to develop the estimated wind speed and wind direction frequency

distribution(s) for the project site from the pre-construction monitoring campaign.

- ❑ Provide hourly (15 minute if available) estimated energy production from the facility over the valid period of on-site meteorological (i.e. anemometer) measurements made prior to project COD. Include as an Excel spreadsheet or csv file. Please provide a description of the methodology used to estimate project energy production from meteorological measurements.

Project Resource – New Solar Project

- ❑ Describe the physical layout of the plant and provide associated schematics. Identify proposed technology including but not limited to manufacturer and supplier of the photovoltaic panels, the annual expected degradation (and warranty degradation), inverters, transformers, and racking (fixed tilt or tracking). Identify make and model where applicable.
- ❑ Describe the level of work done to create the layout included as part of the RFP bid.
- ❑ Provide the P50, P75, P90 and P10 annual NCF projection for the project through the contract term.
- ❑ Provide a 12X24 profile of the P50 facility NCF in Excel format.
- ❑ Provide hourly (15 minute if available) energy production from the facility over the valid period of irradiation data as an Excel spreadsheet or csv file. The sum of the hourly time series is not expected to equal the annual P50 but should be based on available solar data and include all losses to represent net hourly production for the project. Please provide a description of the methodology used to apply the hourly losses.
- ❑ Describe source and location of the meteorological data obtained and, if different from project site, provide an engineering review of its applicability to the proposed site.
- ❑ Identify locations of any operating sites where technology identical to that proposed is deployed, operational history of the technology, and maintenance requirements.
- ❑ Provide any available assessment reports for the project and augment them, if necessary, with a detailed description of the solar and climatic data that were recorded for the site, and how they were sampled and processed (minimum of five years of data strongly preferred).
- ❑ Describe in detail the analysis that used the solar and climatic data at the site (ground measurements strongly preferred) to estimate the net annual and monthly energy output from the project.
- ❑ Provide the meteorological data file and any applicable simulation files, if available (.MET, .PRJ, .PAN, .OND, .SIT, etc.)
- ❑ List and quantify all sources of losses, and provide the basis for the quantification.
- ❑ Provide soiling profile and describe any washing schedule including frequency and dates of cleaning planned, if applicable.
- ❑ Describe the operations and maintenance plan for the project, specifically project staffing and monitoring activities.
- ❑ Describe annual station loads including lighting, heating and cooling equipment, and monitoring system (i.e. DAS or SCADA).

Project Resource – Existing Solar Project

- ❑ Provide a description of the facility, including the year built, the construction contractor, major components datasheets used in the facility (including modules, inverters, transformers, racking), major maintenance performed over the last years, description of operations and maintenance performed each year, the O&M provider, description of remaining warranty periods for existing equipment, etc.
- ❑ Provide the P50, P75, P90 and P10 annual NCF projection for the project through the contract term.
- ❑ Provide a 12X24 profile of the P50 facility NCF in Excel format.
- ❑ Provide map or drawing of project including location of inverters, PV racking, etc.
- ❑ Provide monthly operating reports (MORs) for the period that the project has been in

operation. At a minimum, MORs should include system availability, curtailment levels, and metered production.

- ❑ Identify energy production measurement point and any losses to that point.
- ❑ Provide hourly (15 minute if available) net energy production records for the period the project has been in operation in Excel or csv format.
- ❑ Provide any assessment reports that have been prepared for the project that utilize historical energy production data to forecast energy production for the remaining project life. Please include long-term reference data used in the assessment report to forecast energy production.

Project Resource – Geothermal

- ❑ Provide a project overview which includes a description and map of the site location (including ownership of adjoining properties), years of development and geological summary of site.
- ❑ Describe the resource, the resource temperature profile, and proposed size of the facility as well as proposed technology, layout (include relevant diagrams/drawings, such as general arrangement drawings, heat balance diagrams, one-line diagrams, water mass balance, and major system P&IDs), operational characteristics and anticipated operation and maintenance (annual and major required over the life of the asset).
- ❑ Provide the P50, P75, P90 and P10 annual generation projection for the project through the contract term.
- ❑ Provide a 12X24 profile of the P50 facility generation in Excel format.
- ❑ Discuss the nature of the geothermal resource, and any challenges, including environmental, in drilling or conversion of the resource as a result of the geothermal characteristics. Provide the reservoir fluid quality analysis.
- ❑ Describe the water rights, permitting and licenses required, the process to obtain and maintain these, and their current status.
- ❑ Describe the status of the exploration program at the site, including information on the organizations performing the field work, a summary of the various data collected at the site, and the approach used for validating that data.
- ❑ Describe the analysis used to convert data obtained from the geothermal site into a reservoir model.
- ❑ Discuss the proposed geothermal power production technology appropriate for the site (also identified in description) and the proposed long-term drilling program for the site. Identify the type and quantity of working fluid (refrigerant), if applicable.
- ❑ Identify any innovative design or special operational features that will be required at this site.
- ❑ Provide 3rd party resource assessment.
- ❑ Provide the detailed analysis used to support the estimate of net annual and monthly energy output of the geothermal project.
- ❑ List and quantify all sources of losses, including degradation, and provide the basis for the quantification.
- ❑ Provide a milestone schedule for permitting, contracting, engineering, field development, construction, and commissioning, as applicable.

Project Resource – Hydroelectric

- ❑ Provide a description of the planned (or existing) resource, plant configuration, commercial operation date (or year built), equipment, equipment ratings, number of units, location, license details, etc. Include relevant diagrams and drawings.
- ❑ Include a table of projected monthly and annual water flows (average, adverse, and favorable) over the term of the proposed power purchase contract (or life of asset), including any assumptions for such projections, and a conversion of such flows into kilowatts and kilowatt-hours.
- ❑ Provide the P50, P75, P90 and P10 annual generation projection for the project through

the contract term. ❑ Provide a 12X24 profile of the P50 facility generation in Excel format. ❑ Identify the organization responsible for data collection and analysis, the period over which the data was collected (or forecast), a discussion of the approach used for collecting data, and data quality assurance procedures. ❑ Describe the analysis used to determine the project head assumptions. ❑ Provide 3rd party resource assessment reports for the project. ❑ Does the project have a certificate from the Low Impact Hydroelectric Institute indicating the project meets the requirements for classification as a low impact hydroelectric project? If not, is the project seeking a certification from the Low Impact Hydroelectric Institute? ❑ Does the project qualify as a renewable energy resource (thus generating Renewable Energy Credits and/or associated Environmental Attributes)?
Biomass, Biogas and Solid Waste ❑ Describe the technology and project being proposed, include a description of major equipment, etc. ❑ Discuss the status of fuel supply and transportation contracts with potential suppliers and any contingencies that could affect the availability of fuel supply to the facility. Provide fuel supply pricing and basis for long-term price projection. Describe annual fuel availability. Include assumptions regarding any tipping fees related to procurement of fuel. Describe the fuel transportation infrastructure (in place or to be put in place). If contracts have not been signed, provide copies of correspondence or other materials from these parties that demonstrate their level of commitment to the project. If fuel procurement infrastructure is not in place, describe how it will be put in place and the risks associated with this. What actions are needed to ensure this new infrastructure is developed in a timely manner to support the scheduled in-service date of the project? ❑ Provide documentation that will enable PGE to evaluate project fuel suppliers for current and future production and delivery capabilities, and financial strength. ❑ Provide the P50, P75, P90 and P10 annual generation projection for the project through the contract term. ❑ Provide a 12X24 profile of the P50 facility generation in Excel format. ❑ Provide responses to applicable items in Section 4.
Wave Energy ❑ Describe the technology and project being proposed, include a description of major equipment, etc. Describe the equipment to be used and the layout of your wave project. Include the size, technology type and manufacturer of the individual wave turbine units: ❑ Provide a resource assessment report which includes adequate information to develop net annual and monthly energy projection. ❑ Provide the P50, P75, P90 and P10 annual generation projection for the project through the contract term. ❑ Provide a 12X24 profile of the P50 facility generation in Excel format.

4. Operations and Maintenance Reliability and Outages

Operations and Maintenance (O&M) and Outages
❑ Describe the long-term O&M and asset management strategy. ❑ Provide a list of major component repairs and/or replacements (Generator, Bearings and

Gearboxes) for life of the project.

- ❑ Describe the experience and expertise of the project's current (or proposed, if applicable) O&M operator and the recent operating experience(s) of the plant(s).
- ❑ Describe applicable safety programs and training for the plant staff to ensure both safety and proper operation.
- ❑ Does or would the project have a long or short-term service agreement with the vendor for major equipment? Please describe.
- ❑ Does (or would) the project have access to support from a centralized engineering staff? If so, please describe.
- ❑ Provide a list of the major critical spare parts held in inventory by the project, either at the site or at a common inventory location, or indicate if such parts are readily available from the vendor. What is the policy and approach on critical spare parts? Are spare transformers installed at the site for backup?
- ❑ See also proposed PPA terms regarding PGE's rights with regard to plant operation and plant operation and maintenance.

Outages

- ❑ Describe the normal annual maintenance outages planned for the project (or typically employed if an existing facility. Include the timing of the year and the expected duration of these outages. Scheduled maintenance is strongly preferred to NOT occur between November 1 and February 28, and between July 1 and September 30. Details to be discussed as part of PPA negotiation.

5. Credit and Financial Information

Developer Corporate Structure, Financials and Credit

- ❑ Provide a diagram demonstrating the ownership of the project company and any parent company relationships above the project company. Identify ownership interests (majority and minority) as well as partners involved in the project in the diagram. Identify the proposed credit support provider (if proposing a parent) as part of the diagram. Ensure that the relationship to Bidder is clear.
- ❑ Provide 3 years of audited financials and latest quarter financials of the parent company / credit support provider (subject to confidentiality agreement if not public financials) as well as a forward-looking description of liquidity and capital resources.
- ❑ Provide the unsecured credit ratings of the Bidder the Bidder's credit support provider, the developer and the development team, as applicable. Provide the most recent summary, opinion or update by S&P, Moody's, Fitch and DBRS, as applicable.
- ❑ Provide the DUNS number of the Bidder, the Bidder's credit support provider, developer and the development team, as applicable.
- ❑ Provide a comprehensive statement of Guarantor's total outstanding credit support
- ❑ Provide redline mark-up to the credit terms expressed in the applicable agreements and/or as part of proposal. Provide sufficient detail regarding performance assurance and credit terms in any proposed alternate structures. See also Appendix L.

Project Financing and Commitments

- ❑ Describe whether the Bidder intends to internally finance construction of the project(s), or if it plans to obtain project financing from another source. Identify the financier or potential financiers and plan to secure financing if required. Provide details about prior 3rd party financing experience. Identify the extent to which the developer is committed to providing additional funds if necessary to complete the project.
- ❑ Describe whether the Bidder intends to seek third-party tax equity investment for the project. Describe the Bidders experience with securing tax equity investors for renewable projects (number of projects, locations, MWs, approximate total size of tax equity

investment secured, etc.).

- ❑ Describe any existing commitments by financial institutions and provide documentation supporting these commitments. *In lieu* of such information, describe the plans for securing such commitments.
- ❑ Provide a list of projects in the development and construction phase, identifying the manufacturer(s)/vendors of the major components, counterparties in power sales agreement(s), the stage of completion of the project, the estimated operational date and the original estimated operational date.
- ❑ If the decision to proceed with the generating project depends on obtaining power purchase agreements with third parties other than PGE, please identify the amount of the project output that needs to be subscribed before the Bidder will proceed with construction, and the amount of firm commitments through executed agreements that the Bidder already has for output from the project.
- ❑ Identify the counterparty, product amount and term of each executed agreement. If such information is confidential, please provide a summary of amounts committed.
- ❑ List the name telephone number and contact information of the Bidder's Commercial bank, Financial advisor, Bond underwriter and/or other financial trustee, advisor, counsel or lender.

4. Proposals with Dispatchable Renewable Technology

Proposal

- ❑ Provide a description of the proposal.

.

Monthly Energy and Peak Capacity

- ❑ Provide a table displaying by month the monthly energy for the entire term of the bid, as well as the peak capacity in MW (if applicable) to be supplied under the bid proposal, as metered at the POD. If appropriate, include the guaranteed heat rate (Btu/kWh-HHV) at rated output in the table, accompanied by a heat rate curve.
- ❑ Provide the P50, P75, P90 and P10 annual generation projection for the project through the contract term.

Firm Proposal Output Variability

- ❑ Alternate proposals that offer a delivery schedule other than a flat schedule must include a clear description of the proposed delivery schedule and its relationship with the actual production of the project or projects used for delivery.

  Supply in a table the variation in energy output by month during on-peak and off-peak hours (see sample table, below).Expand upon the information provided in the table if this format is insufficient to fully describe the output variability of the bid.

Monthly Output Variability of the Bid (MWh)

Month	*Average Energy On-Peak Hours ending 07-22, Monday to Saturday (MWh)*	*Average Energy Off-Peak Hours ending 23-06 and all-day Sunday (MWh)*
January		
February		
March		

	April			
	May			
	June			
	July			
	August			
	September			
	October			
	November			
	December			

Temperature Impacts

- ❑ To the extent that the guaranteed quantity of energy, peak capacity (if applicable) or heat rate in the bid is dependent on ambient temperature, clearly identify and describe the relationship and provide estimates for the range of variation.
- ❑ At a minimum, provide an estimate for the quantity of energy, peak capacity (if applicable) and heat rate for a hot summer day and a cold winter day.

Power Product Quality

- ❑ If the Bidder is offering only a portion of the project's firm energy to PGE, describe each entity's rights to the firm energy produced by the project.
- ❑ Describe the process for coordinating the differing operational requirements of the purchasers.

Dispatch

Completely describe all dispatch and operating schedule flexibility that will be available to PGE by contract.

For dispatch or curtailment describe:

- Minimum run time per dispatch call:
- Minimum down time per curtailment:
- Startup time and costs for a cold start:
- Startup time and costs for a hot start:
- Cost impact of dispatch, if any:
- Ramping rates:
- Multiple party output issues:

For turn-down (operation at below 100 percent of base output), provide the following:

- Minimum turndown value:
- Maximum hour-to-hour adjustment:
- Cost impact of turndown, if any:
- Multiple party output issues:

Please provide Information about heat rate degradation for plant turn-down:

Other Factors

Identify and describe in detail the following, if applicable:

- ❑ Environmental restrictions.
- ❑ Operational limitations.
- ❑ Other factors relevant to resources supporting a bid that may prevent the resource from meeting its guaranteed monthly quantities of energy (or peak capacity, if applicable).

Environmental

- ❑ Discuss and describe status of project.
- ❑ Discuss known environmental issues related to the development and/or operation of the project.
- ❑ Describe environmental impacts of, and existing environmental constraints on, existing and proposed projects.

Air Quality

Complete the following table, and provide the information requested below (as applicable).

Emission Disclosures

Emission	*Lbs./MWh*
Sulfur Dioxide (SOx)	
Nitrogen Oxide (NOx)	
Carbon Dioxide	
Carbon Monoxide	
Volatile Organic Compounds (VOCs)	
Particulate Matter (PM)	
Hazardous Air Pollutants (HAPs)	
Solid Waste (i.e. ash)	
Other permitted emissions	
Mercury	

Describe the following:

- ❑ Air pollution controls used on the project, *e.g.*, type, emissions controlled and removal efficiency.
- ❑ Whether the proposed project will exceed any criteria of the National Ambient Air Quality Standards (NAAQS) for any pollutant when operating on either primary or backup fuel. Also describe the "Prevention of Significant Deterioration Increment Consumption" due to this project, as applicable.
- ❑ State whether the project requires a federal, state or local air permit. If relevant, Include a copy of this permit, if approved, or a copy of the permit application, if submitted.

19 Appendix H-1 – Technical Specifications for Owned Wind Resources

Template provided in a separate document available for download on PortlandGeneralRFP.accionpower.com.

Portland General Electric Company

WIND RESOURCE TECHNICAL SPECIFICATION**

Renewable Energy Resources

****NOTE: PGE's final issuance of the 2016 Request for Proposals (RFP) for Renewable Energy Resources is subject to Oregon Public Utility Commission approval of both the draft RFP and the Petition for Partial Waiver of the Competitive Bidding Guidelines, including the expedited RFP timeline.**

May 23, 2016

1. DEFINITIONS 3
2. APPLICABLE STANDARDS 6
3. SCOPE OF WORK 9
4. GEOTECHNICAL INVESTIGATION 17
5. WIND TURBINE FOUNDATIONS 20
6. CIVIL WORKS 23
7. ELECTRICAL BALANCE OF PLANT 31
8. HIGH VOLTAGE TRANSMISSION LINE 51
9. PLANT COMMUNICATIONS NETWORK 57
10. TELECOMMUNICATIONS FACILITIES 59
11. PLANT SCADA SYSTEM 63
12. WIND TURBINE EQUIPMENT 79
13. METEOROLOGICAL MASTS 90
14. ON SITE BUILDINGS 95
15. INSTALLATION, COMMISSIONING, AND PERFORMANCE TESTING 98
16. APPROVED SUPPLIERS 103
17. REQUIRED DOCUMENTATION 108

1. DEFINITIONS

As used in this document, the following terms have the meanings set forth below. Other capitalized terms used and not defined herein have the meanings given to them in the form of Engineering, Procurement and Construction Contract included in the RFP.

Agreement	The agreement to be executed by Owner and Contractor, pursuant to which Contractor will construct the Project. To the extent applicable, the Agreement will be based on the form of Engineering, Procurement and Construction Contract included in the RFP.
Applicable Standards	As defined in Section 2
BOP	Balance of Plant - All aspects of the Work, excluding the WTG Works. Includes civil, electrical, SCADA, and other equipment, systems, and buildings which enable all other work.
BOP Civil Works	Those aspects of the BOP Works relating to the civil infrastructure
BOP Electrical Works	Those aspects of the BOP Works relating to the electrical system
BOP Works	All Work required to allow for the WTG Works (from the interface points at the Wind Turbines) and connection to the Point of Interconnection and operation of the Wind Power Plant
Certification Body	An independent organization which is a recognized body to approve the design of a Wind Turbine against a recognized set of design codes.
Contractor	As defined in the Agreement
Contractor's Specifications	The documents to be attached to the Agreement which fully define the equipment being supplied and installed by Contractor.
Design Life	As defined in Section 3.3.1.
Development Met Masts	Met Masts already installed at the Site prior to Site mobilization
Electrical Works	Those aspects of the Work relating to the electrical system
EMS	Energy Management System
Equipment	The machinery or apparatus brought by Contractor onto the Site to perform the Work, and, where applicable, requiring removal afterwards
ERP	Emergency Response Plan
FAT	Factory Acceptance Test
GA	General Arrangement
Grid	As defined in the Agreement
GUI	Graphical User Interface
HMI	Human Machine Interface
HSE	Health, Safety and Environment
HSEMP	Health, Safety and Environment Management Plan
HSMP	Health and Safety Management Plan
HV	High Voltage. Defined within this specification as the nominal grid connection voltage
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
kV	Kilovolt
LV	Low Voltage

MEASNET	International Network for Harmonised and Recognised Measurements in Wind Energy (www.measnet.org)
Meteorological Station	As defined in Section 12
Met Mast	Having the same meaning as Meteorological Station
MTBF	Mean time between failures
MTTR	Mean time to repair
MV	Medium Voltage
MW	Megawatt
NDT	Non-Destructive Testing
O&M	Operation and Maintenance
OEM	Original Equipment Manufacturer
OHL	Overhead Line
OHS	Occupational Health and Safety
OLTC	On Load Tap Changer
Operations and Maintenance Building	The building required to be provided by Contractor for use by the Maintenance Provider and as detailed in this document
OPGW	Optical fiber composite over-head ground wire
Owner	As defined in the Agreement
Owner's Representative	A representative of Owner, appointed by Owner, to serve as an interface with Contractor with respect to the Work
POI	Point of Interconnection as defined in the Interconnection Agreement
Performance Test	The tests defined in the Agreement to verify performance of the Work as described in this document
Permanent Met Mast	Met Masts connected to the SCADA system for operation of the Wind Power Plant and as defined in Section 13
Plant	The Equipment which Contractor is required to provide and hand over to Owner as part of the permanent Work
Project	As defined in the Agreement
Project Schedule	As defined in the Agreement
Reactive Plant	The Work required to meet the requirements of reactive power control and voltage support
Registered Professional Engineer	Licensed as a Professional Engineer in the corresponding engineering discipline of the design work being undertaken. The Registered Professional Engineer shall be in responsible charge of the work, and have competence in the discipline of the work being performed as defined by laws and regulations in the jurisdiction of the project location.
RTU	Remote Terminal Unit
Turbine SCADA	Supervisory Control And Data Acquisition from the Turbine Manufacturer
Substation SCADA	Supervisory Control And Data Acquisition for the Project Substation
Section(s) of Works or Sections	To describe a part, or parts, of the Work as agreed by Owner and Contractor such that the overall objective is to progressively complete the Work and enable groups or sections of Wind Turbines to be brought into operation as early as possible
Site	The immediate area upon which the Wind Power Plant is located including access roads, Substation, O&M and other associated buildings.

Site Access Point	Entrance to the Site
Site Specific Design Assessment	A Site specific statement of compliance for the design assessment from a Certification Body in accordance with the latest edition of IEC 61400-22 which demonstrates that the combined system of Wind Turbine and Wind Turbine tower is designed to withstand the Site Conditions for the full Design Life
SLD	Single Line Diagram
SIEM	Security Incident and Event Manager
Substation	Means the area and equipment included in the following works: HV switchgear, MV/HV transformer, MV swithchgear and associated equipment, reactive plant (if required), the control building, the auxiliary MV/LV transformer/s, diesel generation set and all items associated with it as described in this document.
Temporary Met Mast	Temporary Met Masts as defined in Section 13 for the purpose of site calibration installed in accordance with IEC 61400-12-1
TSP	Transmission Service Provider
Turbine Foundation	The Work required to support the Wind Turbine and Wind Turbine tower
UPS	Uninterruptable Power Supply
VT	Voltage Transformer
Wind Power Plant	The Wind Turbines and all associated BOP infrastructure up to the Point of Interconnection for the Project
Wind Power Plant Communications Network	As defined in Section 9
Wind Power Plant Electrical System	All Electrical Works included in the Work associated with the transmission of power from the Wind Turbines to the POI and the control and monitoring of the transmission of power from the Wind Turbines to the POI as described in this document.
Wind Turbine	Wind turbine generator unit which consists of the rotor, nacelle, yaw system and tower including all associated electrical, safety, access, control equipment and other systems contained within or attached to the nacelle, tower and/or Turbine Foundation (alternatively Wind Turbine Generator or WTG)
WTG Works	All Work related to the Wind Turbines including but not limited to their installation, commissioning, and testing necessary for their operation
Work	As defined in the Agreement

2. APPLICABLE STANDARDS

The "Applicable Standards" are the standards applicable to the Work, as determined by the agencies having jurisdiction in the region of the Project and as contained in the applicable:

- Laws and Regulations (defined in section 2.1 below)
- United States Standards and Codes (defined in section 2.2 below)
- International Standards and Codes (defined in section 2.2 below), and
- Industry Codes (defined in section 2.2 below)

Where a reference to the above is made in this document the latest edition shall apply.

Furthermore in the event of any discrepancy in the Applicable Standards, the most stringent standards and requirements shall apply.

Contractor shall be responsible for ensuring that the Work comply with all Applicable Standards and as these may be amended and revised from time to time.

The Applicable Standards are in addition to the requirements set forth in the Agreement, this document, including any additional standards, the Permits, and the Specifications.

Any the event of any departure from Applicable Standards the referenced codes and standards must be fully explained in writing and submitted for Owner's review and approval prior to implementation.

2.1 Laws and Regulations

2.1.1 As amended from time to time, all laws, rules, regulations and orders having force of law in the state which the Project is located that directly or indirectly apply to the Work. The Work shall comply with all applicable laws and regulations, including, but not limited to:

- Occupational Safety and Health Regulations
- Electricity Regulations
- Environment Regulations
- Civil Aviation Authority
- Road Authority
- Military Authority
- Communications Authority
- Local civil government authorities

2.2 Codes and Standards

2.2.1 The Work shall comply with all applicable local codes and standards, including, but not limited to the relevant standards and codes of practice of the:

- International Building Code, as modified by state and local authorities
- National Electrical Code, as modified by state and local authorities
- National Electric Safety Code, as modified by state and local authorities

2.2.2 or where relevant local standards and codes of practice do not exist the relevant standards and codes of practice of the:

- ANSI
- IEEE
- AIC

- NFPA
- ASTM – American Society for Testing of Materials
- OSHA
- ISO
- IEC 61400-1
- IEC 60287-3-2 Economic Optimisation of Power Cable Size
- IEC 60826 - Design criteria of overhead transmission lines
- IEC 61400-1 Wind Turbines - Part 1: Design requirements
- IEC 61400-11 Acoustic noise measurement techniques
- IEC 61400-12-1 Power performance measurements of electricity producing wind turbines
- IEC 61400-21 Measurement and assessment of power quality characteristics of grid connected wind turbines
- IEC 61400-22 Conformity testing and certification
- IEC 61400-24 Lightning protection

2.2.3 The Work shall comply with all latest applicable industry codes, including, but not limited to the following standards:

- ASCE-AWEA RP 2011, Recommended Practice for Compliance of Large Land-based Wind Turbine Support Structures;
- ACI 318-11: Building Code Requirements for Structural Concrete
- DNV OS C502 (2010):Offshore Concrete Structures (for fatigue requirements of onshore wind turbine foundations)
- FIB Model Code for Concrete Structures, 2010
- ASCE 7: Minimum Design Loads for Buildings and Other Structures
- DNV GL: Guidelines for the Certification of Wind Turbines, 2010
- DNV GL Standard DNV GL-ST-0126: Support Structures for Wind Turbines, Edition April 2016
- ASTM Annual Book of Standards, Volume 4.08 Soil and Rock (I):D420-D5876 and Volume 4.09 Soil and Rock (II) D5877-latest
- US Federal Highway Administration, Gravel Roads Construction and Maintenance Guide, August 2015
- Bulletin 1724E-200, Design Manual for High Voltage Transmission Lines, US Department of Agriculture, Rural Utilities Service, Electric Staff Division, December 2015
- National Electrical Safety Code, 2012 Edition, IEEE
- ASCE 48-11 – Design of Steel Transmission Pole Structures
- ASCE Manual No. 74 - Guidelines for Electrical Transmission Line Structural Loading, 2010, Third Edition
- IEEE-738 - Standard for Calculating the Current-Temperature Relationship of Bare Overhead Conductors
- RUS Bulletin 1724E-200 – Design Manual for High Voltage Transmission lines
- IEEE P1863 - Guide for Overhead AC Transmission Line Design
- IEEE Std. 524, 1992 - IEEE Guide to the Installation of Overhead Transmission Line Conductors,

2.3 Engineer of Record

2.3.1 All engineering shall be performed under the responsible charge of the engineer of record, who shall be a registered professional engineer, registered in the corresponding discipline for the reports or drawings produced, and the state(s) in which the site is located. The registered professional engineer shall have experience and competence in the area of engineering being performed as defined by laws and regulations of the applicable jurisdiction.

2.3.2 Final "Issued for Construction" engineering drawings and reports shall be signed and stamped by the registered professional engineer in responsible charge of the engineering work.

3. SCOPE OF WORK

Contractor is responsible for the engineering, procurement and construction of the Project. It is not the intention of this section or document to specify all details of design and construction of the complete Project. However, the Work shall conform in all respects to high standards of engineering, design and workmanship and be capable of performing in continuous commercial operation meeting all contractual obligations of Contractor including guarantees and warranties in a manner acceptable to Owner.

If there are other or different requirements than are specified in this document or Agreement (including any exhibits thereto) that are necessary in order to provide Owner with a System that: (i) has no Defects, (ii) reflects Prudent Industry Practices; and (iii) is capable of performing on a sustained, fully operational basis to generate the electricity as described in the Agreement, Contractor is to satisfy such requirements as part of the Work.

3.1 General

3.1.1 The Work supplied by Contractor shall achieve the objective of connecting the Wind Power Plant to the POI for the purpose of generating electricity into the network and be of a proven, robust and reliable design incorporating protective systems and devices with adequate factors of safety and operability built-in. Work will include, but not be limited to:

- The engineering, procurement, and construction of the BOP
- The supply, delivery, and installation of the Wind Turbines
- The engineering, procurement, and construction of the O&M Building
- Transmission line between the collection substation and interconnection

3.1.2 The Work shall be carried out in accordance with and meet the requirements of the following:

- The Agreement including but not limited to this document
- Applicable Standards
- Warranty obligations
- Land lease and easement agreements
- Wind Turbine technical specifications
- The Project geotechnical constructability study
- The Project grid interconnection agreement

3.1.3 Contractor shall be responsible for obtaining all relevant permits and authorizations required to undertake the Work.

3.1.4 Contractor shall be responsible for the actions required to enable the engineering, procurement and construction of the Work.

3.1.5 Contractor shall be responsible for all reclamation activities as required for all areas disturbed during the Work.

3.1.6 Contractor shall be responsible for the establishment of appropriate O&M procedures, quality management system documentation and warranties for the Work.

3.1.7 Contractor shall plan and execute its own Work so as to minimize the effect of work by others on its own operations and the effect of its work on the operations of others.

3.1.8 All equipment supplied by Contractor shall be supplied new, complete and operational and shall include all necessary accessories and incorporate all miscellaneous material, minor

parts and other such items, whether or not the items are indicated on the drawings or in this document, where it is clearly the intention that they should be supplied or where they are required and necessary to complete and commission the equipment.

3.2 Project Description

Owner is requesting proposals for a newly constructed wind power project meeting all requirements of the Agreement including but not limited to those listed in this document.

3.3 Site Conditions

Contractor will ensure that all aspects of the Work are fit for purpose and suitable for the current and reasonably predicted conditions at the Site through inspection, examinations, investigations, explorations, surveys, tests, studies and data collection. All inspections, examinations, investigations, explorations, surveys, tests, studies and data collection will be included in Contractor proposal and thus, Contractor will not be entitled to any scope change based on results included in these investigations.

It is Contractor's responsibility to ensure that all aspects of the Work are suitable for the existing and predicted conditions of the Site including but not limited to:

- Climatic (including, but not limited to, both local and regional wind and snow loading)
- Environmental
- Community acceptance and impact
- Geotechnical
- Transmission, and
- Hydrological conditions

3.3.1 If aerial survey techniques are employed, Contractor will validate aerial survey data with ground based data collection.

3.4 Design Life

Contractor will design, engineer, procure, and construct the Project according to the following intended design life:

3.4.1 Civil Works (including Turbine Foundations): 30 years

3.4.2 Electrical Works (including collection system, substation, and communications): 30 years

3.4.3 Wind Turbines: 20 years

3.4.4 O&M Building: 30 years

3.4.5 Transmission Line: 60 years

3.5 Maintainability

3.5.1 The Work shall be provided by Contractor to allow maintenance to be performed safely and efficiently without significant dismantling or disruption to other items or parts of the Work or unduly curtailing power generation.

3.5.2 The Work shall allow maintenance activities that can be performed by a limited crew using mobile plant and operating in remote locations.

3.5.3 Contractor shall provide sufficient access around all of the Work, in accordance with good utility design practice and Applicable Standards, to allow effective maintenance and

removal of items from service or parts thereof, while maintaining operation of the Work unaffected by maintenance tasks.

3.6 Facility Safety

The Work designed and provided by Contractor shall ensure satisfactory operation in which safety of personnel and Work and continuity of service are the first considerations, and equally to facilitate inspection, cleaning, maintenance and repairs.

3.6.1 The design shall incorporate industry best practices for the safety of all those concerned in the operation and maintenance of the Work and of related works supplied under other contracts.

3.6.2 The Work shall be designed and constructed so that they comply with all relevant health and safety requirements.

3.6.3 Contractor shall undertake risk assessments and processes in accordance with the relevant standards to ensure that the design complies with the safety requirements of Applicable Standards and this document.

3.6.4 All items supplied by Contractor shall be designed to ensure satisfactory operation under the environmental conditions prevailing at the Site and under such variations of load as may be met with under working conditions on the system including those due to synchronization and electrical faults including short circuit.

3.6.5 Safe operation shall not rely on the connection of the Wind Turbines to the SCADA system or a remote monitoring center.

3.7 Permits

Contractor will obtain and maintain, at its sole cost, all permits required to design, engineer, procure, and construct the Project.

3.8 Project Management Plan

3.8.1 Contractor shall develop a project management plan for the management and execution of all phases of the Work and shall address as a minimum:

- Construction project manager and key team members
- Communication
- Permits, licenses, certifications and agreements required
- Procurement and sub-contracting
- Project schedule and payment milestones
- Resource loading
- Environment, health and safety
- Management of interfaces

3.9 Project Schedule

Contractor shall develop a Project Schedule which shall be used as the baseline for tracking progress through the design, engineering, procurement, and construction of the Work.

3.10 Project Milestones

3.10.1 Contractor will define milestones with associated completion certificates to include, as a minimum:

- Public road completion
- Access road completion
- Individual Wind Turbine foundation completion
- Collection circuit completion
- Substation completion
- Transmission line completion
- Individual Wind Turbine mechanical completion
- Individual Wind Turbine final completion
- Substantial completion
- Final completion

3.10.2 Contractor will provide a guaranteed Project Substantial Completion date with associated damage provisions. Project Substantial Completion will be achieved after all Wind Turbines comprising the Work have achieved foundation completion and mechanical completion; all public and access roads, collection circuits, the substation and the transmission line have been completed, all Wind Turbines are connected and synchronized with the grid, commercial operation has been achieved according to the Project interconnection agreement, and Contractor and Owner have agreed upon a final punch list.

3.11 Quality Control

3.11.1 Contractor shall operate a quality system equivalent to the ISO 9000 series of standards and as approved by Owner.

3.11.2 Contractor's quality assurance / quality control plan will be adequate to cover all construction operations.

3.11.3 Contractor will submit all quality assurance / quality control documentation to Owner to show compliance with the requirements of this document.

3.12 Reporting

At a minimum, Contractor will provide weekly progress reports throughout the design, engineering, procurement, and construction activities, as well as "plan of the day" reports daily during the construction period.

3.13 Training

3.13.1 Contractor will develop and provide training to Owner personnel in the safe operation of Project equipment including but not limited to the Electrical Works, Substation, and Wind Turbines.

3.13.2 Contractor will involve Owner's personnel during Project start-up activities.

3.13.3 Contractor will provide training materials and manuals for all equipment provided by Contractor, to facilitate a smooth transition of operational responsibility from Contractor to Owner.

3.14 Design & Engineering

3.14.1 Contractor will complete design and engineering services and will provide comprehensive drawings and specifications for a complete and fully operational Project that meets the requirements of the Agreement including those listed in this document (see Section 17).

3.14.2 Contractor will submit 30% (preliminary) design packages for the entirety of the Project for Owner review. Such packages will include, at a minimum, drawings, specifications, and assumptions.

3.14.3 Contractor will submit 75% (issued for review), 90% (issued for procurement), and 100% (issued for construction) design packages for the entirety of the Project for Owner review. Such packages will include, at a minimum, drawings, specifications, design calculations, materials, and assumptions. 100% (issued for construction) design packages shall be issued prior to the commencement of construction.

3.15 Project Documentation

Contractor shall provide documentation, including engineering and design information, as it is developed and issued throughout the Agreement from the beginning of engineering to Project completion, to:

- Enable verification of compliance of the Work with the Agreement and this document
- Provide comprehensive documentation of all aspects of management, engineering, procurement, construction and performance, for Owner's future use in fully and solely operating and maintaining the Work

Required Project documentation is detailed in Section 17. For any documentation that is not available at the time of bid proposal, Contractor will provide justification.

3.16 Design Engineering Submittals

Each submitted drawing shall be unique and shall be clearly marked with the name of the project, facility name, facility designation, specification title, specification number, project equipment or structure nomenclature, component identification numbers and Owner's name.

3.16.1 Engineering Design Document and Drawings Formats

Drawings shall adhere to Owner's CAD Standards. All Contractor and Subcontractor drawings (including shop fabrication drawings) shall be submitted in the following formats:

- Drawings: AutoCAD Drawings (*.dwg) – the latest version as specified by Owner
- 3D Models: Navisworks (*.nwd), AutoCAD (*dwg), AutoDesk Design Web Format (DWF)
- Raster Image Files: Tag Image File (*.tif, *tiff)
- Adobe Portable Document Format (*pdf)

3.16.2 Document Format

Typical project lists shall be submitted in MS Excel format. Examples include, but are not limited to:

- Spare Parts
- Special Tools List
- Electrical Load Lists
- Equipment List

- Instrument List
- Lubrication Schedule
- DCS I/O List
- Cable and Conduit Schedule

All PDF documents shall be unlocked, indexed, word searchable and editable. Project lists shall be submitted in MS Excel format.

3.16.3 Manuals

The electronic versions of the O&M manuals shall be word searchable PDF format, fully indexed and shall not be protected. The index shall link to the pages referenced in the index and the bookmarks shall coincide with the required tabs in the paper form.

Manuals which contain information on multiple manufacturer models shall have the model used at Project highlighted. Manuals shall include as a minimum:

- Maintenance intervals and tasks; including
- Procedures
- Tool
- Inspection criteria
- Troubleshooting guide
- Condition monitoring intervals and tasks, including procedure and criteria

3.16.4 Equipment Numbering

Contractor shall use Owner's equipment numbering scheme for all equipment. Owner's equipment numbering scheme shall also be on all Contractor drawings.

3.16.5 Equipment Information

Contractor shall provide, as a minimum, the information shown in the Project equipment list template for all equipment supplied for the Project.

Contractor shall supply all spare parts and bill of materials for the Project.

3.17 Health, Safety and the Environment

3.17.1 Contractor shall have and maintain documentation detailing its HSE system and if combined, Contractor's policy is expected to have two separate and distinct sections related to: (1) Health and Safety and (2) the Environment.

3.17.2 Contractor shall be responsible that the health and safety requirements extend to all sub-contractor Work associated with or included in the Agreement.

3.17.3 If requested, Contractor will be required to provide documentary evidence to show compliance with the requirements of this document.

3.17.4 Contractor is required to have an operational HSE management system including, at a minimum a method for the identification of hazards during the execution of the Project and subsequently through the Design Life of the Work through risk assessments, hazard reporting, planned inspections, regular maintenance of the Work, and personnel qualification reviews.

3.17.5 Contractor shall have the following management plans submitted and approved by Owner prior to commencing the Work:

- A Health and Safety Management Plan (HSMP);

- An Environment Management Plan (EMP); and
- An Emergency Response Plan (ERP).

3.17.6 Both the HSMP and the EMP shall be specific to the Agreement and Work.

3.17.7 The HSMP and EMP shall be reviewed at regular intervals as agreed between Owner and Contractor to ensure that it remains current and relevant to the Work.

3.17.8 The HSMP and EMP shall establish the process for incident reporting in accordance with the Agreement requirements.

3.17.9 A formal risk register shall be created and used to record the identified hazards, risk assessment and risk control methods to be employed by Contractor throughout the duration of the Work.

3.17.10 Contractor shall provide a description of Contractor's permitting system and safe work procedures for the applicable high risk work associated with the Agreement (e.g. management of hazardous substances, working at height, confined spaces, extremes of temperature and electrical switching, other where relevant).

3.17.11 Contractor shall notify Owner immediately of any incident, involving injury, property or environmental damage or near miss incidents that had the potential to impact HSE, which occurs during the carrying out of the Work.

3.17.12 Contractor shall comply with all relevant Applicable Standards and its obligations under the Agreement including this document for the handling, storage and disposal of hazardous materials and solid waste.

3.17.13 Contractor shall be responsible for the safe disposal of all waste, toxic and hazardous materials during the course of the Work. Such disposals shall be in accordance with the requirements of the relevant Government Authorities.

3.17.14 Contractor shall be responsible for obtaining all approvals, permits or other authorizations required for the disposal of waste.

3.17.15 Contractor shall be responsible for providing adequate fire protection equipment for protection of the Work during the course of the Work including any requirements stipulated in the planning permit such as the supply of fire water tanks.

3.18 Delivery, Storage and Handling

3.18.1 Delivery

Contractor shall bear the responsibility for delivery of equipment, spare parts, special tools, and materials to the site and shall comply with the requirements specified herein and shall provide required information concerning the shipment and delivery of the materials specified in this Agreement. These requirements also apply to any sub-suppliers making direct shipments to the jobsite.

Owner shall, from time to time, at their discretion supply equipment, spare parts, special tools, and materials to the site. Contractor shall coordinate receipt of such items and shall apply all requirements set forth herein to those items.

Contractor shall, either directly or through contractual arrangements with others, accept responsibility for the safe handling and protection of the equipment and materials furnished under this Agreement by Contractor before and after receipt at the port of entry. Acceptance of the equipment shall be made after it is installed, tested, commissioned, placed in operation and found to comply with all the specified requirements.

All items shall be checked against packing lists immediately on delivery to the site for damage and for shortages. Damage and shortages shall be remedied with the minimum of delay, at no additional cost to Owner when it is Contractor supplied.

Delivery of portions of the equipment in several individual shipments shall be subject to review of Engineer before shipment. When permitted, all such partial shipments shall be plainly marked to identify, to permit easy accumulation, and to facilitate eventual installation.

3.18.2 Storage

Upon delivery, all equipment and materials shall immediately be stored and protected by reasonable means until installed in the Work. It is assumed that all materials can be received and stored at the project site. If offsite storage is required, it shall be coordinated and approved by Owner.

Stacked items shall be suitably protected from damage by spacers or load distributing supports that are safely arranged. No metalwork (miscellaneous steel shapes and reinforcing steel) shall be stored directly on the ground. Galvanized steel with architectural purposes shall be stored with appropriate spacers to protect against galvanic discoloring. Galvanic discoloring is not applicable to ground mount array piles for which some discoloring is acceptable. Masonry products shall be handled and stored in a manner to hold breakage, chipping, cracking, and spalling to a minimum. Cement, lime, and similar products shall be stored off the ground on pallets and shall be covered and kept completely dry at all times. Pipe, fittings, and valves may be stored outdoors, but must be placed on wooden blocking. PVC pipe, geomembranes, plastic liner, and other plastic materials shall be stored off the ground on pallets and protected from direct sunlight.

Motors, electrical equipment, and all equipment with antifriction or sleeve bearings shall be stored in weathertight structures maintained at a temperature above 60°F [16°C]. Electrical equipment, controls, and insulation shall be protected against moisture and water damage. Space heaters furnished in equipment shall be connected and operated appropriately to protect equipment from condensation.

Equipment having moving parts, such as gears, bearings, and seals, shall be stored fully lubricated with oil, grease, etc., unless otherwise instructed by the manufacturer. Manufacturer's storage instructions shall be followed by Contractor.

Equipment and materials shall not show any pitting, rust, decay, or other deleterious effects of storage when installed in the Work.

When applicable and reasonable, the packaging of spare units and spare parts shall be suitable for long-term storage in a damp location. Each spare item shall be packed separately and shall be completely identified on the outside of the container.

3.18.3 Handling

Stored items shall be laid out to facilitate their retrieval for use in the Work. Care shall be taken when removing the equipment for use to ensure the precise piece of equipment is removed and that it is handled in a manner that does not damage the equipment.

4. GEOTECHNICAL INVESTIGATION

4.1 General

The Project shall have a site specific design level geotechnical investigation completed to evaluate geotechnical conditions for wind turbine foundations, electrical collection system, electrical transmission, substation foundations, operation and maintenance facilities, and project civil infrastructure including roads and drainage facilities.

4.1.1 Document Review

A document review shall be conducted consisting of available geotechnical and geologic documentation, which at a minimum includes the following:

- Historical and current aerial imagery
- Regional geologic maps
- Soil survey reports
- Groundwater hydrology data and maps
- Landslide hazard maps (as applicable)
- Karst hazard (sinkhole) maps(as applicable)
- Mine subsidence maps (as applicable)
- Seismic hazard maps
- Other applicable geotechnical and geologic mapping

4.1.2 Geotechnical Hazards

All geotechnical hazards that may affect the project shall be included in the geotechnical study and report, with recommendations for mitigation as applicable. Geotechnical hazards shall include, at a minimum:

- Seismic hazard and seismic effects (ground shaking, liquefaction, tsunami, seismic induced slope instability, etc.)
- Landsliding and slope instability
- Flooding and debris flow
- Foundation settlement and land subsidence
- Expansive soils
- Corrosive soils
- Any other geotechnical hazards that may affect the project

4.1.3 Geotechnical Exploration

For all wind turbine locations, geotechnical exploration shall consist of a minimum of one exploration point per turbine foundation, or more as necessary to characterize soil and bedrock conditions within the foundation influence zone. All subsurface exploration shall be located within the turbine foundation footprint, in accordance with and have a minimum depth of 50 feet below the ground surface, and be sufficiently deep to capture all soil and bedrock materials that can influence foundation behavior. The drilling method chosen shall be capable of achieving the minimum exploration depth without encountering refusal. Samples shall be taken at regular intervals to characterize materials within the soil and bedrock profile. Minimum sampling in soil materials shall include standard penetration testing at a maximum spaced interval of 2.5 feet, and 5.0 feet to the total boring depth, or more often as determined by the Geotechnical Engineer. Core borings in bedrock materials shall include a continuous core run, logged to determine sample recovery and assess the character of the bedrock materials. Rock or soil drilling without sampling (percussion, air-track or similar) is not considered suitable for geotechnical

exploration without prior owner approval. A boring log shall be prepared for each exploration point that includes all geologic and geotechnical observations, sampling information (sample type, blow counts, etc.), groundwater observations, and boring completion information. All exploration locations shall also be plotted on a map of the project site.

If groundwater is detected within the foundation influence zone during geotechnical exploration, a standpipe piezometer shall be installed to monitor groundwater fluctuation that could affect foundation stability and bearing capacity.

In-situ testing, including cone penetration testing, dilatometer, pressuremeter, vane shear and other in-situ test methods shall be supplemented with a minimum of 10 percent borings with sampling to correlate soil material properties to the in-situ tests.

4.1.4 Geophysical Testing

Seismic testing, including downhole seismic, seismic CPT, and surface methods should be conducted at minimum of 10 percent of proposed sites in order to determine shear and compression wave velocity of the subsurface materials. The shear and compression wave velocities shall then be used to determine dynamic shear modulus and be input into dynamic analyses of foundation stiffness.

Geophysical testing, including seismic velocity testing, electrical imaging, or other appropriate methods may also be used by the Geotechnical Engineer to assist in determining soil properties for turbine foundation design. Geophysical investigations should be carried out by a licensed professional with specific experience in the geophysical method to be used. Geophysical methods shall only be used to supplement the subsurface exploration program and not be used as the only means of geotechnical exploration.

4.1.5 Groundwater Considerations

Effects of groundwater shall be accounted for in the foundation design and considered in construction of the project. Monitoring of groundwater levels may be necessary over a minimum year period to capture seasonal fluctuation in groundwater levels. The geotechnical engineer should determine the design groundwater level, which shall take into account seasonal fluctuation as well as long term groundwater levels, and shall account for any buoyancy effects resulting from the design groundwater level.

4.1.6 Geotechnical Laboratory Testing

Laboratory testing should be conducted on samples from soil borings gathered during the subsurface exploration program to determine engineering properties for design of the proposed foundations. Laboratory testing should be sufficient to characterize all soil types and layers that may have an impact on the foundation design.

The following laboratory tests should be included in the soils laboratory testing program, as applicable:

- Moisture content and unit weight (all relatively undisturbed samples)
- Plasticity indices (minimum of 10 representative samples)
- Grain size analysis (minimum of 10 representative samples)
- Shear strength (unconfined, triaxial, direct shear, vane shear, etc.) (minimum of 10 representative samples)
- Consolidation/settlement characteristics (minimum of 10 representative soil samples)
- Hydrocollapse (as appropriate, minimum of 10 representative soil samples)
- Compaction characteristics (maximum unit weight, optimum moisture content, etc.) (minimum of 10 representative samples of potential backfill materials)

- Corrosivity characteristics (Sulfate, chloride, pH, resistivity, etc., minimum of 10 representative samples)
- Other geotechnical laboratory testing as appropriate.

4.1.7 Geotechnical Recommendations

Geotechnical engineering recommendations shall be provided in the geotechnical report for the following for incorporation into design of the project:

- Foundation bearing capacity
- Foundation total and differential settlement estimates
- Soil shear modulus (for wind turbine foundation stiffness calculations)
- Shear modulus degradation factor
- Seismic parameters in accordance with ASCE 7 and local standards
- Design groundwater level, and recommendations for construction dewatering
- Foundation subgrade recommendations
- Mitigation measures for expansive soils
- Mitigation measures for soil corrosion of concrete and buried metal
- Recommendations for gravel and paved roads
- Recommendations for site building foundations
- Recommendations for substation foundations
- Recommendations for transmission line foundations, as applicable
- Ground improvement recommendations, as applicable

5. WIND TURBINE FOUNDATIONS

The Wind Turbine foundations shall meet the requirements of this section and Section 6. Where applicable the requirements of this section modify and/or replace the requirements of Section 6.

5.1 General

5.1.1 The Wind Turbine foundations shall be designed, built and constructed in accordance with local and international industry standards of care, best practice and guidelines.

5.2 Design

5.2.1 Wind Turbine foundations shall be designed to support the Wind Turbines for all anticipated loads consistent with the information provided in this document and as determined by Contractor's own geotechnical and site investigations.

5.2.2 The foundation designer shall prepare a design basis document to outline all references, design procedures, and software tools to be utilized for the design and analysis of wind turbine foundations.

5.2.3 The design shall withstand any seismic loading associated with the Site and Contractor shall make its own assessment of the likely ground accelerations based on the greater return period of: 475-year return period as specified in IEC 61400-1, or as specified in the applicable state and local standards.

5.2.4 The Wind Turbine foundations shall be designed to consider all relevant design factors, including but not limited to:

- The above-mentioned ultimate limit state, serviceability limit state, and fatigue limit state loads, as required by the turbine supplier;
- The required degree of rotational stiffness with respect to:
  - The site geotechnical conditions, and
  - The Wind Turbine specification and turbine supplier's foundation requirements
- Allowable stresses for the supporting soils
- The stability of the foundation
- shear modulus degradation of soils
- Flexure and shear in the foundation
- Resistance to tower anchorage pullout
- Seismic loading
- The presence of groundwater (buoyancy effects)
- Load transfer reinforcement to transfer loads into the foundation
- Fatigue in the embedded foundation inset or anchor bolt cage and reinforcement
- Fatigue in rock anchors(if applicable)
- Crack control in the reinforced concrete
- Accommodation of cable ducts as required by the Wind Turbine manufacturer
- Accommodation of the grounding requirements of the Wind Turbine manufacturer
- Accommodation, where applicable, for the installation of Temporary Met Masts as required for the Power Performance Measurements and Site Calibration
- Avoidance of ponding within the foundation influence zone

- The density of the backfill over the top and at the sides of the foundation and its control and achievement on site
- The need to safely access and construct the foundation at all stages of its construction

5.3 Excavation, Ponding and Reinstatement

The excavations shall involve stripping vegetation, topsoil and subsoil, storing each separately and further excavation or piling to a suitable bearing stratum.

5.3.1 Following excavation and prior to a lean concrete slab layer (mud mat) the substrate shall be inspected by a suitably qualified geotechnical engineer to verify the findings of any geotechnical studies and specifically as it relates to the Wind Turbine foundation design.

5.3.2 Following excavation to the design founding level, a lean concrete slab layer (mud mat) layer shall immediately be poured to prevent softening or drying of the foundation.

5.3.3 After construction of the foundation, the top and sides of the foundation shall be backfilled as appropriate to the design with compacted material at a controlled density before reinstatement of topsoil and re-seeding, with due allowance for the crane hardstand pavement and other associated infrastructure.

5.3.4 In the event of ponding, the excavation shall be drained before foundation construction commences. Debris, weak, softened or disturbed material shall also be removed and replaced with suitable material, as appropriate.

5.4 Blasting

5.4.1 Owner shall be notified in advance of any blasting work anticipated for the project Site.

5.4.2 Blasting plans shall be prepared by Contractor for all anticipated blasting work to be conducted for the project.

5.4.3 Contractor shall obtain and provide for all needed permits and licenses required for blasting.

5.4.4 Storage of explosives and blasting materials shall be consistent with applicable federal, state and local laws and regulations.

5.4.5 All blasting shall be conducted in accordance with Owner approved blasting plan, and applicable permits.

5.4.6 Blasting shall only be performed by appropriately licensed and qualified persons experienced in the use of blasting for rock excavation.

5.4.7 The geotechnical engineer shall approve of material resulting from blasted excavations prior to use as general fill material. Recommendations from the geotechnical engineer regarding the use of blasted material shall be followed when using the blasted material as fill or other use on the project site.

5.5 Formwork

5.5.1 Shall meet the requirements of Section 6.2.

5.6 Reinforcement

5.6.1 Shall meet the requirements of Section 6.3, except where the following requirement takes precedence.

5.6.2 No reinforcement in the wind turbine foundation shall be welded.

5.7 Welding

Where welding is necessary for fabrication of any Wind Turbine foundation component other than foundation concrete reinforcement:

5.7.1 All structural or load bearing welds shall meet the AWS D1.1 Structural Welding Code for steel (current edition at time of bid).

5.7.2 All welds shall be identified per the AWS Code and or be clearly marked on a drawing as applicable in accordance with an established procedure. This procedure for identification shall define in detail how Contractor controls the identification and marking of welds and how the weld history, NDT results and material placement are recorded.

5.7.3 Welders shall be certified and welding procedures shall be provided and meet the AWS D1.1 code

5.7.4 Welding inspection shall be conducted by a certified welding inspector per the AWS D1.1 code, and the certification or qualifications shall be furnished by Contractor.

5.7.5 Contractor shall develop and maintain complete, up-to-date records of all inspections, surveys and tests, including failures.

5.7.6 Contractor shall maintain records of weld repair and rejection rates throughout the Work.

5.7.7 Owner reserves the right to conduct regular audits and cross checks on production weld joints to verify the competence of all technicians working to agreed NDT procedures.

5.8 Concrete Works and Batching Plants

5.8.1 Contractor shall meet the requirements of Section 6.4, and

5.8.2 The batching plant(s) shall have a production capacity that is capable of providing concrete to any WTG foundation as to prevent the occurrence of unplanned cold joints and other discontinuities with the WTG foundation concrete.

5.8.3 Contractor shall provide a method statement for forming designed cold joints, as part of Contractors Documentation. However, while supply of this method statement is required prior to construction it does not imply that a cold joint shall be accepted by Owner.

5.9 Concrete and Grout Strength

5.9.1 Shall meet the requirements of Section 6.5

6. CIVIL WORKS

6.1 General

6.1.1 The Design shall suit the requirements for construction access for long loads, heavy plant and cranes as well as ongoing access for O&M of the Wind Power Plant.

6.1.2 Roads and tracks shall be designed to minimize cut and fill and cross drainage requirements consistent with property boundaries, drainage paths and other site constraints.

6.1.3 Roads and tracks shall be designed to minimize native vegetation clearance and be in accordance with Applicable Permits.

6.2 Formwork

6.2.1 Formwork shall be in good condition, capable of supporting all loads applied to it during construction, sufficiently rigid to prevent movement or deflection and provide a standard quality surface finish to the concrete.

6.2.2 Gaps and joints shall be adequately sealed to prevent seepage of concrete.

6.2.3 Prior to pouring concrete, formwork shall be clean with release agents applied as appropriate.

6.2.4 Formwork shall be removed with care and any damage shall be repaired.

6.3 Reinforcement

6.3.1 Reinforcement, including post-tensioning strand, shall comply with all applicable state and local standards including ACI 318, ASTM A615, ASTM A706.

6.3.2 Reinforcement shall be cut and bent in accordance with ACI 318.

6.3.3 Acceptable manufacturers and processors of steel reinforcement shall hold a valid certificate of approval. Evidence of compliance with this Section shall be obtained when contract bids are received. And approval from Owner shall be obtained in writing prior to procurement.

6.3.4 Contractor shall nominate the items in which each individual batch of reinforcing steel is to be used and shall also state the country, mill of origin and the specification to which the steel for that Work item is produced, and clearly demonstrate how it is equivalent to that specified.

6.3.5 Certificates from a laboratory of chemical composition and physical properties of all reinforcing steel shall be required. All testing shall be in compliance with applicable standards, including frequency of sampling and testing. (Refer to Level B Construction Documentation requirement).

6.3.6 Steel shall not be ordered or placed before written approval has been obtained from Owner.

6.3.7 Once such approval has been obtained, the materials shall be cut and bent in accordance with ACI 318.

6.3.8 Reinforcement shall be free from loose rust, dirt, oil and any material that may impair the bond with the concrete.

6.3.9 Spacers and support bars shall be of a type that shall adequately support the reinforcement and resist deflection.

6.3.10 Tying wire shall be annealed wire of adequate size for the purpose required. Sufficient ties shall be used to ensure stability of the reinforcement.

6.3.11 Welding of any grade of steel concrete reinforcement is not permitted.

6.3.12 Reinforcement shall be supported on plastic or concrete bar chairs.

- If concrete bar chairs are adopted, they shall be fabricated from the same grade of concrete as that which they are to be cast into.

6.4 Concrete Works and Batching Plant

6.4.1 Contractor shall provide a detailed method statement for quality control and concrete batching and transport.

6.4.2 Concrete shall be transported, placed, compacted and cured in accordance with Applicable Standards.

6.4.3 Concrete mix design, cement, aggregate, admixtures, and trial batch test result shall be provided for owner approval prior to concrete placement.

6.4.4 If an on-site portable batch plant is used, the following shall apply:

- Contractor shall provide and maintain on-Site storage of cement, aggregates and all other materials required for concrete production.
- Contractor shall provide and maintain a concrete batching plant(s) with all equipment, facilities, approvals and permits that are required for the associated batching plant(s).

6.4.5 If an off-site batch plant is utilized, the following shall apply:

- Travel times to the primary and backup batch plants shall be provided for owner approval
- A transportation plan for off-site concrete batch plants shall include an allowance for potential traffic impact on transportation time, for owner approval

6.4.6 A backup shall be provided for critical items including the batching plant (on site or alternate location), concrete delivery and placement equipment (conveyor belt or pump).

6.4.7 Prior to pouring Contractor shall install all grounding elements and cable ducts (tapes, electrodes, etc.) exothermic (Cadweld, etc.). Welding of grounding elements to reinforcing steel shall not be permitted.

6.4.8 Unformed concrete finish on the surface of the concrete shall be screeded and finished neatly to be uniform and non-slip when wet.

6.4.9 Adequate precautions shall be implemented in finishing to prevent plastic shrinkage cracking. Methods to be used for plastic shrinkage cracking shall be provided to Owner prior to placement of concrete.

6.4.10 A hot and/or cold weather concreting plan shall be prepared in accordance with ACI 305R and ACI 306R, as applicable to anticipated project site temperatures.

6.5 Concrete and Grout Strength

6.5.1 As a minimum, concrete and grout shall have a minimum compressive strength of 4000 psi, or greater as specified by the Foundation Designer.

6.5.2 Concrete constituents shall meet the requirements listed in Table 1, below:

Table 1 Concrete Material Standards

Material	Requirement
Water	Clean, Potable, free from acid/alkali, oil, petroleum products, organic material or other deleterious substances
Portland Cement	ASTM C150, Type I, II, or V or ASTM C1157, Type GU, MS, or HS
Coarse Aggregate	Gravel, crushed gravel or crushed stone, in accordance with ASTM C33
Fine Aggregate	Washed natural or manufactured sand, in accordance with ASTM C33
Concrete Curing Compound	ASTM C309 and C1315
Admixtures:	
Air Entrainment	ASTM C260
Water-reducing	ASTM C494 Type A
Retarding	ASTM C494 Type B
High Range, water reducing	ASTM C494 Type F
High range water-reducing and retarding	ASTM C494 Type G

6.5.3 Grout materials shall be non-shrink cementitous (ASTM C1107) or epoxy material.

6.5.4 The concrete or grout strength shall be defined by the characteristic compressive strength at age 28 days.

6.5.5 Sampling and testing of concrete shall be in accordance with ACI 318, ASTM C172, ASTM C31, ASTM C39, ASTM C172 and ASTM C231.

6.5.6 Sampling and testing of grout material shall be in accordance with ASTM C579.

6.5.7 Sampling and testing concrete is be carried out by an accredited materials testing laboratory.

6.5.8 Testing shall also conform to Section 15.8 of this specification.

6.6 Off–site Road Improvements

6.6.1 Contractor shall establish any off-Site road or public highway improvements that are required to:

- Comply with agreements between Owner and the local Authorities
- Permit full access for the project
- Permit delivery of all plant and equipment required for the project, and
- Permit delivery and supply of all other plant items, construction materials and equipment required to complete the Wind Power Plant, including, but not limited to:
  - Wind Turbine components, and
  - Cranes for the installation of the Wind Turbines.

6.6.2 Contractor, with respect to the Work, shall be responsible for obtaining any relevant encroachment permits or other permits or authorizations and reaching any relevant agreements required with Government Authorities and third parties.

6.6.3 Contractor shall maintain off-site roads in as good or better than original condition throughout construction.

6.7 Site Entrance and Access Roads

6.7.1 Contractor, with respect to the Work, shall be responsible for obtaining any relevant permits or authorizations and reaching any relevant agreements required with Government Authorities and third parties in relation to access:

- Except where explicitly agreed as being within Owner's scope
- Except in the case of approvals or agreements with landowners which shall be obtained through Owner

6.7.2 Contractor shall be responsible for establishing the extent to which improvements are required to any existing and new site entrance and access roads to facilitate the Project.

6.7.3 Contractor shall be responsible for establishing the site entrance and access roads to facilitate the Work including, but not limited to:

- Delivery and installation of Wind Turbine components in accordance with the turbine manufacturer's requirements.
- Crane access for the installation of the Wind Turbines.
- Two-way traffic for construction access
- All-weather emergency vehicle access to work areas and wind turbine locations

6.7.4 Access road geometry shall conform to the following criteria, the Turbine Supplier requirements, and permit requirements:

- Road width shall be a minimum of 16 feet
- If the design road width is less than 32 feet, passing areas shall be provided every 1500 feet. Passing areas shall be a minimum of 16 feet wide in addition to the road width, and a minimum of 200 feet long.
- Road cross-fall gradient shall be between 1 and 4 percent
- Maximum road longitudinal gradient shall be 10 percent
- Turn radii shall be as specified by the turbine supplier

6.7.5 The Site entrance and access roads shall furthermore be designed to facilitate access including crane access, for the ongoing operation and maintenance of the Wind Power Plant.

6.7.6 Contractor shall repair the Site roads and access roads to the required standard at the end of the construction, but site access for crane access and delivery of large components cannot be diminished.

6.7.7 Particular attention shall be given to cutting, storing and reinstating topsoil and vegetation in order to encourage regeneration of vegetation.

6.7.8 Treatment of cut and fill slopes and installation of drainage shall be in accordance with applicable state and local standards and regulations.

6.7.9 All roads and tracks shall be designed in accordance with the geotechnical engineer's recommendations appropriate to the Site, Climatic Conditions and their period of use including, but not limited to:

- Subgrade strength
- Hydrology
- Flooding
- Frost
- Snow

6.8 Crane Pads / Hardstands

6.8.1 Each wind turbine shall have a crane pad layout designed, constructed and maintained to be suitable for the installation, operation and maintenance of the Wind Turbine, in accordance with the turbine manufacturer's requirements and remain for future operational requirements.

6.8.2 Crane pads are assumed to be left in place at the end of construction, unless specified otherwise by the owner or permit authorities.

6.9 Underground Cable Runs

6.9.1 Underground cable runs, including SCADA communication cables and earth conductors, shall be located at an appropriate depth to meet Applicable Standards, Owner's requirements as set forth in the Agreement and this document, and industry best practices.

6.9.2 Where appropriate, cables or cable conduits shall be laid during access road construction in order to avoid disturbing reinstated ground. Cables shall be suitably protected where they cross roads.

6.9.3 Possible surface reduction from future road maintenance shall be considered when selecting the cable burial depth at road crossings.

6.9.4 To prevent damage, all direct buried cables shall be laid on a bed of not less than 2 inches of sand or friable soil free of sharp stone and covered by not less than 2 inches of the same material.

6.9.5 Cables shall be installed in accordance with Applicable Standards including requirements for mechanical protection, warning tape and depths of burial.

6.9.6 All trenches are to be backfilled and compacted on completion and original levels restored to a minimum level of compaction specified by the Geotechnical Engineer. No surplus soil piles or stockpiles are to be left on the Site.

6.9.7 Native material excavated from the trench shall be used for the bedding/cover material as much as practicable, subject to the requirements listed above, local ordinances, and the need to ensure thermal stability. In areas where topsoil is present, the topsoil shall be preserved during excavation and replaced following installation of the backfill.

6.9.8 Reseeding shall be undertaken by Contractor once trenches are backfilled and topsoil replaced.

6.9.9 Variations in underground cable installation depths, due to road/creek crossings and the typically rigid structure of direct burial machines, shall be considered in the cable sizing calculations and the selection of cable depth derating factors.

6.9.10 Cable runs within the MV/HV substation shall be installed in precast concrete trenches and/or Schedule 40 PVC conduits.

6.9.11 Direct buried cables leaving a trench to pass through ground surface shall be protected by a PVC conduit bend and concrete haunch, or other rigid frame acceptable to Owner.

6.9.12 Contractor shall be responsible for reinstatement of all fences, walls, watercourses, roads and embankments crossed by the cables to the satisfaction of Owner and in accordance with all Applicable Permits.

6.9.13 Suitable cable marker posts shall be installed to indicate the route and depth of all underground power cables at each change of direction and on each side of each corresponding road crossing and fence crossing.

- The markers shall include cable voltage details and telephone numbers of both the asset Owner and the appropriate dig-safe agency.
- Landowners shall also be provided with these phone numbers and the as-built cable route details and drawings.

6.9.14 Electronic cable marking tape shall be installed along the length of all buried power cable.

6.9.15 An appropriate cable locating device shall be provided to enable the location of underground cables and electronic markers.

6.9.16 All trenched fiber cables shall be protected against rodent damage by use of PVC conduit, Pest Duct or armored fiber installation as chosen by the contractor and approved by Owner.

6.10 Fences, Gates, Entrances, Cattle Grids

6.10.1 All fences and entrances shall be in accordance with Applicable Standards and Applicable Permits.

6.10.2 All fences, gates, entrances, and cattle grids shall be of a standard type and similar in all aspects with the type commonly used in the local area unless otherwise specified.

6.10.3 Contractor shall determine and comply with the requirements of all Government Authorities.

6.11 Drainage

6.11.1 Drainage shall be provided by Contractor and Drainage provided shall prevent erosion, consistent with:

- Federal, state and local laws and regulations
- The design assumptions and criteria of the Wind Turbine foundations, and other elements of the Civil Infrastructure
- The absolute requirement to maintain adequate soil cover over the WTG foundation
- Pollutant discharge and other environmental permitting restrictions on construction and the finished Project
- Consideration of the safety of personnel and wildlife through the construction work

6.11.2 Batters and steep slopes that are disturbed in the course of the Project shall have a suitable means of stabilization applied.

6.11.3 Erosion control measures shall be installed in accordance with federal, state and local standards and regulations.

6.11.4 Appropriate means of energy dissipation shall be incorporated into the site drainage.

6.11.5 Additionally, Contractor shall provide drainage that shall accommodate:

- A 25-year return period flood event for the road and drainage infrastructure, and
- A 100-year return period flood with sufficient freeboard for the WTG tower and turbine components, substation and permanent buildings.

6.11.6 The natural drainage patterns of the Site shall be maintained and ponding shall be prevented, other than explicitly where small scale ponding is specifically designed to minimize erosion during drainage. Any pre-existing drains which are damaged in the Work shall be restored.

6.11.7 Access road and crane pad drainage shall be integrated and prevent water flow on the turbine roads.

6.11.8 Water pooling under the WTG step-up transformer pads (if required) shall be prevented. To comply with this requirement, Contractor shall consider raising the ground level prior to installing the transformer kiosks.

6.11.9 Excavations shall be fully drained prior to any construction work within them.

6.12 Disposal of Excess Material

6.12.1 Surplus soil and excavated materials may be disposed of on-Site to the extent this is consistent with Applicable Permits and planning and environmental constraints on the Project.

6.12.2 Other wastes including chemical waste shall be removed from the Site and disposed in an appropriately registered facility in accordance with federal, state and local laws and regulations. If immediate removal is impractical the wastes are to be temporarily stored in accordance with the Laws and applicable standards.

6.12.3 All permits and authorizations required for the temporary storage of waste on site shall be obtained by Contractor.

6.12.4 No litter or construction related waste is to be left on the Site.

6.13 Reclamation

6.13.1 Contractor shall reclaim all areas which have been disturbed during the Work by replanting and indigenous seeding, including conformance with the requirements of any Permits and any Project Agreements.

6.13.2 The seed mix and plant species are to be approved by Owner prior to re-seeding.

6.13.3 Reclamation shall be in accordance with the Permits and planning and environmental constraints on the Project.

7. ELECTRICAL BALANCE OF PLANT

The Electrical Balance of Plant (EBoP) shall keep all Wind Turbines electrically energized (except under fault conditions or for maintenance) and collect the output of the Wind Turbines and transfer it to the Point of Interconnection (POI).

The design of the EBoP by Contractor shall:

- Be for high reliability and efficiency;
- Be compliant with Interconnection Agreement requirements; and
- Allow safe operation and maintenance.

7.1 General

7.1.1 The Wind Power Plant shall integrate seamlessly with and be fully compatible with the TSP interconnection facilities at the POI, including any required communications links.

7.1.2 The POI will be defined in the Interconnection Agreement

7.2 Transmission Service Provider and Interconnection Agreement requirements

7.2.1 Contractor shall ensure that the EBoP and components supplied under the EBoP comply with Interconnection Agreement requirements.

7.2.2 Contractor shall undertake studies, prepare a modelling package, information and technical reports that confirm compliance with Interconnection Agreement requirements.

7.3 Environmental Conditions

7.3.1 The Wind Power Plant electrical system, including equipment selection, design and installation, shall be suitable for all environmental conditions expected at the Site, including those as defined in Section 3.3 and, without limitation:

- Normal and abnormal voltages and currents, and
- Lightning.

7.3.2 It shall remain Contractor's responsibility to satisfy themselves of the appropriate environmental conditions and to supply equipment that is suitable for operation under those conditions.

7.4 Materials and Suppliers

7.4.1 The Wind Power Plant Electrical System shall consist only of new, un-used equipment made from the highest quality materials and components.

7.4.2 All electrical plant shall be sourced from reputable suppliers, consistent with Section 16, that are accredited to recognized manufacturing quality systems.

7.5 Electrical Equipment Ratings

7.5.1 All electrical equipment within the Work shall be adequately rated, including with respect to thermal ratings, fault ratings and insulation ratings.

7.5.2 Thermal Ratings

- Thermal ratings of all electrical equipment shall be adequate for continuous operation at the loading levels expected for that equipment, considering amongst other things, extremes of low voltage and low power factor, 45°C ambient air temperature and additionally temperatures experienced within the immediate installation area of the equipment.
- Thermal ratings of all electrical equipment shall be fully covered by Type Test Certification. Temperature rise shall be specifically addressed and only OEM Type Test certificates shall be accepted to support evidence of compliance in this matter.
- Designs that rely on assumptions of cyclic loading for their adequacy shall not be accepted.

7.5.3 Fault Ratings

- Fault ratings of all electrical equipment shall be such that it shall pass, without damage, the maximum expected fault currents for a period no shorter than the backup protection clearing time and considering the maximum expected future fault level at the POI to the TSP network within the Design Life.

7.5.4 Insulation Ratings

- All electrical equipment shall have adequate insulation ratings for the maximum possible expected voltages – including continuous, temporary, switching, surge and lightning overvoltages.
- Suitable overvoltage protection shall be installed by Contractor to ensure that the insulation ratings of the Work are respected.

7.6 Safety and WTG Isolation

7.6.1 It shall be possible to locally isolate, de-energize, lockout and earth each Wind Turbine without de-energizing others.

7.7 Economic Optimization

7.7.1 All components of the Wind Power Plant Electrical system shall be designed by Contractor to minimize electrical losses, as far as is economically advantageous.

7.7.2 Wherever applicable, cable sizes shall be determined in accordance with IEC 60287-3-2 Economic Optimization of Power Cable Size and within the constraints imposed by other limitations such as voltage drop, fault ratings and thermal ratings.

7.7.3 Notwithstanding the above, the electrical system shall be designed to ensure that electrical losses are minimized as far as economically advantageous and that as a proportion of the total Wind Power Plant generation, over an average year and measured between the Wind Power Plant POI and the sum of the outputs of all the Wind Turbines, shall be less than 2.5%.

7.8 Reliability

7.8.1 The Wind Power Plant electrical system between the Point of Interconnection with the TSP and the Wind Turbine terminals shall be designed to achieve availability in excess of 99.5% on an annual basis, after considering both planned and unplanned outages.

7.8.2 The availability calculation shall take into account the expected mean time between failures (MTBF) and the mean time to repair (MTTR) of the components of the electrical system, and the proportion of the Wind Power Plant (number of Wind Turbines affected by the failure divided by the total number of Wind Turbines) affected by the failure of the component, however Owner acknowledges that such a calculation is a design intent and not a warranty.

7.9 Project Substation

7.9.1 General

- Contractor will design, construct, test and commission a Project Substation that is the primary interface between the Wind Farm and the high voltage (HV) bulk electrical system (BES) of the incumbent utility. The Project Substation will be divided into two main sections;
- A HV voltage section that ties the Project Substation to the BES at the Point of Interconnection (POI), and
- A medium voltage (MV) that ties the Project Substation to the collection system of the Wind Farm.
- The HV section of the Project Substation will be configured based on the nature of the interconnection to the POI. In general, two basic types of interconnection are possible, dictating two different HV configurations. The types of interconnection contemplated for this specification are:
  - A radial interconnection to an existing HV substation, owned and operated by the incumbent utility; and
  - A line tap interconnection to an existing HV transmission line(s), owned and operated by the incumbent utility.
- For a radial interconnection, the HV section configuration, as a minimum, shall consist of:
  - A full tension deadend structure to support the gen-tie line from the Project Substation to the POI (see Section 8);
  - 3 - 1Ø Line Arrestors;
  - Combination metering class, HV, PT and CT devices;
  - A motor operated, SCADA connected, Line Disconnect Switch;
  - A high side generator step up (GSU) transformer SF6 circuit breaker, with 2 sets of 3Ø, gang operated, breaker isolation switches;
  - A GSU transformer rated to support the maximum output of the Wind Farm, equipped with both high and low side station class lightning arrestors;
  - A 34.5 kV low side, SF6 circuit breaker, with 2 sets of 3Ø, gang operated, breaker isolation switches;
  - A protective relaying scheme and attendant equipment appropriate to protect all HV, MV and transmission line equipment;
  - A communications and control system to facilitate both local and remote control of the Project Substation;
  - Interconnecting bus work, jumpers, terminations, cabling, conductors and hardware necessary to interconnect all equipment;

  - Support structures, insulators, foundations and hardware necessary to isolate all energized parts from earth; and
  - A complete, interconnected grounding system sized to limit step and touch potentials during high voltage faults.
  - Note that all HV devices shall be rated commensurately with the nominal operating voltage of the POI.
  - It may be necessary under some circumstances to utilize two or more GSU transformers, based on the size of the proposed Wind Farm. Under such circumstances, the radial configuration will be expanded to accommodate the ultimate size of the Wind Farm.

- For a Line Tap interconnection, the HV section configuration, as a minimum, shall consist of:

  - At least two, full tension deadend structures to support the existing transmission lines;
  - At least two sets of 3 - 1Ø Line Arrestors;
  - At least two motor operated, SCADA connected, Line Disconnect Switches;
  - At least three SF6 circuit breakers connected in a ring bus configuration, with 2 sets of 3Ø, gang operated, breaker isolation switches for each circuit breaker;
  - Combination metering class, HV, PT and CT devices;
  - A GSU transformer rated to support the maximum output of the Wind Farm, equipped with both high and low side station class lightning arrestors;
  - A 34.5 kV low side, SF6 circuit breaker, with 2 sets of 3Ø, gang operated, breaker isolation switches;
  - A protective relaying scheme and attendant equipment appropriate to protect all HV, MV and transmission line equipment;
  - A communications and control system to facilitate both local and remote control of the Project Substation;
  - Interconnecting bus work, jumpers, terminations, conductors and hardware necessary to interconnect all equipment;
  - Support structures, insulators, foundations and hardware necessary to isolate all energized parts from earth; and
  - A complete, interconnected grounding system sized to limit step and touch potentials during high voltage faults.
  - Note that all HV devices shall be rated commensurately with the nominal operating voltage of the POI.
  - It may be necessary under some circumstances to utilize two or more GSU transformers, based on the size of the proposed Wind Farm. Under such circumstances, the ring bus configuration will be expanded to accommodate the ultimate size of the Wind Farm.
  - Contingent upon operating voltage of the HV section of the Project Substation, adequate space will be provided to expand the Project Substation to include up to six breaker positions;
  - For voltages of 345 kV and above, the Line Tap configuration will be modified to support a breaker and a half configuration.

- The MV section shall be comprised of a set of parallel radial feeders to interconnect the collection system to the Project Substation. As a minimum, the MV section shall include;
- 34.5 kV SF6 circuit breakers, equipped with three phase, gang operated breaker isolation switches and a by-pass switch for each collection system feeder;
- 34.5 kV station class arrestors at the termination point of each collection system feeder;
- Interconnecting bus work, jumpers, terminations, conductors and hardware necessary to interconnect all equipment;
- Support structures, insulators, foundations and hardware necessary to isolate all energized parts from earth; and
- A complete, interconnected grounding system sized to limit step and touch potentials during high voltage faults.
- Note that 34.5 kV Indoor Metal Clad Vacuum circuit breakers may be considered at the discretion of Owner.
- The specific characteristics of the required systems and equipment are described in subsequent sections.
- Phase to phase and phase to ground conductor clearance criteria will be in accordance with Owner Substation Design Standards. If required for equipment access, clearances will be increased.
- Studies to be completed as part of Project Substation design will include, at a minimum, in both report and software-specific file format, where applicable:
  - Short circuit analysis (EasyPower file)
  - AC and DC system studies
  - Bus ampacity study
  - Direct stroke protection analysis for lightning
  - Arc flash hazard analysis (EasyPower file)
  - Grounding study (CDEGS file)
  - Relay coordination study
  - Insulation coordination study
  - Electro Magnetic Compatibility (EMC) Study
- All design choices should be based upon results from the above mentioned studies. Contractor is responsible for obtaining all necessary data needed for the studies mentioned above.
- The Substation shall minimize electrical losses as far as is economically advantageous. Contractor shall use the value defined in Section 7.7 in determining the value of any energy gained/lost in the optimization process.
- Specific Owner requirements include:
  - SEL GPS clock for relay time synch
  - All intelligent electronic devices shall be provided with an Ethernet port and DNP 3.0 TCP/IP communication protocol if available or Modbus TCP/IP protocol if DNP is not an available option.
  - Test switches on all trip, close and wetting voltage connections. Slip links or disconnecting terminal blocks on all other connections.

- Redundant relays, including lockouts
- Preference for open air breakers (SF6 insulated) on the 34.5 kV side of the substation
- Non-insulated ring type terminal connectors shall be used on all control circuits as well as current and potential transformer circuits. All other terminal connectors for conductors smaller than 8 AWG shall be non-insulated ring type or pre-insulated spade type. The indent mark form the crimp tool must be clearly visible.

7.9.2 Security

- The Project Substation shall be enclosed by a steel expanded metal perimeter fence, constructed in accordance with the relevant Section(s) of the NESC and Owner Substation Design Standard.
- The Project Substation shall have access control and monitoring provisions to ensure that Owner is able to capture, record and monitor all personnel, authorized or unauthorized that enter the site area. Contractor shall coordinate the preferred access control methodology with Owner along with additional provisions such as video monitoring and motion detection.

7.9.3 Substation Foundations

- All foundations for substation support structures and equipment pads shall be designed in accordance with applicable building codes, the recommendations of the Geotechnical Engineer (including consideration for wind and seismic withstand capability), and Owners Substation Design Standards.
- Blasting to facilitate the Substation foundation is not permitted without authorization from Owner.
- Precast trenches will be free of water and firm throughout and during the life time of the substation.

Transformer pads for main power transformers shall be designed based on Owners Substation Design Standards. The containment pit should be sized accordingly based on oil capacity and estimated volume of rain water with quench rock surrounding the transformer capable of containing the complete volume of transformer oil plus an additional 6” of rain water Oil containment shall include active monitoring for oil detection along with EMS/SCADA alarm points.

7.9.4 Potential Transformers

- All potential transformers used for metering shall be of the wire wound type with shell or core construction. They shall be at least 0.3 class outdoor units with NEMA pads. Contractor shall determine the rating, connection type and turns ratio based on applicable system studies and metering system designs.
- Potential devices shall meet the requirements of IEEE C57.13-2008
- Capacitive Coupled Voltage Transformers (CCVT) may be used for detection or verification of line or bus potential only
- Capacitive Coupled Voltage Transformers shall be of the passive filter type.
- Capacitive Coupled Voltage Transformers shall be of the passive filter type.

7.9.5 Current Transformers

- All MV current transformers shall be connected through an indoor, panel mounted, current test switch, specifically a States Type FMS or ABB equivalent. Each current transformer neutral shall be brought into the control building for single point grounding within the associated protection relay panel.
- Provisions shall be made to enable the secondary leads of all current transformers to be shorted via removable links.
- Current transformers to be used for metering shall be of at least 0.3 accuracy class with a rated overload factor of 2.0.
- Current transformers shall meet the requirements of IEEE C57.13-2008

7.9.6 Generation Step Up (GSU) transformers

- The GSU transformer(s) shall be sufficiently sized to allow the full Project capacity to be delivered to the POI at the maximum of its ONAN / ONAF / ONAF rating.
- The GSU shall be new, outdoor, non PCB mineral oil filled, 3Ø, 60Hz, Cooling class ONAN/ONAF/OFAF, 65°C Rise. The main step-up transformer(s) shall be in accordance with the requirements set forth in Table 3 herein, at a minimum.

Table 2. Substation transformer specifications

Description	Value
Quantity	1
Type	Mineral Oil filled, hermetically sealed, outdoor installation
Voltage ratio	TBD* / 34,500 / 13,200 Volts (HV / MV / TV)
Phases	3
Windings	3 (HV, MV, Tertiary)
Steady state temperature rise	65°C above ambient
Frequency	60 Hz
Impulse levels	TBD kV (HV), 200 kV (MV), 110 kV (Tertiary)
Vector group	Grounded wye
Cooling	ONAN / ONAF / ONAF
Tapping range	±5%, 2.5% steps, manual control DETC Contractor shall determine the need for an OLTC based on the results of applicable system studies. If an OLTC is specified it shall have a ±10% range with 32 0.625% taps. If employed the OLTC shall have provision for remote or local control.
Paint finish	ANSI 70 sky grey color
Guaranteed losses	TBD
Temperature gauge	Required
Pressure level indicator	Required
Pressure relief device	Required
Oil sampling valve	Required
Filling orifice	Required
Tank ground tag	Required
Oil level indicator	Required
Oil Gas Analyzer	Serveron TM
Bushing CTs	Minimum of two sets on both primary and secondary windings. Class to be determined by relaying scheme.
Grounding	Solid (primary and secondary windings) Buried delta (tertiary winding)

7.9.7 High Voltage Circuit Breakers

- HV and MV circuit breakers shall be rated and selected based on the requirements of Owner Substation Design Standards.
- Basic parameters for HV circuit breakers are SF6 insulated, three-pole, single throw, with dead–tank design and dual trip coils.
- Basic parameters for MV circuit breakers are vacuum interrupters, three-pole, single throw, with dead–tank design.
- All circuit breakers shall contain instrument transformers for metering and/or protective relaying applications.

7.9.8 Disconnect Switches

- Disconnect switch placement and selection is based on Owner Substation Design Standards. Disconnect switches are typically placed in the following locations:
  - HV Line Disconnect
  - HV Breaker Disconnect
  - MV Line Disconnect
  - Breaker Disconnect
  - MV Capacitor & Reactor Switch
  - MV Grounding Transformer Switch
  - Disconnect switches are typically manually operated, 3 gang, non-load break, outdoor rated and provide the ability to ground
  - All disconnect switches shall be three phase, gang operated devices
  - Where motor operators are employed, provisions for de-coupling the motor and manual operation shall be provided
  - A DNP 3 compatible SCADA interface shall be provided with all motor controllers

7.9.9 Grounding Transformers

- Grounding transformers shall be sized to effectively ground the portion of the collection system circuit that is disconnected from the main Project Substation 34.5-kV bus when the Project Substation feeder or collector breaker is open. However, at a minimum, grounding transformers shall be capable of carrying 300A per phase for 10-seconda and 900A in the neutral to ground circuit for 10 seconds.
- Grounding transformers shall be 3-phase, and may be configured either Wye-Delta or Zig-Zag.
- Grounding transformers installed inside or near the outside of the substation fence shall be installed with ground-fault detection provisions.

7.9.10 The cable design is not permitted to include splices. Whenever possible all conductors and cables should be a single continuous run.

7.9.11 No splices shall be made in conductors for instrument circuits or control circuits. Shields may be spliced where necessary to permit connection to the station ground. Power cable circuits may be spliced only by methods and at locations acceptable to Owner.

7.9.12 Surge Arrestors

- All surge arresters should be sized according the results of the insulation coordination study.
- HV & MV surge arrestors shall meet the requirements of ANSI C62.11 for Station Class installation in a 60-Hertz outdoor installation.
- Equipment surge arrestors shall be station class, metal-oxide type surge arrestors for outdoor use and polymer housing. Surge arrestors shall be shatterproof.

7.9.13 Rigid Bus

- Design of the bus systems shall be in accordance with IEEE 605 and Owner Substation Design Standard, at a minimum.
- Loading and seismic performance shall be in accordance with the Project design and Project Site location. Such information is subject to verification by Contractor.

- Station post insulators shall be of sufficient strength to support the rigid bus and shall be ANSI 70 gray color.

7.9.14 Connectors and Fittings

- Connectors and fittings shall be of the proper size and design to assure permanent, secure, and low-resistance connections.
- Connectors and fittings shall be in accordance with ANSI C119 & CC 1 along with requirements of Owner Substation Design Standard.
- Rigid bus connections to transformers, breakers, CCVTs, or freestanding current transformers are prohibited.

7.9.15 Grounding System

- The grounding system/grid shall be installed throughout the Project Substation.
- The ground grid shall be designed in accordance with IEEE 80 and Owner Substation Design Standard.
- The system shall be designed such that Project Substation personnel are protected from step and touch hazards that can occur as the substation grounding system provides the earth return electrode during power system phase to ground faults.
- Contractor shall perform ground resistivity testing prior to final design to determine ground analysis parameters. The ground resistivity shall be measured with the methods given in IEEE 81.
- Ground conductors shall be sized for fault duration of 0.5 seconds.
- Equipment grounds shall conform to the following general guidelines:
  - Grounds shall conform to the NESC.
  - All equipment grounding connections shall be connected to the ground grid.
- The ground grid shall extend at least three (3) feet outside the perimeter fence of the Project Substation and shall be bonded to the fence, according to Owner Substation Design Standards, and as required to meet acceptable levels of both touch and step potential and ground potential rise.
- A minimum of six (6) inches of washed crushed aggregate shall cover the entire Project Substation footprint, including those areas reserved for future build-out and five (5) feet outside the Project Substation security fence, in order to help reduce touch and step potentials. A greater level of washed crushed aggregate shall be installed if necessary to meet the Requirements and satisfy the recommendations set forth in the geotechnical engineering report. The minimum resistivity shall be 3,000 ohm-meters. Crushed rock shall conform to ASTM C33, gradation 1.5 to No. 8 particles. Additional design criteria should be considered for vehicular access to the Project Substation.

7.9.16 Lightning Protection

- Lightning protection shall be designed in accordance with IEEE 998, Owner Substation Design Standard, and the results of the lightning protection study.

7.9.17 Lighting

- A lighting system shall be furnished for the Project Substation based on the requirements of Owner Substation Design Standards. The lighting system shall provide personnel with illumination for Project Substation operation and maintenance under normal conditions, and means of egress under emergency conditions.
- Lighting levels shall meet, at a minimum, the requirements of the NESC, including Table 111-1 therein.
- Outdoor lighting shall be LED type.

7.9.18 Equipment Labelling

- All major equipment and devices shall be properly labeled with nameplates that meet Applicable Standards (including those for safety) and other Requirements.
- Equipment labelling conventions shall follow Owner Substation Design Standards, as applicable.

7.9.19 Electrical Equipment Enclosures

- Control cabinets, pull boxes, and junction boxes shall be in accordance with NEMA standards and type number and shall be suitable for the Project location conditions. Minimum design shall be:
  - (1) Indoor: NEMA 1
  - (2) Outdoor: NEMA 3R, stainless or aluminum.
- All enclosures shall be provided with pad-locking provisions.
- Junction boxes shall be located adjacent to roadways, and be surrounded by a minimum of four (4) bollards of a red color.

7.9.20 Battery System

- All battery systems shall conform, at a minimum, to the Applicable Standards of IEEE, ANSI, and NEMA.
- Batteries shall be provided with racks, connection devices, tools, instruction books, protection shield covers, rail protection system, and other standard items. They shall also include redundant fans for the required ventilation.
- Contractor shall supply provide, at a minimum, one complete set of 125 VDC station batteries. For HV sections with a nominal operating voltage of 230 kV or higher, two redundant sets of station batteries will be provided.
  - Contractor will provide one fully rated, self-cooled battery charger for each battery set provided, capable of recharging the batteries within eight hours while serving continuous load. The chargers will be served from the Project Substation AC system.
- For the Project Substation, Contractor shall provide one (1) DC system, including, but not limited to, batteries, two (2) battery chargers, safety fused disconnect switch, a battery disconnecting means and panel boards.
  - Fused disconnect switch shall be a 3-way make-before-break transfer switch between the battery cells and an open 'alternate' position, feeding the chargers

and DC load. DC 'transfer' position shall be left unconnected in the switch panel, reserved for future NERC testing.

7.9.21 Raceway

- Raceway shall conform, at a minimum, to the recommendations included in IEEE 525 and Owner Substation Design Standard.
- Individual raceway systems shall be established for the following services:
  - (1) 600-volt control cable.
  - (2) Special electrical noise-sensitive circuits.

7.9.22 Control and Protection

- Contractor will design, procure, construct and test the control and protection system for the Substation. The system will include, but not be limited to, protective relays, indication meters, revenue meters, switches, instruments, devices, and wiring. Relay panels will be installed in the Substation control room.
- Contractor will provide drawings sets, for review, comment, and approval by Owner consistent with requirements set forth in Section 17 and inclusive of one-line drawings, three-line drawings, control panel arrangements, fabrication details, bill of materials, nameplate lists, DC control schematics, AC schematics, circuit schedules, auxiliary equipment schematics, wiring diagrams, index sheets, and legends.

7.9.23 Protective Relaying

- Relaying will provide secure and selective isolation of equipment when necessary. Redundant primary and secondary schemes will be included for all high voltage equipment.
- All relays will be wired to a central communication processor which will integrate all relaying.
- Protection will be included for breakers, bus, transformers, HV & MV lines, capacitors, and inductors.
- Protection specifications include:
  - Transformers
    - (1) set of CTs, 1 high, 1 low – 2 x SEL-787E
    - (2) More than 2 sets of CTs – 2 x SEL-487E
  - Bus
    - (1) 15kV, or lower, switchgear – 1 x SEL-587Z
    - (2) All other bus configurations:

      (a) 6 or fewer positions on ultimate build out – 2 x SEL-487B
      (b) 7 or more positions on ultimate build out – 2 x 3 x SEL-487B
  - Feeder (15kV and below)
    - (1) No remote source (radial circuit) – 2 x SEL-751A
    - (2) Possible remote source (including bus ties) – 2 x SEL-751
  - Collector circuits (34.5kV)

- (1) 2 x SEL-751

– Line – 2 x SEL-411L
– Owner has standard part numbers for each relay type; deviations from those part numbers need to be approved in advance.
– All relays shall communicate to Owner SCADA via DNP 3.0 over Ethernet.
– Redundancy

- (1) Redundant CTs and VT secondaries shall be used in all cases except:

  (a) 15kV and lower balance of plant circuits
  (b) SEL-587Z applications
  (c) Transformer neutral CTs when multiple CTs are not available

– DC Circuity should be fully independent between relays; sourced from separate battery systems.

- (1) Circuits associated with a single close coil may have a single DC circuit connected to each relay.

– Lockout Relays

- (1) Electroswitch per Owner design masters.
- (2) Two per zone

  (a) Fully redundant for tripping, common close block circuits.
  (b) Tripped by local protection as needed, tripped by adjacent zones for breaker failure.

– Test Switches

- (1) FT type test switches shall be provided for:

  (a) Each protective relay shall have sufficient positions to accommodate the following circuits. Name plates shall be provided to identify the purpose of each test switch.
    - Each AC circuit to the relay, one switch position per voltage circuit and two per current circuit.
    - Positive and Negative side of relay power.
    - Both sides of each output used to trip (breaker or lockout) or close.
      - Input wetting voltage.

  (b) Each lockout relay shall have sufficient positions to accommodate each trip circuit.

– Wiring

- (1) All schematics shall be per Owner design masters where such exist
- (2) All wires provided with wire labels at each end per Owner design master
- (3) All crimped lugs shall be non-insulated ring lugs.
- (4) Any terminal on the Phoenix blocks on the SEL-7xx relays that requires more than one conductor shall utilize an appropriate crimped ferrule.
- (5) All SIS wiring shall be appropriate for the Phoenix blocks on the SEL-7xx relays, 41 strand #14.
- (6) All CT circuits from field to relay racks shall terminate on shorting terminal blocks. All other circuits shall terminate on slip link terminals.
- (7) All cables provided with cable tags at each end per Owner design master

– Racks

- (1) 36” rack design, one rack per zone of protection. Rack design masters will be provided.

7.9.24 Reactive Power Compensation Equipment

- Reactive plant shall be provided including both static and dynamic reactive power requirements and voltage control; unless it can be shown that the requirements under the Interconnection Agreement can be met without reactive plant that supplements wind turbine capabilities.
- The reactive plant shall include a controller, which allows the choice of either voltage control or power factor control at the connection point as required under the Interconnection Agreement. The controller will incorporate coordinated control between the Wind Power Plant SCADA system and the substation SCADA system and taking into account the main power transformer load tap changer control if applicable.
- The controller shall incorporate voltage regulation within the Wind Power Plant in order to maintain voltages at the wind turbine terminals at their required levels.
- The contractor is responsible for the complete design, implementation, integration, testing, and tuning of the overall reactive power compensation, voltage control systems, including interface, integration with, and coordination with the Wind Power Plant SCADA system, Owner, turbine supplier and other equipment suppliers as required.

7.9.25 Metering

- The Wind Power Plant shall be metered at the Point of Interconnection in accordance with Interconnection Agreement requirements. The meters shall be electronic meters approved by the TSP; and Contractor shall be responsible for obtaining meter approval.
- Check meters
  - In addition to the revenue metering equipment required by the Interconnection Agreement, redundant SEL-735 meters shall be provided to meter net plant output.
  - Check meters shall have full power quality monitoring capability.
  - At a minimum the metering equipment will meet the following specifications:
    - Current Transformers: +/- 0.3% @ B0.1 - 1.8 ohms, 10% - 100% rated current
    - Voltage Transformers: +/- 0.3% through B. ZZ @ 90% through 110% of nominal voltage

7.9.26 LV Supply and Stand-by Diesel Generator

- Contractor shall provide the most cost efficient design for the Substation LV power supplies incorporating the following requirements:
  - Normal supply shall be a metered service from the local utility, if so required by local statues. Else, this service shall be the back-up source.
  - Backup-supply shall be fed via MV through a local transformer at any time the MV system is energized;

  - In the event of loss of voltage on the Normal Supply LV leads, the diesel generator set shall automatically start. Supply shall be manually switched over to a stand-by diesel generator supply.
  - Normal and Stand-by supplies shall never be paralleled.
  - Stand-by supplies and the diesel generator supply may be paralleled.

- The diesel generator shall be enclosed in a kiosk designed to limit the noise of the generator, with the exhaust aimed away from any buildings. The diesel generator shall be fitted with a fuel tank with sufficient capacity to run the generator for at least 48 hours at full load. The fuel tank shall be installed within a bund sufficient to contain at least 110% of the fuel volume. The bund shall be fitted with an oil/water separation system and the bund shall be shielded to prevent the accumulation of rainwater.
- As an alternative to a diesel generator, the backup supply may be obtained from the existing distribution network in the area, provided that reliability is demonstrated and that the supply is not sourced from the same substation/s that the HV supply is derived from.

7.9.27 EMS SCADA System

- EMS SCADA system is to include RTU, HMI, SCADA Input/Output devices and an Ethernet network connecting intelligent electronic devices, designed and constructed according to owner design masters.
- Contractor shall provide a complete EMS SCADA drawing set, including network block diagrams, schematics and wiring diagrams created according to owner design masters.

7.10 Collection System

7.10.1 General

- The Project electrical collection system shall be buried. Overhead circuits may be permitted with Owner approval.
- The electrical collection system will include power and communications cabling in the same trench. See Section 9 for fiber optic specifications.
- The layout of the electrical collection system will follow existing or new roads wherever possible, but not in contradiction to economic optimization as described in Section 7.7. Civil Works Requirements
- Trenches will be free of water, firm throughout, and of a minimum dimension to facilitate cable installation
- Backfill will be compacted to 85 percent (85%) of standard proctor density, unless alternatively specified.
- Blasting for the collection system trenching is not permitted without authorization from Owner.
- Studies to be completed as part of Project electrical collection system design will include, at a minimum:
  - Grounding studies
  - Short circuit analysis

  - Load flow study
  - Reactive compensation study
  - Annual electrical loss calculation
  - Arc flash analysis
  - Harmonic analysis
  - Transient overvoltage and cable withstand
  - Voltage drop study
  - Thermal design analysis of cable ampacity considering the following assumptions:

- Trefoil cable installation
- 25ºC Ambient soil
- 200 rho (used for cost estimate only)
- 48 inches burial depth to top of cable
- 90ºC rating
- 100% load factor
- 90% compaction (95% compaction results required in construction to provide margin)
- Studies shall be completed and submitted in document form, with files native to the software utilized for any simulation, modeling, or studying.

7.10.2 Power Cabling

- Collection system 34.5 kV cable shall be rated 35 kV, direct buried aluminum conductor with copper concentric neutral. Insulation shall be tree retardant, water blocked, cross-linked polyethylene insulation (TRXPL) or ethylene-propylene rubber insulation (EPR) 345 mils thick, 100% insulation level (provide cost alternative for 133%), that meets or exceeds all requirements of applicable AEIC, IEEE, ICEA, NEMA, and UL standards.
- Cable sizes to be utilized are (as required):
  - 1/0 AWG AL (full neutral)
  - 3/0 AWG AL (full neutral)
  - 4/0 AWG AL (full neutral)
  - 500 kcmil AL (1/3 neutral)
  - 750 kcmil AL (1/3 neutral)
  - 1000 kcmil AL (1/6 neutral)
  - 1250 kcmil AL (1/6 neutral)

  Other cable sizes shall not be used per Owner direction.
- All central conductors shall be Class B stranded. No more than one (1) conductor per cable shall be allowed. Conductor material shall be aluminum or copper.

7.10.3 Cable Installation

- Use of plow type installation equipment is not allowed unless confirmed appropriate for soil type and approved by Owner.
- Mechanized, all-in-one wheel or chain trenching-laying equipment is allowed, and open trench method is allowed.

- Cable trefoil configuration shall be maintained by use of zip ties or suitable tape in accordance with manufacturer recommendations and Owner approval, placed at 10 foot maximum intervals.
- Burial depth: 48 inches below final grade to top of cable
- Bedding: Approximately 6 inches of < ¼ inch native bedding (or thermal backfill if required), and twelve (12) inches of < ¼ inch native (or thermal backfill if required) soils shall cover the collector fiber optic and cable bundle and shall be screened/visually inspected for materials in excess of two (2) inches. Bedding material shall be free of debris, roots, or other deleterious material unsuitable for use within the cable trench. A continuous metallic marking tape shall be laid in the trench a minimum of thirty (30) inches below grade, and at least twelve (12) inches above cable bundle in all cultivated areas.
- Electrical marker balls shall be installed in the trench every 300 feet, at all crossings and at every turn. The markers shall be programmed with the feeder number as per the substation breaker identification number.
- Compaction: Backfill above the first lift shall be placed in maximum 6-inch lifts and tamped or compacted between lifts. Minimum compaction shall be 95% testing every 500 feet at start of job, increasing to 1000 feet upon approval by engineer (assume 90% compaction in ampacity studies to provide margin).
- Ditch dams, consisting of sand bags or soil cement berms placed over the conductors at a 30 degree angle, shall be placed at intervals in all cable runs which traverse slopes greater than 3 per cent. Spacing shall vary, depending on the steepness of the grade, at from 100 ft to 300 ft.
- All collector trenches shall be laid out and pre-graded to assure correct burial during final grading. Changes of grade between trenching and final profiles shall be accounted for in confirming burial depth.
- Final depth of collectors shall be verified following final grading and adjusted to meet the specified minimum requirements.
- Parallel collector circuit bundles shall maintain a minimum separation of 8-feet, in order to provide physical and thermal separation. Closer spacing where necessary shall be evaluated for thermal effects or shall require de-rating of the buried conductors.
- Sufficient slack shall be provided at termination points to allow two future terminations. Establishing slack via coil under the padmount transformer or junction box, in a plenum or vault, is preferred.
- A sufficient amount of cable slack shall be provided to allow installation of elbows and termination of the cables to the appropriate junction box and/or Turbine switchgear terminal and permit ready disconnection of the elbows and mounting on the parking stands. For the avoidance of doubt, such slack shall allow for the installation/service disconnection of connectors, dead breaks, and other similar devices.
- Cable bending radius shall not be less than NEC and cable manufacturer requirements.
- Directional drilling bores are allowed for crossings.
- Cable markers shall be placed at all road, utility and waterway crossings.
- Directional fault current indicators (DFCI) at all key feed through points, branch points, load-break Circuit Switches, and junction boxes. Each DFCI shall include a

fiber optic indicator-extension, with lenses mounted through the enclosure. All DFCIs shall be installed and phase orientations displayed uniformly.

- Collection system conductor shall be rated for a maximum temperature of 250°C (short-circuit current rating).
- Collection system components shall be rated for a basic impulse level (BIL) of 200 kV.
- Cable Splices/Terminations/Connections
  - Direct burial splices are not allowed.
  - Splices shall be made in above ground metal or fiberglass splice vaults. Splice-points shall include a capacitive test point and allow means of establishing a ground point with hot-stick applicable accessories. Splices and terminations at junctions, pad mount transformers are to be made by experienced personnel, with manufacturer refresher training on site at beginning of job, with training certificates made part of QA/QC job books.

7.10.4 Load Break Circuit Switches

- Load-break circuit switches shall be provided at each sub-circuit or major branch to isolate major sections of the collector system in the event of a cable fault or turbine issue, and should be located at every "major" cable system intersection. All load-break circuit switches shall provide means of visibly observing the open/closed state.

7.10.5 Pad Mount Transformers

- Pad mount transformers shall be installed on vaults; fiberglass box pads will not be used.
- Spare pad-mount and ground reference transformers will be supplied at a ratio of 1:40 (one spare per 40 installed)
- Transformers shall be K-factor rated
- Transformer tanks shall be rated to withstand 10psi internal pressure.
- Each padmount transformer shall be equipped with an exterior fill value, drain valve, oil sample port, oil level gauge, temperature gauge, and nitrogen bleed valve, under lockable covers.
- Each pad mount shall be equipped with an operating handle.
- Each pad mount will have infrared viewing port installed on secondary side.
- For each Wind Turbine type, each transformer in the Wind Farm shall be of the same type and shall, with the exception of the MV switchgear configuration, be directly interchangeable with any other.
- It shall be possible to completely replace any transformer without removing any Wind Turbine or Wind Turbine tower.
- Any switching, protection or isolation functionality provided as part of the Wind Turbine transformers shall facilitate safe switching and operation to the maximum extent afforded by modern electrical equipment in accordance with the Applicable Standards.
- Fuses under oil are not permitted.
- Any pad mount transformer enclosure will afford appropriate environmental protection, including ice fall from the wind turbine. In particular all enclosures shall provide ingress protection required by the Wind Turbine transformer and any other

equipment housed therein is respected. The enclosure will be constructed for its environment including corrosion and erosion conditions and shall be suitably designed for the prevention of damage caused by livestock and other animals commonly present in the environment.

- Oil-filled transformers will be supplied with a bund adequate for the purpose of containing oil. A vault, in which the transformer is mounted upon, may be configured to serve this purpose.
- A minimum bund capacity of 110% of the transformer's maximum oil volume is required and the bund shall be shielded to prevent the accumulation of rainwater.
- Ball studs shall be installed on the LV side of the transformer for ease of grounding.

7.10.6 WTG Tower Foundation Electrical Work

- MV Cable
  - Sufficient slack will be provided at termination points to allow two future terminations. Establishing slack via coil under the padmount transformer or junction box, in a plenum or vault, is preferred.
- LV Cable
  - Conduit - two spare power conduits are required.
- Grounding
  - Driven ground rods shall be installed for each WTG transformer, and bonded to the turbine foundation ground grid and rebar cage
  - Pad mount transformers shall be ground bonded to the WTG foundation ground ring via Eufer ground.
  - Ground rings shall be bonded to the WTG foundation large diameter, full length reinforcing bar by suitable mechanical clamps.
  - Ground resistance shall comply with turbine supplier maximum resistance requirements.
  - Ground grid resistance shall be tested at each WTG foundation prior to connection to (isolated from) trench ground.
  - Underground ground connections are to be exothermic weld.
  - Ten (10) feet wide "beauty ring" crushed, high impedance rock shall be placed around the tower foundation pedestal and transformer pad if required, in accordance with ground study step and touch analysis results.

7.10.7 Overhead Installation

- The following general specifications apply to the Project overhead collection system if applicable:
  - Overhead collection system shall be designed and installed in accordance with Owner T & D Standards.
  - Collection system shall be in full compliance with the applicable requirements of the Oregon Avian Power Line Interaction Committee.
  - Double circuit construction is allowed.

  - Portions of the 34.5 kV overhead collection system may be installed as underbuild on 230 kV transmission line only where terrain or other construction factors absolutely dictate.
  - Conductor type shall be 1590AAC, with an OPGW shield required per Owner direction.

7.10.8 Surge Arrestors

- Surge arrestors shall be fully shielded, submersible, dead-front devices rated at 35-kV class, 600A, 30kV/24.4MCOV and meeting the requirements of ANSI C62.11 for Station Class installation in a 60-Hertz outdoor installation.

7.10.9 Grounding

- Turbine foundation ground system ground rods shall be copper-clad, 5/8-inch diameter, 8-foot-long rods at a minimum.
- All turbine manufacturers, local requirements, NESC and IEEE shall be adhered to in the grounding design and construction. Grounding design shall consider recommendations of the geotechnical report, grounding study (personnel safety for step-and-touch potentials), and lightning and surge protection.

7.10.10 Conduit

- Conduit size shall be in accordance with ANSI / NFPA 70, at a minimum. Conduit material shall be Schedule 40 PVC, with smooth interior surface and suitable pulling lubricant used to prevent cable damage while pulling cable into duct.
- The location of all conduits shall be surveyed and recorded within the as-built drawings.
- All above-ground power and communications cabling shall be installed in conduit.
- All below grade crossings, including road, utility, and wetland crossings (if required), shall be installed in conduit.
- LV cable from turbine to pad-mount transformer (if any) shall be installed in conduit.

7.10.11 Connectors and Fittings

- Connectors and fittings shall be of the proper size and design to assure permanent, secure, and low-resistance connections.
- Suitable connectors and fittings to be used where appropriate include:
- Belleville washers for pad connections
- Stainless steel bolts for copper to aluminum connections
- Stud-to-pad and cable-to-pad connectors for stranded aluminum conductors
- Tubular compression fittings for stranded aluminum conductors
- Four bolts or two "U" bolts for copper bus work joints
- Shield wire dead ends, splices, and taps shall incorporate fittings that are compression type with bolted jumper connections, with compressions sleeves of at least 90% shield wire strength.
- Disconnect switch terminal pad connectors will be NEMA four (4) bolt terminal pad connectors.

8. HIGH VOLTAGE TRANSMISSION LINE

8.1 General

8.1.1 The HV Transmission Line shall be designed, assembled, constructed and tested consistent with all Applicable Standards including:

- ANSI / IEEE C2 – National Electric Safety Code
- ASCE 48-11 - Design of Steel Transmission Pole Structures
- ASCE Manual No. 74 - Guidelines for Electrical Transmission Line Structural Loading, 2010, Third Edition
- IEC 60826 - Design criteria of overhead transmission lines
- IEEE-738 - Standard for Calculating the Current-Temperature Relationship of Bare Overhead Conductors

8.1.2 Furthermore the HV Transmission Line shall be designed, assembled, constructed and tested in accordance with local and international industry best practice and guidelines and achieve compliance with the requirements of:

- RUS Bulletin 1724E-200 – Design Manual for High Voltage Transmission lines
- IEEE P1863 - Guide for Overhead AC Transmission Line Design
- IEEE Std. 524, 1992 - IEEE Guide to the Installation of Overhead Transmission Line Conductors
- Applicable Permits
- Owner Standards
- Any other relevant requirements of local, state and national authorities

8.2 Line Route and Access

8.2.1 The line route and pole locations shall be in accordance with the Applicable Permits.

8.2.2 Transmission Pole Spotting Criteria:

- Minimize contact with environmentally sensitive areas, streams, forested areas, or other valuable natural habitats.
- Minimize contact with property parcels that have incompatible zoning or land use planning classifications.
- Minimize contact with areas where terrain or drainage would interfere with transmission line construction and maintenance.
- To the extent practical, if any existing structures require replacement, the structure should be replaced on a structure-for-structure basis. All new structures will be placed as close as possible (either ahead or back along the center-line) to the existing structures.
- The structures at line angle points (P.I.s) will be placed in the same location as the existing structures. Temporary structures will be used during construction to support the existing circuit in order to remove the existing P.I. structure and replace with a new structure.
- Where the rights-of-way are sufficiently wide, new structures will be placed along side of the existing structures to facilitate a 10-hour return to service time of existing transmission lines during construction.

- Some structure locations may be shifted significantly for more optimal design or as dictated by environmental factors.

8.2.3 Perform any field surveys to acquire topography and other field data, as necessary, for transmission line design. Provide all electronic copies of the associated AISC survey files to Owner. Contractor shall be responsible for the staking of all proposed locations for core borings, Right of Way acquisition and any other associated engineering activity such as wetland delineation.

8.2.4 Perform subsurface utility analysis to address construction access and external loading limits for all foreign utility crossings.

8.2.5 Design solutions and obtain crossing approvals for all foreign utility crossings from other owner utilities (e.g. power lines, state or county roads, communications cables, railway lines, gas pipelines, etc.).

8.2.6 Review to determine whether any Federal Aviation Administration regulations apply, provide written notification to those agencies for their review and acceptance, incorporate any requirements in the design and note any specific construction details on the new drawing set. Aviation marker spheres shall be used as part of the construction requirements on all prominent crossings, such as limited access highways, river or major ravines. Any aviation marker lights that are required must have an automatic monitoring system installed with each light.

8.2.7 Acquire transmission line right-of-way covering the line from the collector substation to the POI.

8.2.8 Minimize disturbance areas, damage to cultivated crops or pastureland and avoid native vegetation sensitive areas as far as possible.

8.2.9 Drainage and erosion control shall meet the requirements of Section 6.11.

8.2.10 Reinstate and re-vegetate all disturbed areas.

8.3 Foundations for Poles or Towers

8.3.1 Pole or tower foundations shall be designed in accordance with the Applicable Standards, and meet requirements of the geotechnical report, as well as requirements for concrete in this specification.

8.3.2 All transmission line custom steel pole structures and any guy anchors shall be supported by drilled reinforced concrete caissons. The foundations shall be designed per current industry standards and the designer shall use Ensoft, Inc's LPILE or PLS-CADD-foundation design computer program.

8.3.3 Program inputs (pole loading, soil conditions data from core borings and Geo – Tech report output) and output results shall be provided to Owner. Contractor must perform a geotechnical and subsurface investigation at each foundation structure location that will include a boring to determine the soil parameters to be used in the design.

8.3.4 If shallow bedrock is encountered in the soil borings, the caisson foundations shall be designed to be embedded into solid rock a length equal to at least one caisson diameter.

8.3.5 The ultimate strength of overturning moment and uplift of the foundation shall not be less than 1.25 times the design factored load reactions of the structure. The ultimate strength of foundations subjected primarily to compression load shall be not less than 1.10 times the design factored load reaction of the structure. Overturning moment foundations

designed by rotation or pier deflection performance criteria shall use factored structure reactions for determination of the foundation performance.

8.3.6 The minimum caisson diameter for each structure shall be the custom designed steel pole manufacturer's anchor bolt circle diameter plus a 6 inch minimum clearance to surrounding competent soil or bedrock materials around the anchor bolt cage.

8.3.7 Alternate transmission tower foundation designs shall be submitted to Owner prior to executing the foundation design effort.

8.3.8 The pedestal height above ground line shall be designed with a minimum of 12 inches of reveal above final grade unless prior approval is given by Owner.

8.4 Design

8.4.1 Owner requires preparing the line design utilizing PLS-CADD. A copy of the final PLS--CADD design file shall be provided electronically to Owner.

8.4.2 All final drawings shall be approved and sealed by a Registered Professional Engineer certified within the state of proposed construction.

8.4.3 Contractor will stake and acquire a core boring and a geotechnical report for each structure site and perform a customized foundation design for each structure.

8.4.4 Contractor shall determine and specify all of the associated hardware that will be required for the OPGW installation along with splice locations determined. The hardware specified must meet the wire manufacturer's specifications and utilize their recommended supplier.

8.4.5 Contractor shall locate all proposed OPGW splice locations at easily accessible structures. Slice points shall also be located near other telecom utility crossings or a point nearest to a telecommunication provider's infrastructure if a crossing does not exist.

8.4.6 Contractor shall comply with the manufacturer's recommendations and Applicable Standards for all assemblies and installation of poles, conductors and other components.

8.4.7 All new Transmission structures should be direct embedded Round Wood Pole (Monopole, H-Frame style, or 3-Pole style) or Tapered Tubular Steel supported by a drilled reinforced concrete foundation. Tapered Tubular steel pole structures and associated attachments shall be weathering steel or galvanized steel.

8.4.8 Conductor installed should be one of Owner's standard conductors. Conductor shall be single bundled. The use of multiple bundled conductor shall be approved by Owner.

8.4.9 All insulators, style and manufacturer, shall be pre-approved by Owner. Non-Ceramic insulators are not permitted to be used for voltages above 138kV. For 230kV lines, insulators must be toughened glass (Seves) or Porcelain (NGK).

8.4.10 Contractor shall hire an Engineer to complete a grounding study, incorporating the mutual coupling and induced voltage of the phase conductors and shield wire(s). This study shall inform the grounding scheme for the Transmission Line and OPGW system to ensure public and worker safety. This study is required to be presented to the owner prior to completion of the Transmission Line Design.

8.5 Assembly and Installation

8.5.1 Contractor will provide off-loading and secure storage facilities and shall be held responsible for the proper protection and safekeeping of all material until the completion

date. Contractor shall be held responsible for any loss or damage to material after delivery.

8.5.2 Contractor will verify and confirm the quantities of material supplied by vendors. Conductor used is to be optimized to obviate excessive waste. A nominal amount (dependent on the terrain - max. 5%) of phase and earth conductor will be allowed for sags and jumpers.

8.5.3 The applicable type of tower shall be erected on the completed foundation. In the case of self-supporting tower concrete foundations, towers shall not be erected until the concrete has had at least 14 days in which to cure, or test breaks have proved the Design strength of concrete has been achieved, whichever is later. In the case of guyed tower concrete foundations and/or anchors, towers shall not be erected until the concrete has had as least 21 days in which to cure, or test breaks have proved the Design strength of concrete has been achieved, whichever is later. Guyed steel structures are discouraged and require approval from Owner.

8.5.4 All design tolerances shall be documented and provided to Owner and achieved.

8.5.5 Substantial temporary conductor supports shall be used, or equally effective measures taken, to prevent encroachment of statutory clearances, or other clearance requirements stated in the permits, between the conductor being strung and other power or communication lines, roads or railways being crossed.

8.5.6 Suitable structures under each phase will be erected to protect all fences from conductor damage during stringing.

8.5.7 Temporary changes in poles, fixtures or conductors of lines being crossed will only be carried out if accepted by Owner. Contractor shall indicate any changes considered necessary and will co-ordinate any changes with the owner of the service.

8.5.8 Contractor will endeavor to arrange that all crossings be made with the crossed line de-energized. The time of line outages shall be kept to the absolute minimum. All preparatory work shall be done prior to the work permit coming into effect. Upon completion of the work, Contractor shall immediately notify the applicable utility that lines are clear and release the working permit.

8.5.9 All phase and earth conductors shall be tension strung. Stringing shall be done in daylight hours only.

8.5.10 The equipment and methods used for stringing the conductors shall be such that the conductors will not be damaged. Particular care shall be taken at all times to ensure that the conductors do not become kinked, twisted, bird-caged or abraded in any manner.

8.5.11 Contractor shall make suitable arrangements for temporary staying of towers, and anchoring of conductors when necessary. Conductors may not be anchored to any portion of any tower, except strain towers, and then only at the points designed for conductor attachment. Temporary anchoring to footings and guy anchors will not be permitted. Where temporary anchoring is required, suitable temporary anchors shall be provided. Installation and removal of temporary anchors will be Contractor's responsibility

8.5.12 All conductors shall be strung by the controlled-tension method by means of rubber faced, double bullwheel-type tension stringing equipment. This equipment must be so designed that there shall be no conduction of the heat generated by the braking action, to the bullwheels. There shall be appropriate mechanical braking on the reels to prevent loose conductor between the reels and the bullwheels, but sufficient tension to pull the conductor in between layers remaining on the reel. Brake controls shall be positive and fail-safe in order to minimize the danger of brake failure.

8.5.13 The tension shall be controlled individually on each conductor, and when the desired tension is obtained, the same constant tension shall be held so long as the brakes are left at this setting. Tensions, while pulling, must be sufficient to clear all obstacles safely without damage to the conductor. At no time shall the pulling tension exceed the tension shown on the sag charts.

8.5.14 Adequate protection shall be provided where there is danger of conductors being damaged by vehicles or other equipment and objects. Conductors shall not be left in contact with the ground, vegetation or any conducting or semi-conducting material. Wood lagging or similar material shall be used to protect the conductor when working at ground level.

8.5.15 Before stringing commences, Contractor will be required to compress sample phase and earth conductor mid span joints, as well as phase conductor dead/end assemblies on site using the matched and numbered dies and compressors intended to be used on the line during stringing. The length of conductor between any two fittings on the sample shall be not less than 100 times the overall diameter of the conductor. At an acceptable testing authority a tensile load of about 50% of the breaking load of the conductor shall be applied and the conductor shall be marked in such a way that movement relative to the fitting can easily be detected. Without any subsequent adjustment of the fitting, the load shall be steadily increased to 95% of the breaking load and then reduced to 90% of the breaking load and maintained for 1 min. There shall be no movement of the conductor relative to the fitting due to slip during this period of 1 minute and no failure of the fitting. The conductor shall then be loaded to failure, and shall again withstand a minimum load of 95% of the minimum breaking strength of the conductor for it to be deemed acceptable. If the sample fails this test, a further three (3) samples shall be tested and will all be required to pass the above. A copy of the test report shall be provided to Owner prior to stringing.

8.5.16 Records of temperature, sag and tension for each section regulated shall be kept by Contractor, and a copy supplied to Owner.

8.5.17 OPGW shall be installed for the dual purpose of providing a lightning shield for the conductors and fiber-optic communications. A minimum of 48 individual fibers shall be provided in the OPGW conductor.

8.5.18 All conductor shall be Sagged using the T-t Transit method and by installing a dyno at the far end of the deadend section. The Transit targets and dyno shall confirm adequate sag has been reached. Identical processes shall be followed when installing additional phases in the same deadend section.

8.5.19 Structures requiring guy wires will have fencing to protect them from wildlife and vehicles.

8.5.20 Fire preventative coating will be applied up to 8 ft on structures if wooden products used.

8.6 Earthing

8.6.1 The earthing system shall clearly and demonstrably ensure the safety of personnel, the public and equipment under all normal and abnormal operating conditions and all fault conditions.

8.6.2 The earthing system shall ensure that there is no risk to personnel, the public or livestock of electric shock (e.g. transferred potential, step voltages and touch voltages).

8.6.3 Pole structures shall have a maximum footing resistance of 10Ω, unless a requirement for lower resistances is determined by the earthing study.

8.7 Commissioning

8.7.1 Contractor to provide owner with as-built LiDAR survey of complete Transmission Line. The Survey of existing facilities shall be commissioned and completed within 1 month of conductor installation.

8.7.2 Contractor to provide owner with IR survey of entire transmission line after the line has been energized and is delivering not less than 80% of anticipated nominal load.

8.7.3 Contractor to provide owner with Corona survey of the entire Transmission Line after the line has been energized and is delivering not less than 80% of anticipated nominal load.

9. PLANT COMMUNICATIONS NETWORK

The Wind Power Plant Communications Network shall connect to all Wind Turbines and Meteorological Stations on the Wind Power Plant site and shall connect to the terminal points as specified in this document, including but not limited to the TSP communication network.

Contractor shall be responsible for achieving a fully functional communications link between the Wind Power Plant SCADA server(s), each of the Wind Turbines and the Meteorological Stations.

9.1 General

9.1.1 The Wind Farm communications network will connect to the terminal points as specified, be compliant with Applicable Standards, and meet any additional requirements of the TSP Interconnection Agreement.

9.1.2 Fiber optic cables shall be used for the Wind Farm communication network.

9.1.3 The Wind Farm communications network shall be suitable for the Site, including:

- Immunity from the effects of fault and lightning currents
- The expected ambient temperature range
- Geotechnical conditions
- Protection from pests and rodents

9.1.4 No joints in the fiber-optic cable are permitted.

- Prior to fiber-optic cable installation, all cable will be inspected and tested with optical domain reflectometer.

9.1.5 Communications network requirements

- Underground fiber optic cable shall be as follows:
  - Conduit EPDM SDR 11 minimum
  - 12 fiber for individual collector circuits
  - For rodent protection a combination of the following methods shall be used:
    - Non-armored fiber-optic cable in Pest Duct
    - Non-armored fiber-optic cable installed in a minimum of 4” schedule 40 PVC or HDPE innerduct
    - Armored fiber optic cable
    - Any concreted encased duct bank or metallic conduit
    - Any owner approved substitution that achieves equal protection from rodent damage
  - Collapsed fiber-optic ring system layout design, installation and testing.
- The communication network will be designed for a minimum of one (1) GB bandwidth
- The fiber-optic cabling will be either 12 strand multimode or 12 strand single mode, as applicable and consistent with standard industry practice
- Fusion splicing will be used if required, and completed in above-ground pedestals.
- Splice vaults shall be composed of reinforced concrete or fiberglass and equivalent in size to 4’x4’x4’ with interior racking to mount splice case off the bottom of vault. Vault shall have an open bottom with gravel base.

- Extra fiber-optic cabling (slack) will be included at each end of all cable runs consistent with standard industry practices
- The communication system will have a maximum attenuation of 0.35 dB/km at 1310 nm or 0.25 dB/km at 1550 nm and will include a minimum system margin of between four (4) and six (6) dB
- In the event fiber-optic cables are placed in trenches with wiring associated with other parts of the Work, underground rated subduct that also provides the ability to eliminate or decrease damage due to wildlife infestation. will be used to protect and separate the cable

  – Redundancy

    - The Wind Power Plant Communications Network shall have redundancy, so that the failure of a single component or communications link in the Communications Network shall not result in the loss of communication to more than one Wind Turbine, Meteorological Station, Terminal Point or Interface.
    - Redundancy may be achieved by using ring topology for the fiber-optic network such that communications can be maintained to all Wind Turbines in the event of a break in one of the cores of the fiber-optic cable. Re-routing of data shall take place automatically and not require manual intervention.

10. TELECOMMUNICATIONS FACILITIES

10.1 SUMMARY

10.1.1 This Section summarizes the communications systems Contractor shall provide as part of its proposal. The proposal shall address three aspects of the telecommunications design.

- Intra-site Communications - the Network shall primarily be an Ethernet Fiber network to support intra-site data and voice communications needs.
- Substation Interconnect - Contractor shall incorporate plans for the communications needs required to interconnect the facility to the bulk electric power system. This may include transfer trip and any of special or remedial protection schemes needed for the interconnection of the facility to the bulk electric power system. This design shall meet any requirements from the interconnecting utility, the Public Utility Commission, and/or the Independent System Operator for SCADA or Metering.
- Owner Connectivity - to support remote monitoring and operation of the facility. This will include one or more data links back to Owner operations center. This shall include connectivity for both the Primary SCADA link as well as the plant operational data link serving plant operations such as sending operational and maintenance data to a historian, allowing remote access and control, and voice communications to the facility.

10.2 TELECOMUNICATIONS APPROACH

10.2.1 Contractor shall provide a bid that both meets these specifications and allocates a budget for the design, procurement, and construction of these telecommunications facilities. The site network and the interconnection requirements should be known and the design and costs of these facilities should be accounted for and well understood. The communications link to Owner will depend greatly on the location, size, and type of facility proposed, and therefore Contractor shall propose a solution that meets these functional specifications. During negotiations this aspect of the design may be revised based on site specific conditions. An allowance for each of these three sections (Intra-site Communications, Substation Interconnect, and Owner Connectivity) shall be provided. The proposal price will not be revised if the ultimate solutions remains within these allowances.

10.3 TELECOMUNCATIONS FACILITES

10.3.1 The following shall be provided both during and after construction:

- Communications during construction: Contractor shall provide a communications network to be used during construction, and specifically communications services to the on-site trailers used during construction. A minimum of 5 Mbps Ethernet link shall be provided to each Owner trailer, along with (2) phone lines per trailer, which may be either VOIP or POTS. The Ethernet link shall only be dedicated to Owner and no other users. Contractor shall further provide any communications circuits needed for their own use. In addition each trailer shall be equipped with one 7’ tall 19” wide communications rack and 20 A of AC power for Owner to install routers/switches used to distribute data connections.
- Intra-Site Network: Contractor shall provide a data network that extends from a central substation or maintenance office to all equipment enclosures throughout the facility that house microcontroller equipment.

- This network shall be constructed such that it supports the following applications:
  - Shall support the Real-time control for the operation of the plant.
  - Shall support remote monitoring for Owner to gather operational data from microprocessor-controlled equipment.
  - Shall support monitoring of weather information.
  - Shall allow Owner to remotely access remotely configurable equipment to make settings changes and firmware upgrades.
  - Shall support the use of Voice at each enclosure, desk, conference room, or security control point.
  - Shall support the use of Video where required for security and operations of the plant.
  - Shall include Wireless Access Points in Office locations
- The network shall be capable of meeting the following specifications:
  - Use IP/Ethernet communications over a fiber and copper network.
    1. At least 60 Strands of single mode (SM) fiber shall be installed between all buildings as part of the project. Fiber shall be configured in a logical ring and where possible into a diverse optical ring.
    2. Category 6 copper shall be used for all connections between switches and equipment within a building.
  - Use gigabit Ethernet connections
  - Use VLANS for segmentation of traffic
  - Use Quality of Service to Prioritize traffic flows
  - Use Rapid Spanning Tree or other advanced ring convergence protocols.
  - Support POE where phones or wireless access points are installed.
  - Use managed equipment that support the following:
    1. Centralized authentication via RADIUS or TACACS
    2. Centralized logging via Syslog
  - Use hardened network equipment rated for the environment in which it will be installed.

- Interconnection to Bulk Electric Power System:
  - Build any fiber, microwave, or leased facilities needed in order to tie facility into bulk electric power system.
  - Follow Western Electricity Coordinating Council (WECC) teleprotection standards.
  - Meet utility interconnection standards.
- Owner Communications Circuits :
  - Contractor shall provide the following communication circuits, each with the respective parameters given. These communications circuits can be delivered over the one or more aggregate leased circuits if possible. These circuits may make use of a private data network or a leased facility from a common carrier. Contractor's proposal shall include the capital cost for construction, as well as the estimated monthly recurring cost if applicable. Owner shall not be responsible for any communication links required by manufacturers, such as for remote access by the turbine or generator manufacturer. Contractor shall make use of Owner equipment listed below in Section 10.4, where such equipment is required:

Circuit Name	LOC A	LOC Z	Type	Capacity	Latency	Avail.	Circuit Description

O&M POTS LINE	O&M	PGE WHQ	FXS	64 kbps	100 msec	99.99%	PHONE LINE
O&M CORPORATE NETWORK	O&M	PGE WHQ	ETH	20 Mbps	100 msec	99.99%	CORPORATE NETWORK SERVICE
O&M SECURITY ETHERNET	O&M	PGE WHQ	ETH	1.5 Mbps	0.5 sec	99.99%	CORP SECURITY LAN
SUB SECURITY ETHERNET	SUBSTATION	O&M	ETH	1.5 Mbps	0.5 sec	99.99%	CORP SECURITY LAN
SUB REMOTE ACCESS LAN	SUBSTATION	PGE WHQ	ETH	1.5 Mbps	0.5 sec	99.99%	REMOTE ACCESS FOR PROTECTION & AUTOMATION GROUP
SUB COMM TECH LAN	SUBSTATION	PGE WHQ	ETH	1.5 Mbps	0.5 sec	99.99%	REMOTE ACCESS FOR COMM TECHS
SUB SCADA	SUBSTATION	PGE WHQ	RS-232	64 kbps	1 sec	99.99%	SERIAL DNP 3.0 SCADA
SUB AGC SCADA	SUBSTATION	PGE WHQ	RS-232	64 kbps	1 sec	99.99%	SERIAL DNP 3.0 AUTOMATIC GENERATION CONTROL
SUB PHONE	SUBSTATION	PGE WHQ	VoIP	64 kbps	100 msec	99.99%	PHONE LINE FOR CONTROL HOUSE
SUB ACCESS CONTROL POTS	SUBSTATION	PGE WHQ	FXS	64 kbps	100 msec	99.99%	PHONE LINE FOR SECURITY ACCESS CONTROL
SUB SECURITY POTS	SUBSTATION	PGE WHQ	FXS	64 kbps	100 msec	99.99%	PHONE LINE FOR SECURITY
INTERCONNECT METER POTS	SUBSTATION	PGE WHQ	FXS	64 kbps	100 msec	99.99%	PHONE LINE FOR INTERCONNECTING UTILITY METER
INTERCONNECT PHONE POTS	SUBSTATION	PGE WHQ	FXS	64 kbps	100 msec	99.99%	PHONE LINE FOR INTERCONNECTING UTILITY PHONE

10.4 TELECOMUNCATIONS EQUIPMENT & INSTALLATION

10.4.1 In each major facility provide space for (4) adjacent Communications racks. For the Plant and Switchyard/Substation facilities, locate the Communications racks in the same room or adjacent to the relay equipment racks. For the O&M Building or Administration Building, in addition to the Communications racks, provide (4) racks for IT Operations and (2) racks for Corporate Security Operations. Locate the Communications racks in the same room or adjacent to racks dedicated for IT Operations and Corporate Security. Each room to include 4'x8' fire-rate plywood backboard (white).

10.4.2 In the O&M or Administration Building, provide a Communications room of at least 240 sq. ft., with dimensions of 12' x 20'. For the Switchyard/Substation, the Control House shall be of adequate size to accommodate the telecommunications equipment, -48 VDC charger, and -48 VDC battery, as well as any additional equipment required in preceding or proceeding sections.

10.4.3 Provide a -48VDC power system capable of supplying the load with an 8 hour reserve time at each major facility.

10.4.4 Provide a SATRAD-G2 satellite phone system with exterior antenna, rack mount equipment, and a dedicated desk phone (PSTN Interface).

10.4.5 Communications equipment shall be grounded per Motorola R56 standards in O&M and Administration Buildings. Grounding in the Switchyard/Substation shall follow standard industry practices, and single point grounding methodology.

10.4.6 Installation of fiber optic cable shall meet TIA-568C or later, in addition to any other relevant industry standards. Intra-site fiber optic cable shall be installed in innerduct, within appropriate PVC conduit, cable trench or ducting.

10.4.7 OPGW fiber optic cable shall be installed in the shield wire position for any new transmission line installations.

10.4.8 Contractor shall provide diagrams or drawings matching existing Owner documentation standards for all building/room plans, cable routing, equipment racks, equipment wiring, and circuit schematic diagrams for all installed telecommunication facilities.

10.4.9 All equipment and systems shall be tested to ensure desired performance, and the results shall be submitted to Owner in writing. Communications systems shall not be considered approved for operation until the testing results are reviewed and approved by Owner or a designated Owner's representative.

10.4.10 All installed cabling shall be labeled to allow Owner or an independent third party to locate and document individual cables at each termination point.

10.4.11 Equipment specified for this project shall be of the same manufacturer and model as Owner uses in their existing communications systems:

- Dual-post Rack – Chatsworth "Clear", 19" x 84"
- Ethernet Switch – Cisco
- VoIP Phone - Cisco
- Wireless Access Point – Cisco
- SONET Fiber Node – Fujitsu 4100 ES shelf and support cards
- T1 Multiplexer – RAD MP4100 shelf and support cards
- DSX-1 Cross-connect panel – Telect 28-port; 010-0128-0101
- Fiber Patch Panel – Clearfield FxDS, with SC/UPC Connectors
- ADSS Fiber Cable – OFS AT-3BE17NT-060-CMEA (60-CNT)
- OPGW Fiber Cable – AFL DNO-8234 (48-CNT)
- -48 VDC Fuse Panel – Telect GMT Dual Feed 20/20-position
- -48 VDC Charger Panel – Valere; CK4D-ANL-VC shelf, min 24 hours battery recharging capability while under load
- -48 VDC Battery (Plant or Switchyard/Substation) – C&D (flooded), min 8 hours carry time
- -48 VDC Battery (O&M or Admin Building) – C&D (flooded) or East Penn Deka Unigy II (VRLA) with one-piece base and interlocking cells, min 8 hours carry time

11. PLANT SCADA SYSTEM

The SCADA system shall be a proven system, suitable for performing the operation, maintenance and monitoring functions associated with the Wind Power Plant.

Other features that include modules for managing O&M may be offered as an option. These may include maintenance scheduling, spare part records, service records and maintenance records.

11.1 General

11.1.1 The central SCADA computer shall be installed in the substation and shall be suitably protected against all reasonably foreseeable environmental conditions.

11.1.1 The SCADA system shall record and report all necessary operational details and allow central and remote, automatic and manual control. The software provided shall also be capable of undertaking the warranty calculations and providing daily/monthly/yearly operations and management reports to an agreed format. SCADA system will be able to generate nonstandard reports, points and Owner will have the ability to create new reports/points without vendor assistance. Owner will be given access to all points via a standard communication protocol.

11.1.2 The SCADA system shall be capable of meeting the TSP Interconnection Agreement requirements, for monitoring and control of the Wind Power Plant. This shall include the provision of real time data required by the Interconnection Agreement via the TSP RTU.

11.1.3 The SCADA system shall be equipped with a database back-up facility, together with a facility for online access to the database, that shall allow Owner to obtain and process data and to customize and configure reports for the purpose of undertaking the warranty calculations and providing daily/monthly/yearly operations and management data, by employing suitable industry standard database software (e.g. MS SQL Server).

11.1.4 The SCADA system shall be capable of routine interrogation from a remote site at an acceptable speed.

11.1.5 The SCADA system shall be connected to all the Wind Turbines and the central SCADA control via industry standard data communication hardware and software. It shall also be possible to connect other signals including utility meters and other Wind Turbine signals as required by the design and supply of the Wind Power Plant. It shall be possible to access the SCADA system from any of the Wind Turbines using a portable PC, giving full access to the system. The SCADA system will also support the addition of nonstandard instrumentation to include, but not be limited to, SODAR, LIDAR, cameras, and other meteorological instrumentation.

11.1.6 Should the central SCADA control or communication connection fail the individual Wind Turbines and electrical systems shall continue in operation and shall be operated safely by the individual Wind Turbine control system.

11.1.7 It shall be possible to store at least one (1) year of data from the Wind Power Plant without archiving it from the system. It shall be possible to remotely download raw 10-minute average SCADA data by means of an online database facility for further analysis.

11.1.8 Upgrades to the SCADA software and any necessary hardware keys shall be provided free from charge throughout the warranty period. Contractor shall provide additional upgrades, additional hardware keys and support on reasonable terms over the Design Life.

11.1.9 The SCADA system shall be traceable and transparent in operation. It shall be structured in such a way as to provide maximum data integrity. Data sampling rates shall be

sufficient to meet the requirements of the warranty and testing contracts and external parties as specified in this document.

11.1.10 It shall be possible to download configuration and parameter settings from the Wind Turbine controllers and record them on the SCADA system.

11.1.11 SCADA system will be accessible and independent of the Wind Turbine providers supplied SCADA system. SCADA system will be scalable and able to integrate with other variable energy assets.

11.2 Main SCADA Components

11.2.1 The SCADA system shall comprise as a minimum:

- Main SCADA server(s), viewing and operation station (may be combined with server) in the Wind Power Plant Control Building
- Communications links connecting all Wind Turbines, Met Masts, buildings and electrical equipment within the Wind Power Plant
- Interface to Wind Turbine controllers
- Interface to external systems including the TSP's RTU
- Interfacing and connections between components as required
- SCADA system will have a local user interface at the physical SCADA system. System will be accessible to Owner employees 24/7. Owner employees will be able to control the plant in the event of communication failure externally.

11.3 Main SCADA Server(s), Viewing and Operation Station

11.3.1 The SCADA viewing and operation station shall allow full viewing, analysis, reporting, fault diagnosis, resetting of faults and control of Wind Turbines consistent with its deployment as the primary SCADA terminal located on the Site.

11.3.2 The SCADA viewing and operation station shall be equipped with a printer suitable for printing reports from the SCADA system.

11.3.3 The SCADA system will be fully accessible to Owner engineering and compliance group. Owner will be able to designate which SCADA points will be archived in Owner's PI system through the OPC server.

11.4 Interfaces

11.4.1 The main SCADA server(s) shall interface with an RTU provided by the TSP. The communication protocol and medium for this interface shall be agreed with the TSP.

11.4.2 The main SCADA server(s) shall interface with an RTU provided by Owner. The communication protocol and medium for this interface shall be agreed with Owner. This interface shall provide AGC control of the entire plant.

11.4.3 The main SCADA server(s) shall interface with any substation capacitors, SVC or other reactive plant comprising part of the Work as necessary for their control and monitoring. This interface shall be suitable for the purpose of:

- Voltage, VAR or power factor control as necessary to achieve compliance with the Interconnection Agreement and TSP requirements, Wind Turbine requirements and plant insulation ratings

- Controlling voltage at the Wind Turbines' terminals to maximize uptime and energy production and minimizing electrical losses as reasonable
- Viewing the status and monitoring the condition of any reactive plant as necessary
  - The main SCADA server(s) shall interface with the substation equipment. This interface shall be suitable for the purpose of:
    - Viewing status of circuit breakers and switches at the substation
    - Obtaining voltage, current, active and reactive power, and relay data at feeders and the point of interconnection with the TSP
    - Receiving equipment alarms
    - Tripping feeder circuit breakers

11.4.4 The main SCADA server(s) shall interface with Owner's PI data collection and historical system via Owner's standard interface.

11.5 Availability and Reliability

11.5.1 The SCADA system, inclusive of all elements including and between the Wind Turbine controllers and the main SCADA server shall be designed and implemented for an availability of 8760 hours per year minus hours for planned outages and 100% reliability. Redundancy shall be designed into the system to meet the required availability and reliability.

11.5.2 Redundancy shall be provided for all critical elements that are prone to failure, including electromechanical hard drives and computer power supplies.

11.5.3 In case of a grid failure or other loss of power, an uninterrupted power supply (UPS) shall prevent data stored on the main SCADA server(s) from being lost after loss of supply. When normal conditions are resumed, the main SCADA server(s) shall re-start automatically.

11.6 Cyber Security

Contractor shall furnish and configure the following security features as part of the SCADA system to be compliant with NERC Critical Infrastructure Protection (CIP) and Owner's internal standards.

11.6.1 Security Center

- Contractor shall provide a security center to accompany the SCADA system.
- Contractor will supply all necessary servers, one local view station, and any necessary networking devices to connect the security center to the SCADA system
- Each security appliance (with the exception of the vulnerability scanner) must reside on its own virtual machine operating in separate subnets, with strict access rules governing which communications are allowed into and out of the networks.
- Security appliances:
  - Patch Management:
    - Contractor shall supply an on-site patch management server capable of deploying patches for all software, hardware, and integrated third-party applications within the SCADA system, security center, and all other sub systems

- SCADA vendor shall evaluate, test, and provide appropriate patches to all devices and software within the SCADA system, security center, and all other sub-systems
- Patches will be provided on a monthly basis
- The patch management server will compile a comprehensive, centralized view of the patch status of each computer through agent-based scans, which will be capable of being displayed on a graphical dashboard. This information will also be integrated into the SIEM.
- Patch Management functions will operate in a virtualized environment, utilizing agents installed on SCADA system, security center, and other subsystem devices.

– Malware prevention

- All Windows endpoints within the SCADA system, security center, and any other sub-system will have host-based whitelisting
- Malware prevention will provide centralized configuration and control of malware prevention agents that reside on each client.
- Malware prevention agents will restrict which executables can run on the client by creating a whitelist of programs that are allowed to run.
- Malware detection will be reported to the SIEM, and standard reports must be capable of running on an automated schedule
- Malware prevention functions will operate in a virtualized environment, utilizing agents installed on SCADA system, security center, and other subsystem devices.

– Backup and Restoration

- Contractor shall provide an on-site backup server to schedule and preform automatic backups
- Contractor shall provide a network attached storage (NAS) to store backups
- Contractor shall provide specific recovery instructions for all devices
- All capable devices within the SCADA system, security center, and any other sub-system shall be backed up
- Other devices within the SCADA system, security center, and any other sub-system, such as networking devices, shall have their configurations, firmware, and any other applicable configuration files pulled automatically on a scheduled basis
- All backup files shall be encrypted
- Backup and restoration functions will operate in a virtualized environment, utilizing agents installed on SCADA system, security center, and other subsystem devices.

– Anti-Virus

- SCADA vendor shall integrate approved anti-virus software for all Windows systems within the SCADA system, security center, and all other sub systems.
- SCADA vendor shall provide an on-site anti-virus management server to apply updates to end point software
- All Windows endpoints will have host-based anti-virus software running at all times
- SCADA vendor shall provide updated anti-virus definitions on a weekly basis
- The anti-virus software will automatically detect, repair, and quarantine any spyware, adware, viruses, and other malicious intruders
- The anti-virus software will be installed on a dedicated anti-virus management station and will be used to:

    1. Integrate client software
    2. Configure and manage SCADA clients

3. Distribute anti-virus signatures
4. Generate anti-virus status reports

- Anti-virus software will continually monitor client's machine for known viruses, the client must be installed and configured such that it does not adversely affect the operation of the SCADA system or delay operator actions
- The anti-virus software will provide a standard set of reports that can be run on an automated schedule and will be incorporated into the SIEM. The reports that will be included with the anti-virus software will be, at a minimum:

1. Viruses report
2. Protection status report
3. Protection coverage report
4. License usage report
5. Anti-virus software version report
6. Users of infected computers report
7. Most infected users report
8. Anti-virus database usage report
9. Incompatible applications report
10. Errors report

- Anti-virus software must also have the ability to create custom reports
- Anti-virus functions will operate in a virtualized environment, utilizing agents installed on SCADA system, security center, and other subsystem devices.

– Vulnerability Scanner

- Vulnerability scanner will perform scheduled scans to identify missing patches, viruses, identify vulnerabilities, detect out-of-date anti-virus signatures, etc. so they are remediated before they can are exploited
- The vulnerability scanner will be capable of running detailed configuration checks that enumerate ports, users, shares, groups, agents, and services. Scans will be user-scheduled to collect information that is integrated with the SIEM.
- Vulnerability scanner can reside on the same device virtualized environment as another security appliance.

– Security Incident and Event Manager (SIEM)

- The SIEM will provide centralized collection and correlations mechanisms to monitor and report on the SCADA system security posture.
- The SIEM functions will consolidate and normalize all event logs generated by a variety of firewalls, NID devices, anti-virus products, anti-malware products, Netflow, vulnerability scanners, SCADA servers, etc.
- The SIEM shall simplify large amounts of disparate types of data in order to provide an indication that a security event may be happening.
- The SIEM shall be capable of running customizable reports on an automated schedule
- Contractor must supply a NAS for all log storage
- The SIEM appliance shall be compatible with existing Owner centralized SIEM
- The SIEM device can be standalone or virtualized, but must be approved by Owner.

• Security Center Computer requirements

– Server:

- General
    1. Each server shall be an independent Microsoft Windows based computer capable of stand-alone operation.
    2. Servers shall connect to SCADA system through an Ethernet NIC
    3. Rack mountable
    4. Servers shall be configured for redundancy complete functionality shall be available with the loss of any server

- Operating System: Microsoft Windows Server 2012 R2 or as recommended by Contractor
- Storage
    1. Raid 5 with minimum of 5 drives
    2. Hard drives:
        a. 1 terabyte per virtual machine
        b. SATA Interface
    3. Hot-plug hard drives

- Memory: Minimum 32 Gigabyte RAM per virtual machine
- CPU Cores: Minimum 4, Intel Xenon or greater, minimum speed 3.0 GHz
- Network Interface: Minimum 5 NICs, 1Gbps
- Power: hot pluggable redundant power supplies
- Virtualization: Up to 4 virtual machines per physical host
- Manufacturer: VMWare or Microsoft Hyper-V
- Manufacturer: Dell PowerEdge R730 or greater

– View Node:

- General
    1. Each server shall be an independent Microsoft Windows based computer capable of stand-alone operation.
    2. Servers shall connect to SCADA system through an Ethernet NIC
    3. Rack mountable

- Operating System: Microsoft Windows 2010, 64 bit.
- Storage: 500 Gigabyte solid state drive
- Memory: Minimum 32 Gigabyte RAM
- CPU Cores: Minimum 2, Intel Xenon or greater, minimum speed 3.0 GHz
- Network Interface: Minimum 1 NICs, 1Gbps
- Video Interface: Support up to 2 HDMI video outputs
- Monitors:
    1. Quantity: 2 monitors per view Node minimum
    2. Resolution: 1920 x 1080
    3. 24 inch diagonal

- Manufacturer:
    1. Dell Precision Rack 7000 Series or greater

– Network Attached Storage (NAS)

- General
    1. NAS shall be connect to SCADA system through an Ethernet NIC
    2. Rack mountable

- CPU architecture: 64 bit
- CPU Cores: Minimum 4, 3.0 GHz
- Memory: Minimum 4 Gigabyte RAM
- Drive bays:
    3. Minimum 12 drives
    4. Hot-swappable
    5. 1TB per drive
- Network Interface: Minimum 2 NIC, 1Gbps
- Power supply: Redundant failover
- Manufacturer: Synology

– Networking Devices

- Cisco iOS
- Netflow capable
- Rack mounted
- FirePOWER services (for firewalls)

11.6.2 Device Management

• Networking Devices

– All networking devices shall receive validated patches from the vendor via the patch management server
– By default, all networking devices will be managed by Owner, with the option of dual management (Owner and vendor) as required
– All networking devices shall have all un-used ports disabled
– post-contract award, the vendor shall provide documentation on all network devices installed with security settings
– All network devices provided by Contractor shall be capable of generating Netflow data
– If critical devices needed to operate SCADA system effectively do not inherently generate Netflow data, Contractor shall provide Netflow generators to simulate Netflow.
– Firewalls

- Firewalls will be implicit deny with exceptions
- Firewalls will be designed with both ingress and egress rulesets
- Post-contract award, vendor all provide information on all communications through the firewalls
- Firewalls will be Cisco iOS based with FirePOWER services
- Firewalls provided must meet all VPN Requirements

– Network Intrusion Detection (NID)

- All communications between different subnets or networks shall be monitored using Network Intrusion Detection System (NID)
- All external access points shall be monitored at the firewall level, capable of blocking unauthorized traffic
- Contractor shall provide any additional NID appliances
- NID devices shall be Sourcefire appliances
- All NID/NIP devices (including firewalls) must be capable of talking up to, and receiving updates from, an Owner owned Sourcefire management server

- End Devices
  - Examples of end devices include, but are not limited to, servers, HMIs, RTUs, controllers, sensors, actuators, meters, and inverters
  - Post-contract award Contractor shall provide documentation detailing all applications, utilities, system services, scripts, configuration files, databases, and all other system requirements for all end devices
  - Contractor shall provide documentation of all services required and justification for why they are necessary
  - Contractor will remove and/or disable all software components not required for operation prior to the FAT
  - Contractor shall configure devices with least privilege file and account access and provide documentation of the configuration
  - Contractor shall disable (through software or physical disconnection) all unneeded communication ports and removable media drives. Contractor will provide documentation that this has been completed prior to the SAT
  - Contractor shall incorporate a patch management process for all devices (in accordance with patch management section)
  - Contractor shall incorporate host-based appliances for all endpoints required by the security center
  - Pre-contract award Contractor will provide information on the patch management process
  - Contractor shall verify that the additional of security features does not adversely affect connections, latency, response times, and throughout, including during the SAT
  - Contractor is responsible for providing hardware capable of performing its normal functions in addition to all required the security functions

11.6.3 Account Management

- All default and guest accounts will be removed prior to the FAT
- Contractor will supply a list of accounts which need to be active and which can be disabled. Owner will approve these accounts in writing.
- Contractor will supply a domain controller to manage all windows-based machines and accounts
- Contractor will supply an Authentication, Authorization, and Accounting (AAA) server for authenticating VPNs and all networking accounts, and device accounts
- Contractor will hand over management of domain controllers and AAA server post-SAT
- All account activity, as well as failed login attempts, will be logged and sent to the SIEM
- All accounts within the SCADA system, security system, and DMZs will adhere to least privilege permission schemes
- Pre-Contract award, Contractor shall provide a separation agreement to determine how Contractor employees who have sensitive knowledge of purchaser's control system and who leave their position or have responsibilities changed will be

prohibited from disclosing that knowledge, where disclosure could lead to a reduction in security

- Contractor shall notify Owner within 12 hours of a Contractor employee, who has access to the SCADA system or any sub-system, quits or is terminated with cause
- Contractor shall notify purchaser within 3 days when a Contractor employee, who has access to the SCADA system or any sub-system, retires or changes position to where they no longer need access to the system
- All accounts will be role based with restricted permissions
- No local accounts shall be enabled within the SCADA system, where technically feasible

11.6.4 Network Design

- Contractor will provide a mechanism for alerting Owner in the event of a vulnerability or exploit that affects the SCADA system within a pre-agreed upon time frame
- Contractor shall disclose the existence and reasons for any identified backdoor codes
- FTP, telnet, and HTTP shall be disabled on all SCADA devices and replaced with SFTP, SSH, and HTTPS or encrypted alternatives where needed
- SSH, HTTPS, and RDP will be the only methods to remotely log into the site devices, authenticated by the AAA server, and may only originate from inside the SCADA system or
- Network Segmentation
  - In addition to all existing DMZs, the SCADA system shall be segmented in a logical manner, to be agreed upon by Contractor and Owner.
  - Contractor shall provide ACLs, port security address lists for all communications between subnets
  - Contractor shall provide and document secure network architecture where higher security zones originate communications to less secure zones
  - Contractor shall provide and document all communication paths between networks of different security zones
  - Contractor shall provide a mechanism for isolating specific subnets if they are known to be causing harm to the SCADA system
- Wireless Communications
  - Wireless technologies such as microwave, cell, Bluetooth, Wi-Fi (802.11x), ZigBee, WirelessHART, or other wireless technologies shall not be used within the SCADA system or any sub-system
- Management Tools
  - Contractor shall provide management tools specific to the hardware and software included in the SCADA system, security system, test environment, or any other sub-system
  - All tools will be licensed to incorporate all devices provided
  - Any licensing must be transferable if any device is replace for any reason
  - Additional licenses shall be available for purchases

11.6.5 Remote Access

- All remote access traffic will be fully encrypted
- All remote access will require 2 factors of authentication
- All access points including routable connections, serial links, or other communication methods will be documented and supplied by Contractor
- All remote access will be managed by Owner, in cooperation with Contractor
- No Contractor (including SCADA Contractor) shall have access to SCADA network or equipment remotely without Owner authorization
- Web Access
  - Under no circumstances will the SCADA system have direct access to the internet
  - All web (HTTP/HTTPS) access will be performed through a web-proxy
  - Contractor shall provide documentation of input sanitation for all web form inputs including, but not limited to, prevention of command injection, SQL injection, directory Traversal, RFI, XSS, and buffer overflow
  - Contractor shall provide an independent, third party assessment of all web-based interface software
- VPN Access
  - All remote access to the control system network must be performed through a VPN
  - VPN terminal server shall be located in a DMZ
  - VPN terminal server shall have monitoring software installed to record and forward pre-encrypted traffic to the NID device
  - VPNs must utilize multifactor authentication (e.g., security token, known key, and/or certificate)
  - VPN connections shall have communication logging, alarming, and monitoring to protect SCADA system from unauthorized modification or use
- Dialup and dedicated phone lines
  - Dial-up and dedicated phone lines will not be used within the SCADA network, security network, or any other sub-system

11.6.6 Physical Security

- Contractor shall provide a lockable or locking enclosure for all control system components
  - Core equipment, such as any backbone switches, SCADA servers, Remote access terminals, Firewalls, Routers, etc. must be locked, at minimum, by a non-reproducible keycard. Access to these cards and equipment must be logged, and this system must electronically record and timestamp who enters the room (e.g. AMAG)
  - Remote equipment, such as remote switches, controllers, media converters, PLCs, RTUs, and other end devices must be secured, at a minimum, by a non-reproducible key or keycard. Access to these keys and equipment must be logged
- Contractor shall verify and provide documentation that unauthorized logging devices are not installed (e.g. key loggers, cameras, and microphones)

- All physical security networks must be separate from SCADA networks

11.6.7 Incident Response/Disaster Recovery

- Pre-Contract award, Contractor shall provide Incident Response and Disaster Recovery (IR/DR) plans
- Contractor must incorporate purchaser's specific IR/DR plans if there are any deficiencies

11.6.8 Test environment

- Contractor shall provide equipment for a test environment to simulate standard operating conditions. The purpose of this system is not to completely reproduce the SCADA system, rather it should mimic key features of the system for testing purposes.
- Contractor shall include all hardware necessary to generate this environment including, but not limited to, SCADA servers, HMIs, Firewalls, Routers, Switches, Controllers, Protocol Converters, etc.
- Contractor shall include all software licenses and patches for all equipment in the test lab
- This network must be capable of testing patches, backups, and preforming penetration tests
- Test environment will be solely managed by Owner

11.6.9 Awareness Training

- Before any user is granted access to the SCADA system, they must undergo an Owner approved security training
- This training must be renewed on an annual basis for all personnel that interact with the SCADA system
- Contractor may provide their own training; however purchaser must verify that this training meets purchaser's requirements
- Contractor is responsible for insuring their personal complete cyber security training in the required time if they elect to train their own personnel
- If Contractor does not wish to have their own training, Owner will provide training to Contractor personal
- All records of this training must be provided to Owner before a Contractor employee is granted access to the SCADA system

11.6.10 Acceptance Tests

- Factory Acceptance Test (FAT)
  - Contractor shall provide current configuration files for all devices
  - Firewall rules, as well as all other access control mechanisms, will be enabled throughout the duration of the FAT
  - Devices will have logging enabled and logs will be provided to Owner at the end of the FAT
  - All Firewall rules will be reviewed during the FAT

- Site Acceptance Test (SAT)
  - Contractor shall ensure all devices are patched to their most current level
  - Contractor shall provide current configuration files for all devices
  - Firewall rules, as well as all other access control mechanisms, will be enabled throughout the duration of the SAT
  - Devices will have logging enabled and logs will be provided to Owner at the end of the SAT
  - All Firewall rules will be verified at the SAT
  - Vulnerability scans must be performed on critical system components as part of the SAT
  - Remote access and remote access restrictions must be tested as part of the SAT
  - Contractor will disable, remove, or modify all Contractor-owned accounts or negotiate account ownership of these accounts as part of the SAT
  - Contractor will create a baseline of system communication and configurations at the time of the SAT to be provided to the purchaser.
  - Contractor shall document the results of any NID tuning signatures and adjusting thresholds to reduce false positives and minimize false negatives.

11.7 Viewing and Display

11.7.1 The SCADA system shall display an "easy-to-read" summary of the Wind Power Plant status and performance at any time and shall also be able to display more detailed information about individual machines. The monitoring system shall be able to process the data and to sort the data necessary for the presentation.

11.7.2 The user shall be able to monitor the Wind Power Plant current status through either a GUI showing a map based representation of the Wind Power Plant or a series of tables summarizing Wind Turbine, meteorological station and grid station status.

11.7.3 The GUI shall provide a top-level view of the Wind Power Plant with facilities to link to particular groups or units. Units shall be represented by icons identifying the unit type and name and conveying the equipment status as the user scans the Wind Power Plant.

11.7.4 Commands shall be instantly available on selecting a unit or group of units from the map.

11.7.5 Direct links shall be available from the GUI icons to the corresponding tabular summary screens.

11.7.6 A single top level tabular screen shall show the complete site status at a glance. Clearly defined areas of the screen shall show Wind Turbines, meteorological stations, grid stations and current events. The Wind Turbine status shall show Wind Turbines on line, faulted, stopped, power and energy outputs. The meteorological status shall show the site mean wind speed, direction, temperature, and pressure. The grid status shall show the grid active and reactive power, voltage and current at the interconnection point with the TSP.

11.7.7 Current Site events shall be clearly shown with event code, event description, response status and times.

11.7.8 There shall be easy access to detailed information screens on individual Wind Turbines, meteorological stations and grid stations.

11.7.9 The Wind Power Plant SCADA system shall display at least:

- Single Wind Turbine data, e.g. status, power, voltages, currents, temperatures, energy, faults and wind speed
- Actual power for the whole Wind Power Plant calculated as a sum of the Wind Turbine outputs
- Actual line conditions at the substation including, voltage, current, active power, reactive power, power factor and average values for each Wind Power Plant and Reactive plant feeder
- Actual status of major substation equipment
- Clock time synchronized to an external source

  - Data collection and storage
  - Data shall be recorded from the Wind Turbines and Met Masts. Provision shall be made for additional sensory data from transformers, meters, noise monitoring stations, cameras, condition monitoring systems, safety and access control equipment as required.
  - Data recorded shall be both regular time series data (e.g. wind speed, power, temperature etc.) and event data (faults, warnings, errors, changes of state, operator initiated changes, etc.).
  - Time series data shall be recorded with an averaging period of 10 minutes. Mean, min, max and standard deviation are required for wind speed and Wind Turbine active power. Other time series data may be recorded as mean only.
  - Data sampling rates for time series data shall be independent of the Site communications network and depend only on the speed of communication with the Wind Turbine controller. Sampling rates shall be 0.5 Hz or higher for time series data at the Wind Turbines and Meteorological Stations.
  - Processed data shall be stored locally in a queue so that no data are lost if the Site communications network is temporarily unavailable. When the network is available, the queue shall be downloaded to the SCADA computer.
  - If any Wind Turbine is switched off, the data processing shall continue and communication with any other Wind Turbines shall not be interrupted.
  - Ten-minute averaged performance data and all event data shall be stored in an industry standard relational database. The data shall be time stamped. The database shall be capable of being searched with a range of data access query functions provided. Ideally these shall be implemented as SQL commands. It shall also be possible to store specific query functions for later use.
  - The returned data shall be capable of graphical or tabular presentation. It shall also be capable of being exported to external analysis programs in appropriate formats, e.g. CSV, Excel etc.
  - It shall also be possible to store at least 50,000 events on the system and to download data to third party software (e.g. Excel) for further analysis.
  - The Wind Power Plant SCADA system shall be equipped with full facilities to back up all critical operating data; all operational data from the Wind Turbines, Meteorological Stations, and other monitored signals; and all other non-regenerable data.

- Backups shall be written to standard media using an open, non-proprietary file format. The backup facilities shall allow all backups to be verified once they are written.

11.8 Control Requirements

11.8.1 The Wind Power Plant SCADA system shall include local and remote control of the individual Wind Turbines, groups of Wind Turbines and substation switchgear.

11.8.2 The Wind Power Plant SCADA system shall include the capability to apply a wind sector management program if necessary.

11.8.3 Remote control shall be capable from a remote computer connected to the Wind Power Plant SCADA system via the Internet or direct modem connection. System configuration shall allow for any number of user-defined groups of Wind Turbines. The following commands shall be included as a minimum:

- Reset Wind Turbine
- Stop Wind Turbine
- Start Wind Turbine
- Stop group of Wind Turbines
- Start group of Wind Turbines
- Selection of fixed voltage / reactive power / power factor mode
- Limit Wind Power Plant output to a configurable value

11.8.4 Remote control function shall be protected by appropriate passwords or hardware key (dongle) in the Wind Power Plant SCADA system.

11.8.5 Adequate provision shall be made for interlocks to prevent unsafe operation of the Wind Turbines while Site personnel are working on them and a switch shall be provided at the Wind Turbines to allow maintenance staff to disable remote access.

11.8.6 Any SCADA system commands shall be ignored if there is a crew at the Wind Turbine. Any commands issued locally at a Wind Turbine shall override the Wind Power Plant SCADA system if there is a crew present. If there is no crew present, commands from the Wind Power Plant SCADA system shall override the current Wind Turbine setting.

11.8.7 The Wind Power Plant SCADA system shall implement auto control of the Wind Turbines. This shall allow automatic implementation of any constraints on Wind Power Plant operation (e.g. network restrictions, noise restrictions, time of day restrictions).

11.8.8 The Wind Power Plant SCADA system shall provide remote access to the Wind Turbines to aid in the remote analysis and repair of Wind Turbine faults. The Wind Power Plant SCADA system shall be optimized to allow remote interrogation and resetting of as many errors as possible consistent with industry standards for safety and machine integrity.

11.9 Reporting

11.9.1 The user shall be able to view and interrogate the 10-minute data and events database and show the events for any unit for any time period. The more common selections shall be catered for in drop down menus such as:

- View Wind Turbine and Wind Power Plant event data with options to, select Wind Turbine or group of Wind Turbines, include events from grid station, meteorological stations and servers, select time range and list all events or filter on type of event
- Scroll through 10-minute data records for a selected Wind Turbine, meteorological station or grid station
- Compare time series data for up to 10 selected Wind Turbine signals
- Trend any selected signal from Wind Turbines, metering stations and meteorological masts

11.9.2 Summary analysis reports for daily/monthly/yearly or other defined time periods shall be produced to an agreed format. They shall be produced on demand by the system. They shall provide extensive analysis and viewing functions for statistical and event data. Reporting based on data that has been archived from the system is not required.

11.9.3 Power curves shall be created for any user-selectable date range and choice of binned or scatter data.

11.9.4 Meteorological data shall be able to be analyzed according to wind speeds, wind direction, turbulence, temperature, pressure, and other data from any installed sensors. This includes frequency distributions, and analysis of mean, maximum and minimum data. Wind speed and wind direction distributions shall be created over any user selectable date range. It shall be possible to generate them from any meteorological station.

11.9.5 The energy production for individual Wind Turbines, groups of Wind Turbines or the whole Wind Power Plant for any time period to date shall be available.

11.9.6 Additional information that shall be available shall include, but not be limited to:

- Faults on a per Wind Turbine and whole Wind Power Plant basis
- Availability reports
- A record of software updates downloaded to the main SCADA server(s) and other machines comprising the Wind Power Plant SCADA system
- Control system control variables and calculated points for:
- Nacelle yaw
- Rotor blade pitch
- Tower Cut in/Cut Out
- Operation mode

11.10 Support for Warranty Calculations

11.10.1 The Wind Power Plant SCADA system shall be capable of producing reports for evaluation of availability and performance as required for warranty and other agreements.

11.11 Remote Alerts

11.11.1 It shall be possible to configure the Wind Power Plant SCADA system to alert operations staff via mobile phone (SMS) or email if any part of the Wind Power Plant requires attention. There shall be a choice to configure this function to operate continuously for unmanned sites or only during certain times of day as required.

11.12 Time Base and Date Formats

11.12.1 A GPS satellite receiver shall be installed to provide time synchronization signals. This device shall provide time synchronization signals for the Wind Power Plant SCADA system main SCADA server(s). All other clocks shall automatically be synchronized to the central computer clock.

11.12.2 Time and date formats shall be chosen to eliminate confusion arising from different time zones, summer/winter changes and different country display formats.

11.12.3 All time stamps on time series data shall apply to the end of the averaging period.

11.12.4 All time stamps shall be stored as UTC, regardless of local time setting used.

12. WIND TURBINE EQUIPMENT

12.1 General

The Wind Turbines shall be fully described within Contractor's Specifications, including specific hub height, tip height and any specific packages offered as optional equipment.

12.1.1 The Wind Turbines shall meet the following minimum requirements:

- The Wind Turbines shall be three bladed, horizontal axis, upwind type
- The Wind Turbines shall be mounted on a tubular tower
- The Wind Turbines shall provide suitable marking and lighting (i.e. aviation related obstacle marking) in accordance with the Applicable Standards and Applicable Permits
- The Wind Turbines shall be identical and their components shall be fully interchangeable between different units
- The Wind Turbines shall be designed to operate and perform acceptably without manual intervention

12.1.2 The Wind Turbine shall be part of a well-developed product range.

12.1.3 The Wind Turbines shall be commercial units of the same model with substantial fault-free operational experience, such that the model meets "Qualified Status," at minimum, or "Proven Status," per the following definitions:

A turbine model achieves Proven Status when:

- The manufacturer is capable of performing all contractual and commercial obligations in North America.
- The manufacturer can demonstrate the ability to support warranty, O&M, and supply chain obligations in North America.
- The version of the turbine that will be supplied to North America carries a valid Design Statement of Compliance (SoC) to IEC 61400-1 standards issued by an accredited certification agency.
- The turbine model has at least 100 turbine-years of experience in the North American market, operating at 95% fleet turbine availability or greater.

A turbine model achieves Qualified Status when:

- The manufacturer is capable of performing all contractual and commercial obligations in North America.
- The manufacturer can demonstrate the ability to support warranty, O&M, and supply chain obligations in North America.
- The version of the turbine that will be supplied to North America *is in the process* of obtaining a Design SoC to IEC 61400-1 standards issued through an accredited certification agency.
- The turbine model is an evolutionary variant of turbines already considered Proven in North America. Examples include rotor diameter changes for new wind classes, cold weather packages, or other modifications sufficient to require a new IEC certification but not a fundamental re-design.

- The turbine model is considered Proven in its home market but is new to North America.
- The turbine model has been performing well in North America for some time but is still without sufficient track record to be designated as Proven.

12.2 Site Suitability

12.2.1 Contractor shall warrant that the Wind Turbine is fit for the purpose of generating electricity in line with Owner's requirements as set forth in the Agreement and this document, Contractors Specifications and within the range of climatic conditions expected at the project site and based upon the final site layout for the Wind Power Plant, therefore including, but not limited to, consideration of Wind Turbine spacing, obstructions (e.g. forestry) and site topography.

12.2.2 In the case a cold-weather package is required, the site-specific loads analysis must state that it explicitly considers the planned operating temperature range. Regardless of cold-weather package, turbines operating outside of the standard IEC temperature range must undergo loads analysis specific to site conditions.

12.2.3 Contractor shall provide a definitive statement confirming that the Wind Turbines are fit for purpose at the site in the final locations for a minimum of 20 years. Any operational modifications required to assure the Wind Turbines are fit for purpose shall be clearly stated in Contractor's Specification.

12.2.4 Contractor shall provide a summary of the applicable site conditions and the output of Contractor's assessment shall be provided with Contractor's Specification.

12.3 Certification and Standards

All Wind Turbine components shall be capable of withstanding all mechanical, aerodynamic and electrical induced loads during a 20-year operating life.

12.3.1 The Wind Turbine design shall be in compliance with the latest edition of IEC 61400-1 Ed. 3.0 Wind Turbines - Part 1: Design requirements.

12.3.2 Contractor shall provide a Wind Turbine with a valid Type Certificate for the climatic conditions expected at the Site. The Type Certificate shall be in accordance with latest edition of IEC 61400-22. In the absence of a Type Certificate, a Design Evaluation Conformity statement according to "-22" section 8.3 plus completion of associated testing is acceptable Associated testing shall include at minimum:

- Safety and Function testing per "-22", section 8.4.2
- Blade testing in accordance with "-22", section 8.4.5
- Power performance testing per "-22" section 8.4.3
- Loads measurement per "-22", section 8.4.4.
- Test reports for the above shall conform to the requirement of "-22" section 8.4.7

12.3.3 The Wind Turbines and Wind Turbine towers shall carry a current and valid Design Evaluation Conformity Statement from a recognized Certification Body or other accredited party acceptable to Owner.

12.3.4 The Certification shall be provided within Contractor's Specifications and shall state:

- Standards to which the design was certified against
- Climatic assumptions

- Cold weather package specifications if applicable
- Description of the scope of the assessment
- Description of the Wind Turbine and Wind Turbine tower design assessed

12.3.5 Contractor shall make the Certification reports available in electronic format.

12.3.6 Contractor shall provide additional documentary evidence of the suitability of the Wind Turbine for the Site if:

- Any of the equivalent climatic conditions at the Site are more onerous that the assumptions in the Design SoC
- Additional characteristics of the Site prevent the Design SoC serving as evidence of the suitability of the Wind Turbine and Wind Turbine tower
- There are deviations in the design of the Wind Turbine or Wind Turbine tower from that assessed in the Design SoC

12.4 Power Performance

12.4.1 An independently performed power curve measurement test of the Wind Turbine model shall be performed in accordance with the IEC 61400-12-1 Ed. 1.0 Wind Turbines - Part 12-1: Power performance measurements of electricity producing Wind Turbines. The report on such shall be provided within Contractor's Specifications.

12.5 Noise

12.5.1 The Wind Turbine shall not have a sound power level in excess of that defined within this document and as required in all Applicable Permits, including planning and environmental and local noise ordinance.

12.5.2 The Wind Turbine shall have had its acoustic noise emission assessed at the Wind Power Plant site according to IEC 61400-11 Ed. 3.0.

12.5.3 The Wind Turbine shall produce no audible tones under any normal operating conditions, when assessed at the Wind Power Plant site according to IEC 61400-11 Ed. 3.0. Acoustic measurements shall include instances of the turbine yawing during power production and yawing below cut-in wind speeds to assure tone prominence meets stated requirements for all operating and non-operating conditions.

12.5.4 Contractor shall specify the maximum warranted A-weighted (LwA) sound power level emissions for the Wind Turbine.

12.6 Electrical Characteristics

12.6.1 Contractor is responsible for ensuring the requirements as defined in IEC 61400-21 are met, including power quality issues.

12.6.2 This shall include carrying out all tests, and production of all documentation, simulations, test results and other information required.

12.6.3 The Agreement shall provide documentation of power quality measurements to IEC 61400-21 within Contractor's Specifications.

12.7 Visual Appearance

12.7.1 The visual appearance of the Wind Turbines shall be in accordance with Applicable Permits.

12.7.2 Unless otherwise instructed by Owner or required by Applicable Permits, the Wind Turbine color shall be of a dull light grey color or similar and all external visible components shall be of an identical color and finish, where not otherwise required.

12.8 Health and Safety

12.8.1 The Wind Turbine shall comply with all relevant health and safety regulations including OSHA standards and as detailed in the Applicable Permits.

12.8.2 The Wind Turbine shall be designed to include provisions that respect the health and safety of the general public, operators, maintainers, land owners and any other personnel who may have an interest in the Wind Power Plant throughout the Wind Turbine's lifetime. These provisions shall include for:

- Fire prevention and fire fighting
- Emergency stop
- Emergency evacuation
- Evacuation of injured personnel including from the nacelle and hub
- Rotating machinery guards, where required by applicable standards
- Electrical isolation of systems and components
- Mechanical protection against hazards
- Mechanical isolation of systems and components including, but not limited to the rotor lockout system
- Lightning protection
- Protection against electric shock and arc flash hazards
- Lighting of tower and nacelle for normal operation and maintenance
- Emergency lighting upon loss of external power
- Unauthorized access and climb prevention

12.8.3 Working at Height Features

- A fall arrest system shall be incorporated on the tower ladder, Lad-Safe or Owner approved equivalent.
- Secure attachment points and safety rails for lanyards shall be provided at all locations inside or outside the Wind Turbine where maintenance personnel may require access and Working at Height hazards apply as per all Applicable Standards.
- Appropriate markings and signs shall indicate hazards, attachment points, include brief instructions, load ratings and maintenance requirements and as required by Applicable Standards.

12.8.4 Confined Spaces

- If any part of the Wind Turbine can be classified as a confined space in accordance with Applicable Standards, appropriate safety and risk control measures shall be in implemented to conform to the relevant Applicable Standards..
- Safety measures shall include but not be limited to the implementation and use of relevant safety processes, procedures, personnel training, signage and equipment.

12.8.5 Rotating Equipment

- Robust guards shall be fitted around rotating machinery in line with Applicable Standards to prevent any part of an operator or their clothing coming into contact with moving parts. Signs warning of rotating machinery shall be clearly displayed.

12.9 Wind Turbine Protection

12.9.1 General

- The Wind Turbine shall have a safety and control system that conforms to all requirements of IEC 61400-1 Wind Turbines - Part 1: Design requirements.
- In addition to this Section further Wind Turbine earthing requirements are identified in Section 7.

12.9.2 Lightning Protection

- The Wind Turbine shall have sufficient lightning protection to protect the Wind Turbine components and its support structure, and shall meet the requirements of IEC 61400-24.
- Details of the lightning protection system shall be given within Contractor's Specifications.

12.9.3 Electrical Protection

- The electrical protection scheme shall disconnect faulted electrical plant within the Wind Turbine and be designed to adequately protect the electrical components of the Wind Turbine for the maximum design fault currents at the Site and any other electrical conditions passed through to the Wind Turbines from the utility system or created by the Wind Power Plant electrical system.

12.10 Markings and Lighting

12.10.1 External Wind Turbine marking and lighting, including but not limited to aviation related obstacle marking and lighting shall be in accordance with any requirements identified or implied by the Agreement and the relevant Permits.

12.10.2 Safety signs shall be displayed in the English language at suitable locations of the Wind Turbine.

12.10.3 Nameplates shall be fixed to the tower base and major components showing; manufacturer name, serial number, part number, manufacturing batch number.

12.10.4 Each Wind Turbine shall have a unique identification number, which shall be clearly and indelibly displayed inside and outside the lower tower access door.

12.11 Wind Turbine Systems and Components

12.11.1 Rotor and Blades

- The blades shall be fitted with an adequate lightning protection system with sufficient receptors and down conductors to protect the complete length of the blade in accordance with IEC 61400-24.

- Blade bearings shall be fitted with automatic lubrication and grease catchers to prevent egress of excess grease.

12.11.2 Nacelle

- The nacelle shall be designed to allow personnel safe and easy access to and from the tower ladder, and a safe working environment within the nacelle.

12.11.3 Gearbox

- Gearbox shall be certified to the IEC 61400-4 standard.
- Replacement gearboxes and components shall be made available by the turbine manufacturer for procurement through the design life of the gearbox.
- A failure modes and effects analysis shall be provided by the gearbox manufacturer to demonstrate that failure modes have been identified and that the design mitigates or eliminates the identified failure modes.
- A summary of the test plan, workshop testing, field testing, loads verification, robustness testing, design reviews, and reliability test results summary from the gearbox manufacturer which validate the long term drive train assembly reliability shall be provided by Contractor. These results should account for system assembly dynamics, grid events, non-torque loading, and other unique operational characteristics specific to the wind industry.
- The gearbox shall be designed to operate without major intervention requiring an offsite crane for a minimum of 20 years.
- All pressurized lubrication lines shall be filtered.
- Gearbox shall be fitted with an off-line oil filtration (3 µm or as approved by the lubricant supplier), in addition to the in-line filter, and a desiccating breather.
- Gearbox shall be fitted with a Gram and Juhl, turbine condition monitoring (TCM), or Owner approved equivalent, online and continuous vibration monitoring system capable of detecting all low and high speed faults. The data shall be property of Owner and integrated into the turbines' SCADA system and Owner's PI historian system. Accelerometers will be threaded into the gearbox housing using integral, threaded holes.
- A list of gearbox faults which are being monitored for and the associated alarm conditions and fault thresholds should be provided by Contractor to permit Owner auditing and continuous improvement.
- Kinematic data for each gearbox model supplied shall be provided by Contractor.
- A bill of material defining the type, make, model, and serial number (if available) of the bearings shall be provided for each gearbox. The BOM shall be provided in MS Excel format.
- The gearbox full load acceptance test report with evidence of run-in, water content in the oil < 500 ppm, and final oil cleanliness of 17/15/12 (or less), and a manufacturing non-conformance summary for each gearbox shall be provided by Contractor.
- The gearbox dimensional outline, lubrication, cooling and heating, and section drawings from the gearbox manufacturer shall be provided by Contractor. Third-party component manuals for cooling fans, lubrication pumps, etc. shall also be provided by Contractor.

- The gearbox specification, transportation, installation, operation, and maintenance manual from the gearbox manufacturer, in addition to the wind turbine installation and maintenance manual, shall be provided by Contractor.
- Routine and planned overhaul or major maintenance, including oil and filter changes, shall be identified in Contractor's maintenance schedule. The maintenance schedule shall be provided in MS Excel or MS Word format.
- The design may be subject to third-party expert review if required by Owner and Contractor's gearbox manufacturer shall co-operate with such reviews.
- Gearbox manufacturer storage, handling, and assembly requirements shall be followed and documented by Contractor whose associated quality assurance records can be made available to Owner upon request.
- Final fill oil to be added during turbine erection shall be tested and verified to be the correct lubricant, cleaner than 16/14/11, and water content <300 ppm before installation. Oil outside of these parameters shall be filtered and dried prior to installation.

12.11.4 Main bearing

- The main bearing(s) shall be designed to operate without major intervention requiring a crane for a minimum of 20 years.
- Main bearing(s) manufacturer storage, handling, and assembly requirements shall be followed and documented by Contractor whose associated quality assurance records can be made available to Owner upon request.
- The main bearing(s) shall be fitted with an automatic centralized lubrication system. Lubrication operation shall be able to be initiated by both SCADA and an integral meter (time).
- Main bearing(s) shall be fitted with borescope access plugs to permit in-situ visual inspection.
- Main bearing(s) shall be fitted with online continuous temperature monitoring.
- The main bearing shall be fitted with a Gram & Juhl turbine condition monitoring (TCM), or equivalent, online and continuous vibration monitoring system capable of detecting all low and high speed faults. The data shall be property of Owner and integrated into the turbines' SCADA system and Owner's PI historian system. Accelerometers will be threaded into the bearing housing using integral, threaded holes.
- A list of the main bearing(s) and housing make, model, and serial number shall be provided.
- The main bearing shaft assembly drawing, lubrication, and component drawings and manuals shall be provided.
- Grease analysis sampling procedure and test limits (such as ICP iron, wear debris concentration, etc.) shall be provided by Contractor.
- Test plan and test result summary should be provided.
- Test results and/or design calculation summary which verify that a 20-year operational life without major intervention is achievable given certain design limitations (namely, a low axial/radial load ratio) in three point-mounted drive train configurations with a spherical roller main bearing.

12.11.5 Generator

- The generator shall be suitable for operation in the full range of climatic conditions which it is expected to experience.
- The generator shall be designed to operate without major intervention requiring a crane for at least 20 years.
- The generator shall be supplied from a reputable manufacturer and be within a standard product range. The passage of lightning through the generator shall be protected against in accordance with IEC 61400-24.
- The generator bearings shall be fitted with automatic centralized lubrication. Lubrication operation shall be capable of initiation by both SCADA and an integral meter (time).
- The generator bearings shall be fitted with a Gram & Juhl turbine condition monitoring (TCM), or equivalent, online and continuous vibration monitoring system capable of detecting all low and high speed faults. The data shall be property of Owner and integrated into the turbines' SCADA system and Owner's PI historian system. Accelerometers will be threaded into the bearing housing using integral, threaded holes.
- The generator cooling system, if air-cooled, shall utilize a closed loop heat rejection system to ensure airborne particulate are not entrained in the generator.
- There shall be a 10 degrees C temperature margin between the generator insulation class temperature rating and the maximum measured generator "hot spot" temperature under all operating and climatic conditions to ensure that any degradation of the generator insulation over 20 years of operation does not lead to failure. A minimum of class F insulation shall be required in any instance.

12.11.6 Hydraulic power unit

- Third-party supplier installation, O&M manuals, process and instrumentation diagram shall be provided.
- On-line filter alarms and temperature monitoring shall be provided.
- Sump shall be equipped with a desiccating breather.
- Oil analysis sampling procedure and limits shall be supplied.
- Hydraulic oil to be filled during turbine erection shall be tested and verified to be the correct lubricant, cleaner than 15/13/10, and water content <100 ppm before installation. Oil outside of these parameters shall be filtered and dried prior to installation.

12.11.7 Yaw System

- The yaw bearing shall be fitted with automatic centralized lubrication. Lubrication operation shall be capable of initiation through an integral meter (time).
- The yaw system of each wind turbine shall be programed and normalized to the same 0-degree (true north) reference.

12.11.8 Service Crane

- The nacelle shall be fitted with a service crane capable of lifting tools and consumables required for scheduled maintenance directly into the nacelle from the ground level.
- The crane shall comply with relevant Permits and Applicable Standards.
- Contractor shall provide details of the service crane, including largest component able to lifted, as part of Contractor's Specifications.

12.11.9 Wind Turbine Tower

- The tower shall be of tubular steel construction.
- The tower shall be fitted with an internal ladder, Lad-Saf (or Owner approved equivalent) fall arrest systems, rest platforms and lighting (including safety lighting which shall work during grid and internal power failure).
- The tower paint system shall at minimum conform to a "C3" environmental protection classification for the tower interior and "C4" for the tower exterior according to ISO 12944. The tower exterior paint color shall be approved by Owner prior to tower fabrication.
- The tower access door shall be of sufficient size to allow removal of the largest sub-assemblies of major components housed within the tower enclosure.
- The tower access door shall be fitted with a mechanism to lock the access door in an open position and include features to ensure safe personnel egress should the tower door be inadvertently locked from the outside.

12.11.10 Cabling

- All cables shall be mechanically protected against effects of bending, abrasions, impact, abnormal heating, rubbing, movement and vibration and supported at suitable locations.
- Terminations and joints shall be installed in a manner consistent with this document

12.11.11 Service Ladder

- The service ladder in the tower shall comply with the relevant Applicable Standards including where applicable, requirements of the current IBC, State and Local standards.
- The clearance between the ladder and tower wall shall comply with the OSHA CFR 1910.27 Standard.
- All turbine ladders shall be equipped with a deflector plate at tower section junctions.
- Turbines not fitted with a Service Lift shall be fitted with an Ibex Power Climber, or Owner approved equivalent installed on the climbing ladder to assist climbers. Owner shall pre-approve the climb assist make and model.

12.11.12 Transformer

- Contractor shall provide a single, suitably rated power transformer for each Wind Turbine to step up from the generation voltage to the Collector System voltage for connection to the Wind Power Plant Electrical System.

12.11.13 Remote control and monitoring capabilities of the Wind Turbines shall be sufficient to fulfill the requirements of:

- Authorized and unauthorized access monitoring
- Applicable Standards and Applicable Permits including but not limited to the Connection Agreement between Owner and the TSP

12.11.14 Low Voltage Supplies

- All low voltage equipment installations shall comply with Applicable Standards and the requirements of this document.

12.11.15 Medium-Voltage Switchgear

- All medium voltage equipment installations shall comply with Applicable Standards and the requirements of this document.

12.11.16 Control System and Converter

- Control System and converter bill of material defining the type, make, model, and serial number.
- One hand held terminal or laptop per 10 turbines for tower troubleshooting, control and software downloading. Software updates per the period of warranty coverage.
- High speed wind extended cut-out options

12.12 Foundation Loads

12.12.1 Contractor shall supply Owner, and as required the foundation designer and certifier, with foundation loads, performance criteria and interface details prepared by the Turbine Manufacturer in accordance with the relevant certification.

12.12.2 The foundation loads shall be compatible with the relevant Certification and Site Suitability Assessment.

12.12.3 Foundation loads are to be calculated in accordance with the all Applicable Standards including, but not limited to:

- International Building Code and applicable state and local amendments
- ASCE 7 (current edition) Minimum Design Loads for Buildings and other structures
- IEC 61400-1 Wind Turbines - Part 1: Design requirements
- DNV GL Standard DNV GL-ST-0126: Support Structures for Wind Turbines, Edition April 2016 (supersedes DNV/Riso Guidelines for Design of Wind Turbines, Second Edition)

12.12.4 Fatigue loads shall be provided in a Markov Matrix format for the specified Design Life.

12.13 Options and Other Features

12.13.1 Contractor shall advise of any special packages that may be supplied as 'Options', including but not limited to:

- Advance grid control
- Special SCADA features
- Vibration and Condition monitoring
- Cold Weather Package
- Meteorological Instrumentation

12.13.2 Should any options be selected by Owner, they shall be included in the definition of the Wind Turbine.

13. METEOROLOGICAL MASTS

13.1 General

13.1.1 Met Mast structures shall be designed and installed to Revision G of the ANSI/TIA 222 standard.

13.1.2 A geotechnical investigation shall be performed at the final Met Mast locations prior to the design phase.

13.1.3 Design and construction shall take into account and not interfere with the requirements for construction access for long loads, heavy plant and cranes for the construction of the entire Wind Power Plant as well as ongoing access for operation and maintenance of the Wind Power Plant.

13.1.4 All meteorological stations shall include a free-standing lattice mast of height such that wind speed measurements may be made at the hub height of the Wind Turbines.

13.1.5 The Met Mast(s) shall be suitable for support of the specified instruments, data logging equipment, communications equipment, any autonomous power supply systems and any marking or aviation lighting as required by relevant Permits. Details regarding the Met Mast instrumentation and mounting hardware shall be reviewed by the manufacturer and incorporated into the design with a minimum of 3kW service for all equipment, plus auxiliary 120VAC provisions and a 20A/120VAC GFCI outlet for service work.

13.1.6 When installed, safe access shall be possible for maintenance to the mast itself and to all instrumentation.

13.1.7 Each Met Mast shall be safely climbable and shall support two persons at any one time. Each Met Mast shall include a suitable wire or rail free fall-arrest system in accordance with ANSI A14.3 Safety Requirements for Fixed Ladders.

13.1.8 The design of the mast(s), while suitable for use in the Site climate, shall be so as to minimize interference to the air flow at the anemometers and wind vanes. The mast arrangements shall comply with the relevant IEC and MEASNET standards, including:

- IEC 61400-12-1 Ed. 1.0 Wind Turbines - Part 12-1: Power performance measurements of electricity producing Wind Turbines.

13.1.9 Contractor shall be responsible for ensuring and demonstrating that the meteorological stations are fit for purpose and that the design and construction are in accordance with all Applicable Standards.

13.2 Power Performance Testing Met Masts

The Permanent and Temporary Met Masts for the purpose of power performance testing and site calibration respectively shall be designed and constructed in accordance with the requirements of:

- The power performance warranty of the Wind Turbines
- IEC 61400-12-1 Ed. 1.0 Wind Turbines - Part 12-1: Power performance measurements of electricity producing Wind Turbines, and
- MEASNET standards.

13.3 Permanent Met Masts

13.3.1 The number and locations of Permanent Met Masts shall be such that at all times there shall be at least one (1) Met Mast within free-stream, non-wake-affected wind, effectively covering wind speed and direction measurement at hub height for all wind directions (360°).

13.3.2 The Permanent Met Masts shall be at least two (2) rotor diameters from the nearest Wind Turbine.

13.3.3 Met Masts shall be sited in accordance with IEC 61400-12-1.

13.3.4 Annex A of the standard IEC 61400-12-1, shall be used to determine non-wake-affected sectors for each Permanent Met Mast.

13.3.5 Security and Fencing

- The Permanent Met Mast installations shall include suitable security/anti-climb fencing to prevent unauthorized access to the Met Mast.
- The fencing shall be 6’ tall chain link. The compound size shall be 40’x40’ with 3” of gravel with weed barrier and include a lockable gate.

13.3.6 Lighting and Marking

- The Met Masts shall be marked in compliance with FAA recommendations found in Advisory Circular 70/7460-1L.
- Temporary or guyed Met Masts may be required to have marker balls installed. The marker balls shall be placed such that they do not interfere with the air flow at the anemometers and wind vanes.

13.3.7 Power Supply

- The Permanent Met Masts shall be permanently connected to a 120VAC power supply.
- Power supply is to be firm against interruption by all environmental and electrical grid conditions for a period of twenty-four (24) hours.

13.3.8 SCADA Connection and Monitoring

- The instrumentation installed shall be connected to the SCADA system such that it can record, with an averaging period of the more stringent requirement of ten (10) minutes or the data sampling rate requirements below:
  - Mean, standard deviation and three-second gust wind speed from each anemometer
  - Mean and standard deviation of direction from each wind vane
  - Mean temperature from each temperature sensor
  - Mean barometric pressure
- Data sampling and sampling rates shall be sufficient to meet, where applicable, the requirements of:
  - The Network Service Provider
  - Warranty and testing arrangements

- Calibrations shall be undertaken prior to installation in accordance with in IEC 61400-12-1 Ed 1.0 and provided to Owner

13.3.9 Anemometers

- All anemometers shall be high quality calibrated, Class 1, cup anemometers meeting all the requirements specified by IEC 61400-12-1
- All calibrations shall be carried out in a MEASNET accredited wind tunnel.
- All mounting of anemometers shall comply with IEC 61400-12-1 recommendations for minimization of mast and boom interference to air flow.
- The primary anemometer shall be placed at hub height as recommended in Section G.2 of IEC 61400-12-1.
- A secondary (control) anemometer shall be installed as recommended in Section G.5 of IEC 61400-12-1.
- A tertiary anemometer shall be installed at the lowest blade tip height.
- Additional anemometers maybe required for testing purposes.

13.3.10 Wind Vanes and Direction Measurement

- All direction measurements shall be made by high quality wind vanes meeting all requirements specified by in IEC 61400-12-1.
- All mounting of wind vanes shall comply with IEC 61400-12-1 recommendations for minimization of mast and boom interference to air flow.
- The primary wind vane shall be installed as recommended in IEC 61400-12-1.
- A secondary wind vane shall be installed as recommended in IEC 61400-12-1.

13.3.11 Other climatic measurement sensors shall be installed to make accurate measurements of:

- Air temperature
- Barometric pressure
- Humidity
- Rainfall

13.3.12 Sensor specifications and mounting arrangements shall meet requirements of IEC 61400-12-1 Ed 1.0.

13.4 Temporary Met Masts

13.4.1 Temporary Met Masts shall be installed in number and at locations as required by IEC 61400-12-1

13.4.2 Anemometers

- All anemometers shall be high quality calibrated, Class 1, cup anemometers meeting all the requirements specified by IEC 61400-12-1.
- All calibrations shall be carried out in a MEASNET accredited wind tunnel.
- All mounting of anemometers shall comply with IEC 61400-12-1 recommendations for minimization of mast and boom interference to air flow.
- The primary anemometer shall be placed at hub height as recommended in Section G.2 of IEC 61400-12-1.

- A secondary (control) anemometer shall be installed as recommended in Section G.5 of IEC 61400-12-1.

13.4.3 Wind Vanes and Direction Measurement

- All direction measurements shall be made by high quality wind vanes meeting all requirements specified by in IEC 61400-12-1.
- All mounting of wind vanes shall comply with IEC 61400-12-1 recommendations for minimization of mast and boom interference to air flow.
- The primary wind vane shall be installed underneath the secondary (control) anemometer as recommended in IEC 61400-12-1

13.5 Foundations

13.5.1 The foundation shall be capable of accepting all loads to be imposed upon it during its temporary installation period or the Design Life, where applicable. Each foundation shall be designed and installed to Revision G of the ANSI/TIA 222 standard.

13.5.2 Particular care shall be taken with respect to the height of the ground on which Temporary Met Masts are installed.

- Ideally Temporary Masts shall be installed on the Wind Turbine foundation, or if not, another suitable foundation at the Turbine location shall be installed, such that all requirements of IEC 61400-12-1 are adhered to. Meaning, it shall be ensured that the relationship between the Temporary Masts sensors and the final installed height of the Wind Turbine is in line with the requirements of the Power Performance measurements standard.
- Any excavation and/or build up at the site that shall be required for the final Wind Turbine foundation should be taken into account to ensure the Temporary Met Mast measurements are applicable for the final installed Test Wind Turbine.

13.6 Instrument Calibrations

13.6.1 MEASNET calibrations shall be undertaken prior to the installation of instrumentation.

13.7 Enclosures and Cabling

13.7.1 Other than the sensors, all local Met Mast system equipment shall be installed at or above the base of the Met Mast in an enclosure that meets or exceeds an IP 66 rating.

13.7.2 All cables between enclosures on the equipment rack shall be in protective conduit.

13.7.3 All cables running up the Met Mast shall be armored, or travel within flexible conduit. The protected cables shall run into a junction box of minimum IP 66 rating for all seals and plugs.

13.7.4 The location of the junction box shall not affect the measurements of the Met Mast sensors.

13.7.5 Sensor cable tails shall have suitable plugs at each end, and shall pass within the booms and risers as recommended in IEC61400-12-1 Ed 1.0.

13.8 Grounding and Lightning Protection

13.8.1 The Met Masts shall be grounded and protected from lightning strikes in accordance with Revision G of the ANSI/TIA 222 standard.

13.8.2 All instrumentation on the Temporary and Permanent Met Masts shall be protected from lightning and grounded in accordance with industry best practice.

13.8.3 Where the instrumentation on a Met Mast is connected to an LV supply from a Wind Turbine or from another fixed source, the connection shall be equipped with overvoltage protection designed to limit the effects of a lightning strike to the Met Mast on the LV supply to which it is connected.

13.8.4 Lightning protection shall be installed in accordance with the recommendations of IEC 61400-12-1.

13.8.5 A separate, multi-stranded copper cable shall connect the mast top lightning finial to the buried grounding system. The tower structure itself can be used as a conductor.

13.8.6 All copper connections shall be used to join the lightning protection components.

13.8.7 The final placement of the mast top lightning finial shall not interfere with the instrumentation, operation and correct functioning of the instrumentation in the dominant wind directions sectors.

13.9 Uninterruptible Power Supply

13.9.1 Meteorological Stations shall have local UPS or equivalent supply.

13.10 Development Met Masts Decommissioning

13.10.1 All Development Met Masts at the Site shall be decommissioned by Contractor in line with directions by Owner.

13.10.2 No Development Masts shall be decommissioned without Owner's consent, which shall follow satisfactory correlation of site measurements between the Development Masts and the new Permanent Met Masts. Such data correlation shall occur prior to energization of any Wind Turbines at the Site.

14. ON SITE BUILDINGS

14.1 General

14.2 Temporary Construction Compound

14.2.1 Contractor shall be responsible for the design, construction, security, operation, maintenance, dismantling, removal and reclamation of the construction compound or compounds.

14.2.2 The construction compound shall house the temporary site offices, health and safety facilities, storage/laydown area and all office, toilet and washing accommodation required to execute the Project. A construction trailer, suitable for Owner's site management, environmental compliance, and safety personnel, shall be provided for Owner for the duration of the Project construction.

14.2.3 Toilets shall be of a type to ensure that all discharges are contained and removed from Site.

14.2.4 24-hour security for the Project and temporary construction compound shall also be provided by Contractor.

14.3 Permanent Buildings

14.3.1 All site buildings shall be suitable for the Site and Climatic Conditions (including applicable reactive soil movements), of a high standard and permanent in nature to achieve the required Design Life.

14.3.2 Buildings shall be designed in full compliance with the Applicable Standards, including the building code regulations in force within the local jurisdiction.

14.3.3 Contractor shall provide all necessary auxiliary supplies, including heating, internal and external lighting, water supply and similar for the site buildings. Contractor shall be responsible for the connection of the permanent buildings to local utilities infrastructure.

14.3.4 The auxiliary power supply shall be derived from an auxiliary transformer or transformers located in or adjacent to the Control Building and/or Substation. Critical Auxiliary power supply shall not be interrupted by the loss of connection to the POI.

14.3.5 Exit Signage and Emergency escape lighting shall be provided in accordance with the local building code regulations.

14.3.6 The final design(s) of all buildings is to be approved by Owner.

14.4 MV Substation Building

14.4.1 If not part of a combined MV Substation / Control Building the building shall be sized to provide the MV Switchroom.

14.5 Control Building

14.5.1 The Control Building shall be sized to provide the following facilities:

- Housing of SCADA equipment;

- General office area/Control room;
- Any additional control room/facility requirements of the TSP.

14.5.2 The power shall be supplied from the MV Switchroom's LV power supply.

14.5.3 The location and minimum accommodation and size requirements of the Control Building shall meet the requirements of all applicable planning Permits and all other Applicable Permits.

14.6 Operations and Maintenance Building

14.6.1 The O&M building and surrounding area shall also incorporate sufficient road infrastructure, parking lot and outdoor facilities suitable for the operation and maintenance of the Wind Power Plant and the operational staff requirements during its Design Life during all anticipated weather conditions.

14.6.2 The O&M building shall consist of the minimum indoor and outdoor storage and working areas corresponding to the Wind Turbine Supplier and/or Maintenance Provider's requirements, in addition to office and meeting space for Owner's staff, bathroom and kitchen facilities as well as network and SCADA control facilities to support wind power plant operations. At a minimum, the building should be 10,000 sq. ft. including the warehouse area (approximately 65 sq. ft. per turbine and a minimum of 7,000 sq. ft.) and the office space (approximately 3,000 sq. ft. including 2nd story/mezzanine office space) minimum. The building shall be of steel construction, site specific design, and shall be at least 20 ft. high with a roof having at least a 5 degrees slope. Building and surrounding plot must be elevated by one foot above the surrounding ground level.

14.6.3 The indoor storage area shall be smooth hardened concrete, while the outdoor storage area shall be covered with compacted gravel.

14.6.4 The O&M Building shall include at a minimum:

- One male restroom and one female restroom
- Heating/air conditioning, fire containment, etc.
- Locker areas including lockers and benches
- A storage room for office supplies and consumables
- A utility room
- A workshop area
- A kitchen which includes refrigerator, oven, dishwasher, microwave and cabinets.
- A conference room with built in projector, screen and seating
- Card reader access to O&M building, warehouse and Server room.
- Area for a Work Control Center that is capable of being qualified CIP compliant

14.6.5 The office area should be able to accommodate working stations for four technicians as well as the site manager in a separate office of about 250 sq. ft., and a project manager office of 150 sq. ft. The server room shall be approximately 240 sq. ft. and climate controlled for temperature and humidity, with a separate air-conditioning system.

14.6.6 The workshop shall be shall be equipped with 480V weld receptacles, 120V outlets, equipment hoist.

14.6.7 The power shall be supplied from the MV Switchroom's LV power supply. Contractor shall provide a backup generator (i.e. 30 kW gas generator, maximum load current at 240 V, 125 A) for critical functions of the facility, such as the servers and emergency lighting. In

a power outage, a dual 200 Amp/Split 400 Amp automatic transfer switch shall automatically transfer power to the backup generator.

14.6.8 Contractor shall specify and supply suitable waste water disposal via on-site means or connection to a public sanitary sewer system, in accordance with codes and regulations in place in the local jurisdiction.

14.6.9 The O&M building and yard shall have a 8 foot high with 3 barbed wire lines fenced perimeter. Access shall be through a sliding gate, of a width large enough to provide easy ingress to the yard for a full size delivery truck.

14.6.10 A parking area shall be provided with sufficient space to accommodate 2 vehicles per 10 turbines with a minimum of 20, including parking for Contractor and Owner, and handicap parking spaces to comply with applicable laws and regulations. The parking area shall be paved with either Portland cement concrete or asphaltic concrete in accordance with local standards.

14.6.11 Structural design for the building shall be conducted in accordance with building code standard regulations for the local jurisdiction. The structural design shall utilize the parameters obtained from the Geotechnical Investigation Report (Section 3).

14.7 Security System

Contractor shall provide a security system that meets the following requirements

- Fiber Sensys perimeter fence protection - single zone around the entire perimeter all fences.
- Bosch Intrusion Alarm system - Bosch Panel, Bosch Keypad, Bosch output relays and position switches for all gates and building doors.
- Access Control on all personnel gates, vehicle gates and building entry doors, arm/disarm reader.
- Vicon CCTV System, consisting of eight exterior perimeter PTZ cameras and one camera at the control house entry door.
- Provision of the required low voltage power supplies for the systems listed above.
- Program and commission this system into Owner Security System with an Owner representative.
- All wiring shall be installed in raceways provided by Contractor.
- Contractor will provide the wire from the control house to the gates, cameras and security fence.

15. INSTALLATION, COMMISSIONING, AND PERFORMANCE TESTING

15.1 General

15.1.1 Contractor shall provide all necessary labor, equipment and tools for erection, installation, commissioning, and testing activities, and shall be entirely responsible for efficient and correct procedures and operations associated with transportation of all components associated with the Wind Power Plant.

15.1.2 Contractor shall adhere to the requirements of this document and the installation, commissioning, and testing requirements set forth in the specifications for the item of work as obtained from the item's original manufacturer.

15.1.3 Contractor will maintain comprehensive records of the installation, commissioning, and testing work and provide Owner with a copy of these records and the as-built drawings at the completion of the work.

15.1.4 The tests on the Work are categorized as follows:

- Factory acceptance tests
- Equipment receiving and inspection checks
- Mechanical completion
- Commissioning tests
- Performance tests for the purpose of achieving Project substantial completion
- Performance tests for the purpose of confirming performance levels during initial operation (such as power performance test)

15.2 Installation Records

15.2.1 The installation records shall include as a minimum:

- Final location of each structure
- Serial numbers of equipment in each structure
- Electrical test records
- Bolt tightening records or certificates (where critical)
- Foundation excavation records
- Concrete and steel records
- Records of remedial works required to foundation excavations
- Quality records throughout the foundation construction
- Photographs of the works at relevant hold points
- Wind Turbine erection records

15.3 Commissioning activities

15.3.1 Contractor shall carry out all testing and commissioning activities, which shall be monitored by Owner.

15.3.2 Contractor shall draw up a general commissioning procedure, which shall cover all activities from mechanical completion of the facilities to Project substantial completion, including all commissioning tests and acceptance tests.

15.3.3 The testing and commissioning phase shall be planned as part of the overall project planning.

15.3.4 Daily and weekly meetings shall be held during the testing and commissioning period to coordinate activities.

15.3.5 Contractor shall be responsible for liaison with third parties, including the grid interconnection provider, to ensure the efficient and timely commissioning of the Work, and provision of all test results and data required by the grid interconnection provider.

15.4 Owner's right to witness tests

Owner reserves the right to attend and witness all tests in relation to the Work. Owner shall be offered an invitation three weeks prior to all testing for right to attend.

15.5 Factory Acceptance Tests

15.5.1 Contractor is responsible for the provision of FAT documentation for all components, including any components manufactured by a third party.

15.5.2 FATs shall be performed in accordance with the relevant manufacturer's established procedures, its approved quality assurance scheme and as identified in Contractors quality plan.

15.6 Commissioning Tests, General

15.6.1 Contractor shall demonstrate by suitable tests that the BOP and Wind Turbines will operate satisfactorily and safely.

15.6.2 Commissioning tests shall be based on Contractor's standard commissioning procedures and shall include, but not be limited to, the tests included in this Section.

15.6.3 No tests shall threaten the safety of the Project or personnel. Contractor will report any such test to Owner should this be the case, along with details on measures to be implemented to mitigate any such risk.

15.6.4 Following satisfactory completion of each commissioning test Contractor will issue a certificate to that effect, supported by Contractor's test report.

15.6.5 Owner may reject the commissioning certificate, providing written reasons for this rejection within 5 business days of submission of the commissioning certificate.

15.7 Commissioning Tests, Wind Turbines

15.7.1 Commissioning of individual Wind Turbines is completed upon issue of turbine completion certificates and the punchlist, demonstrating the Wind Turbines can be operated satisfactorily and safely.

15.7.2 Commissioning tests for each Wind Turbine will follow the technical specifications provided by the turbine supplier in accordance with industry practices and will include, at a minimum, a run test of 168 hours error free duration with operational data recorded by the SCADA.

15.8 Commissioning Tests, Wind Turbine Foundations

Commissioning tests shall include but not be limited to the following:

15.8.1 Certificate from a qualified geotechnical engineer confirming conditions in the base of the excavation were in-line with expectations prior to pouring the foundation.

15.8.2 Third-party Registered Professional Engineer's Report (or certificate) confirming the suitability of the WTG foundation(s) design.

15.8.3 Pre-pour inspection approval from the Foundation Design Engineer.

15.8.4 Concrete production tested in accordance with ACI 301 Specification and supply of concrete and ACI 318, ASTM C172, ASTM C31, ASTM C39, ASTM C172 and ASTM C231:

- Slump tests
- Four (4) concrete test cylinders to be taken every batch, for compressive strength testing at 7 days and 28 days as follows:
  - One (1) specimen tested at 7 days cure
  - Two (2) specimens tested at 28 days cure
  - One (1) specimen to be kept as a permanent record and/or for additional testing
- Drying shrinkage shall be tested at each foundation on the basis of three (3) specimens for each foundation

15.8.5 Grout production tests (for WTG foundation-to-tower base flange connection and/or rock anchors) in accordance with ASTM C579, including:

- A minimum of three (3) specimens (1 set) to be taken for each turbine foundation site for compressive strength testing as follows:
  - One (1) specimen tested from each set at 3-7 days cure
  - Two (2) specimens tested from each set at 28 days cure
- Specimens shall be taken at commencement, during and near completion of grouting.
- If grout production is not continuous then additional sample sets and testing shall be required.

15.8.6 Testing of concrete and grout samples shall be carried out by an accredited laboratory

15.9 Commissioning Tests, Substation and Electrical Works

Commissioning tests related to the Project electrical systems will include the following, as applicable, as a minimum:

15.9.1 Check mechanical state and earth connections.

15.9.2 Check satisfactory equipment labelling and warning signs.

15.9.3 Check substation tap selector switch in correct position.

15.9.4 Ratio and vector group checks on all substation tap settings (unless already checked in the FAT).

15.9.5 Check oil levels.

15.9.6 Winding resistance measurement on highest, lowest and nominal tap settings.

15.9.7 Insulation resistance between all windings, and each winding to earth.

15.9.8 Insulation resistance tests.

15.9.9 Oil sample tests prior to HV applied tests and energization, including breakdown strength, moisture content, and dissolved-gas content.

15.9.10 Check all earth connections.

15.9.11 Check all control, alarms, fans and pumps for correct operation.

15.9.12 Routine tests and dielectric withstand tests prior to energization.

15.9.13 Visual check for damage to insulation, and satisfactory identification of cores.

15.9.14 Perform AC/DC voltage withstand tests ("pressure test") or otherwise as recommended by cable manufacturer.

15.9.15 Test all cables during and after installation in accordance with the manufacturer's recommendations.

15.9.16 Perform functional test (trip/close) of switchgear, including remote operation and indications if applicable.

15.9.17 Perform voltage withstand tests ("pressure test") (to earth, between phases, and across open switch contacts).

15.9.18 Perform conductivity tests across switch contacts (including earth switches) and across busbar joints (if applicable)

15.9.19 Tests on the Wind Power Plant earthing system shall be of sufficient type and number as necessary to fully verify the safety of the Site and to justify any assumptions made in respect of the Wind Power Plant earthing system.

15.9.20 Contractor will measure resistance to earth of each Wind Turbine earthing system (isolated from balance of earth system). The results are required to satisfy statutory requirements and requirements of Wind Turbine manufacturer.

15.9.21 After the installation of all joints and terminations and before energization of the circuit, Contractor shall conduct an insulation resistance (IR) test between each phase and earth/neutral, between the cable screen and earth, and between phases.

15.9.22 Commissioning tests shall be undertaken to confirm compliance with the requirements of the network service provider and grid interconnection agreements.

15.10 Commissioning Tests, Communications Network and SCADA System

Commissioning tests shall include the following as a minimum:

15.10.1 Attenuation measurements on all optical fibers.

15.10.2 Redundant loops tested and operational on all optical fiber loops.

15.10.3 Contractor's standard commissioning tests for the SCADA System.

15.10.4 Tests to demonstrate that the system is able to send and receive all the data required by the grid interconnection provider.

15.10.5 Commissioning tests shall also demonstrate that the system is able to record:

- Ten-minute average values for wind speed, direction, and power operational status from all Wind Turbines
- Occurrence and correction of Wind Turbine events
- Ten-minute average values of power, reactive power, frequency, and power factor from the grid monitoring station(s)

15.11 Performance tests for achieving substantial completion

Performance tests, including a 72-hour Project-wide performance run test, will demonstrate to Owner that the Work operate satisfactorily and safely, comply with the requirements of this document and are suitable for operational handover and for the purpose of achieving Project substantial completion.

15.11.1 If the 72-hour Project-wide performance run test is interrupted due to a fault of Contractor supplied equipment, the 72-hour performance run test shall be restarted.

15.11.2 Contractor shall be responsible for liaising with third parties, including the network service provider, to ensure the efficient and timely acceptance testing of the Work.

15.11.3 All performance data, faults, errors, trips etc. that occur during performance tests shall be recorded by the SCADA until such time that the test has been successfully completed.

15.11.4 If any significant defects occur during the course of any performance test, they shall be remedied immediately by Contractor and the performance test for the affected item shall start again.

15.11.5 Contractor shall provide Owner with the appropriate documentation for the test period in order to verify the tests have taken place and were successfully completed.

15.12 Performance test during initial operations

15.12.1 Contractor will include power performance testing of the Wind Turbines for compliance with the Wind Turbine's guaranteed power curve.

16. APPROVED SUPPLIERS

Below is a list of preferred and approved equipment suppliers and subcontractors for the Work. Should Contractor's proposal include equipment suppliers and subcontractors which deviate from the parties below, Contractor will request approval for the use of such parties from Owner. Owner may request information related to the equipment suppliers experience in the industry, technical specifications of equipment or materials proposed, CVs, and/or other similar background and informational documentation.

16.1 Approved major equipment vendors

16.1.1 Wind Turbine Generators

- General Electric
- Siemens
- Vestas

16.1.2 Collector System Cable

- Southwire
- Prysmian Power Cables and Systems
- General Cable
- Okonite

16.1.3 Substation Transformers

- Pauwels (Winnipeg, Manitoba, Canada shop)
- Smit (The Netherlands shop)
- ABB (St Louis, MO shop)
- Fortune Electric
- Siemens (Mexico shop)
- HICO
- Hyundai (Montgomery, AL shop)
- Delta Star
- Waukesha Electric

16.1.4 Capacitors

- Cooper Power Systems
- General Electric

16.1.5 Protective Relays

- Schweitzer Engineering Laboratories (SEL)

16.1.6 GSU Padmount Transformers

- ABB
- CG Power Systems USA
- General Electric
- Cooper Power Systems
- Siemens

16.1.7 High Voltage Circuit Breakers

- Siemens
- ABB
- Mitsubishi
- Alstom

16.1.8 Instrument Transformers

- ABB
- Trench Ltd
- Alstom

16.1.9 Ground Reference Transformers

- ABB
- Cooper
- GE
- Virginia Transformer
- Pacific Crest Transformers

16.1.10 Transmission Tubular Steel Towers

- Valmont
- Sabre
- Trinity Meyer
- Dis-Tran

16.1.11 Substation Remote Terminal Unit

- Eaton Cooper Power System

16.1.12 Substation Human/Machine Interface

- Schneider Electric

16.1.13 Substation Ethernet Switches and Routers

- RuggedCom

16.1.14 SCADA Input/Output Devices

- Eaton Cooper Power Systems

16.2 Approved subcontractors

16.2.1 Survey and Civil Engineering

- Pioneer Surveying and Engineering, Inc.
- Tenneson Engineering Corp.
- Encompass Energy Services
- David Evans and Associates
- Pacific Community Design
- Westwood Professional Services, Inc.

16.2.2 Geotechnical Engineering

- Barr Engineering
- Renewable Resource Consultants, LLC
- GeoEngineers
- GN Northern
- Cornforth Consultants

16.2.3 Structural Engineering Design (wind turbine foundations)

- Barr Engineering
- Renewable Resource Consultants, LLC
- HDR, Inc.

16.2.4 Cranes and Rigging

- Wilhelm Trucking and Rigging Co.
- Bigge Crane and Rigging
- Barnhart Crane and Rigging
- KR Wind
- Bragg Crane and Rigging

16.2.5 Transportation

- Wilhelm Trucking and Rigging Co.
- ATS Wind Energy Service
- Omega Morgan
- Contractors Cargo Co.

16.2.6 Electrical Contractors

- Rosendin Electric
- Tice Electric
- Mountain Power Construction Company
- Michels
- Christenson Electric
- Henkels & McCoy
- Par Electrical Contractors
- EC Electrical Construction
- NAES
- Blattner Energy

16.2.7 Substation Design

- Black and Veatch
- Power Engineers
- Sebesta Blomberg
- Burns & McDonnell

16.2.8 Collection System Design

- Power Engineers
- Burns & McDonnell

- TBD

16.2.9 Collector System Installation

- RES Earth and Cable
- Robinson Brothers Construction
- PLC
- Blattner Energy

16.2.10 Met Towers

- World Tower
- Magnum Tower
- CER
- Aerial Erectors
- Anetech
- Sabre
- Tower Systems
- Nello
- Sioux Falls Towers
- Vertical Technologies

16.2.11 Earthwork and Roads

- RES Earth & Cable
- Nelson Engineering
- Tower Foundations (TFS Wind)
- Builders Construction Services
- Narum Construction
- Goodfellow Brothers
- Lydig Construction
- Royce Hydroseeding
- Wildlands Inc.
- Geotech Foundation Company West
- Barker Inc.

16.2.12 O&M Building

- Thomas L Wood Heath Construction
- Apollo Sheet Metal Inc.
- Adran
- Shamrock Construction
- Opp & Seibold
- Metal Structures LLC
- SM Andersen Company

16.2.13 Overhead Transmission Line

- Wilson Construction
- International Line Builders

- Michaels
- Potelco

16.2.14 Transmission Line Foundations

- Crux
- DMI Drilling Construction
- Brent Woodward Inc.
- Malcolm Drilling
- Tri-State Drilling

16.2.15 Transmission Engineering Design

- POWER Engineers
- Black & Veatch
- HDR
- Burns & McDonnell

17. REQUIRED DOCUMENTATION

Documentation is grouped and shall be supplied by Contractor in the following categories:

- Level A, Bid Documentation: Documentation submitted prior to execution of the Agreement.
- Level B, Construction Documentation: Documentation to be submitted prior to the commencement of Work on Site or issuing of any completion certificate.
- Level C, As-Built Documentation: As-Built drawings and other record documentation to be submitted after the issuing of any completion certificate.

The documentation requirements listed herein are not intended to be exhaustive and all the requirements of this document relevant to the document submission item shall be considered by Contractor when preparing a submission.

Level A Documents	Description / Comment
Contractor's Specification(s), Site Layout	Proposed aggregation and layout of the: • Wind Turbines (including padmount transformers) • MV Cable routes • Substation • Transmission line • Access roads • Public Roads • Landowner Boundaries • Laydown areas • Foundations • Meteorological stations • Crane pads/hardstands • Borrow pits • Batch plant(s) • Construction compound, and • Permanent and temporary buildings
Contractor's Specification(s)	The documents that shall be attached to the Agreement to fully define the equipment being supplied. As part of this documentation Contractor shall provide a list of: • Standards as identified by Contractor as being relevant to the Work • Equipment suppliers detailing locations, and where major components of the Work shall be manufactured
O&M Building	Functional description and conceptual design specification including details on: • Layout • Elevation drawings • Structural
Control Building	Functional description and conceptual design specification including details on: • Layout • Elevation drawings • Structural
Wind Turbine, Noise Assessment	Noise assessment detailing the predicted Wind Power Plant noise at stakeholder and non-stakeholder receiver locations.
Wind Turbine, Site Suitability Statement	Provision of evidence and a statement of site suitability if conditions are outside type certified conditions

Level A Documents	Description / Comment
Wind Turbine, Specification	Specification(s) of Wind Turbines proposed for the Site including (for each proposed turbine type and operating mode): • Technical description of main components • General arrangement drawings • Description of operational envelope and control system • Details that show compliance with this document • Failure Modes and Effects Analyses • Maintenance schedule, included routine and major overhaul activity • Operational track record and performance including up-to-date installation figures for the proposed wind turbine model • Warranted power and thrust coefficient curves for the purpose of warranty calculations • Independently certified power curve measurement report • Warranted sound power levels and tonality for the purpose of warranty calculations • Independently certified noise measurement report • Electrical specification and single line diagram for the wind turbine, showing protection and earthing systems; interface to Wind Power Plant electrical system, acceptable variations in grid conditions • Independent Power quality measurement report • Confirm wind turbine meets the requirements of the applicable grid code
Wind Turbine, Certification Documentation	Type Certification or Design Assessment of the Wind Turbine applicable to the proposed Wind Turbine configuration
WTG Foundations	Design basis document prepared by the foundation designer, outlining standards, methods and approach to be used in the foundation design.
WTG Foundations, Concrete and Grout Specifications	Including minimum strength required for any concrete or grout forming part of the wind turbine foundation design
WTG Foundations, Preliminary study	Preliminary design information including: • Wind turbine standard foundation design • Proposed foundation design types used for costing estimate based on Preliminary assessment of Wind Power Plant • Foundation design, construct & test philosophy • General arrangement drawings
Civil Works, Specifications	Where not covered by the site layout an outline of proposed BOP Civil Works, including but not limited to: • Overview, specifications • Details of reinforcement • Site testing proposal
Electrical System, Grid Connection, Loss of grid power method statements and procedures	Provide method statements and procedures to achieve the aim of ensuring the Work are able to withstand periods without grid electrical power.

Level A Documents	Description / Comment
Electrical System, Specifications	Outline of proposed electrical systems (balance of electrical plant up to and including the Point of Interconnection) including: • Single line diagram of substation, including reactive plant; protection SLD to be incorporated or provided separately • Wind Power Plant Collector System SLD, showing connection to MV/LV transformers and Wind Turbines; protection SLD to be incorporated or provided separately • Cable route layout for collector system, including approximate in-line joint locations (if applicable) • Reactive power support and voltage control philosophy • Protection philosophy • Substation GA drawing • Primary and Secondary system key equipment specifications, including WTG Step-up Transformer and MV/HV Transformer, Reactive Plant (if applicable), HV and MV switchgear, neutral earthing resistors or neutral earthing transformers (if applicable) • Optimization of power cable and overhead conductor size
Transmission Line Specifications	An outline of proposed Transmission Works, including but not limited to: • Transmission line route including proposed pole/tower locations • Transmission line typical span and pole/tower drawings • Proposed transmission line structures and foundations • Power Line Systems PLS-CADD model
Communications Network, Specifications	Information on the communications system, including specifications and drawings
SCADA System, Specifications	Information on the SCADA system, including specifications and drawings
Meteorological Station, Specifications	Information on the Met Masts installations including number of Permanent Met Masts
Shipping and access routes and plan	Proposed shipping and access routes and major onsite plant required
Installation & Commissioning Plan	Proposed installation and commissioning plan
Grid Connection Documentation	All required information to assist Owner in its application for Grid Connection.
Project Management, Project Plan	Proposed Project Plan including: • List of key personnel with CVs • Project organisation diagram
Project Management, Project Schedule	Proposed Project Schedule including all milestone dates and for completion of Sections of Works (if applicable)
Sub-contractors	A list of all sub-contractors to be included as approved sub-contractors.
Quality Management	Proposed Quality Management Plans applicable to: • Design of the Work • Manufacture of the Work • Transportation and storage of the Work • Installation and erection of the Work • Testing, commissioning, and Substantial Completion of the Work • Shall include, where appropriate, references for FATs of major components
Quality Management, System Description	Description of the Tenderer's quality management system and associated certificates

Level A Documents	Description / Comment
HSE Policy	Description of the Tenderer's HSE System and associated certificates; and proposed Health, Safety, and Environment management plans
Performance Test	Draft of the Project equipment performance test

Level B Documents	Description/Comment
Topographic Survey	Detailed topographic survey, covering all areas where construction is proposed and supplied in both hard copy and electronic copy.
Grid Connection Data and Settings	Contractor shall provide, and update as required, data and settings as required by TSP including but not limited to: • Generating System Design Data Sheets, and • Generating System Setting Data Sheets
Grid Connection Documentation	All required information to assist Owner in its application for Grid Connection
Grid Connection Performance Standard Template	Contractor shall supply a completed performance standard template stating the proposed level of compliance to each access standard in accordance with the TSP's GPS
Work Method Statements	For all parts of the Work
Detailed Specifications	Full specification of the Wind Turbines including specifications of all main components
Wind Turbine, General Arrangement Drawings	Includes the general arrangement drawings of the following: • Nacelle • Hub (including electrical and hydraulic systems as applicable) • Blades • Tower sections including internals (platforms, ladders, hatches, control cabinets and safety equipment) • Service lift • Gearbox (where applicable) • Generator • Mechanical braking system • Hydraulic systems • WTG electrical cabinets • Safety equipment
Wind Turbine, Instrumentation Specifications	• Specification and calibration certificates where applicable of the following Wind Turbine instruments: - Nacelle anemometers - Nacelle wind vanes - Thermometers and other temperature measurement devices such as thermostats - Yaw and pitch sensors or transducers - Accelerometers, and - Condition monitoring sensors
Wind Turbine, Site Specific Modifications	Specifications and general arrangement drawings of any Site-specific modification made to the WTG.
Wind Turbine, Site Specific Statement of Compliance	Site specific statement of compliance for the design assessment from a Certification Body which demonstrates that the combined system of Wind Turbine and Wind Turbine towers is designed to withstand the Site conditions for the full Design Life.
Wind Turbine, Site Specific Statement of Compliance Associated Documentation	All reports associated with the site specific statement of compliance for the design assessment.
WTG Foundations, Geotechnical Certification	Certification from a qualified geotechnical engineer confirming design founding conditions in the base of the excavation prior to pouring the foundation or blinding.

Level B Documents	Description / Comment
WTG Foundations, Civil / Structural Design Report	Including but not limited to the following: • Design loads • Design calculations including all assumptions • Demonstration of suitability of all structural components in extreme wind conditions and over the design life • Detailed foundation specifications • Detailed foundation design drawings • Concrete and Grout Design and the mix proposed as described in this document • Borehole logs and relevant geotechnical test results for each WTG site • All partial safety factors • Decision trees • Reinforcement specifications and testing, and • Conclusions
Civil Works, 3rd Party Structural Design Report	Third-party Registered Professional Engineer's Report confirming the suitability of: • The permanent buildings • Any other structures as required to be certified under the local building and/or structural codes
Civil Works, Civil / Structural Design Report	The design report shall contain, as a minimum, all method statements, design inputs, design calculations, specifications, design drawings, cross sections, layouts and studies regarding: • Borehole logs and relevant geotechnical test results for the HV/MV Substation • HV/MV Substation foundations/footings; • Met Mast foundations/footings • Crane hardstands • Access roads • Permanent Buildings (including structural, architectural, fire rating and hold down details) • Site drainage • Site landscaping • Site reinstatement
Civil Works, Concrete and Grout Design Supporting Information	Contractor shall provide evidence from field, production or trial tests to justify the design of the concrete or grout mix proposed.
Civil Works, Concrete, Work Method Statements	A detailed method statement for on-Site concrete batching, including as a minimum: • Source of materials • Transport plan • Quality control If Contractor proposes to utilize a pre-existing off-Site batch plant, details shall be provided on the concrete supplier including: • Quarry materials suppliers and any additives required • How the delivery of concrete to site is to be managed Contractor shall additionally provide a method statement for forming cold joints should concrete supply be disrupted.
Civil Works, Geotechnical Investigation Report	Geotechnical investigation of HV/MV Substation, Access Roads, Hardstands, Underground Cabling, Wind Turbine & Met Mast foundation/footing sites.

Level B Documents	Description/Comment
Electrical System, Detailed Specifications and Design Drawings	Full specification and design drawings of all elements of the Wind Power Plant Electrical System including, but not limited to documentation for the following items as indicated: • MV/HV Transformer specifications and drawings, including MVA rating, nominal voltage rating, OLTC configuration, AVR, insulating medium, vector group, thermal ratings, temperature rise, fault ratings, insulation ratings, IP level, fire protection, corrosion protection, load and no-load loss guarantees, oil/water separator and bund details, manufacturer and standards compliance. Also required is the Type test certificate (considering environmental conditions, corrosion, cyclic loading, peak voltages and fire risk) and a fitness for purpose statement. • Manufacturer specifications for all Reactive Plant equipment (if applicable) and associated transformers • Cable specifications and schedules for all HV, MV, LV, earthing and fiber-optic cabling in the Wind Power Plant (including MV/HV Substation and Collector System) • Full technical specifications for all termination kits, jointing kits, lugs and connectors to be used in the primary power circuits of the Wind Power Plant and in the earth network • Protection equipment and switchgear specifications (including MV/HV Substation, WTG located MV switchgear, NER/NET if applicable), including insulating medium, description of interlocking and protection, thermal, fault and insulation ratings, IP level, manufacturer and standards compliance, relevant type test certificates • LV systems, diesel generator and associated equipment specifications, including battery and UPS capacities/back-up time • Revenue and power quality meter specifications • In-line cable jointing kits •
Transmission Line Civil/Structural Design Report and Drawings	Foundation and structure design for every pole location, including but not limited to the following: • Design loads • Design calculations including all assumptions • Demonstration of suitability of all structural components in extreme wind conditions and over the design life • Detailed foundation specifications • Detailed foundation design drawings • Concrete and grout mix design proposed • Borehole logs and relevant geotechnical test results • All partial safety factors • Decision trees • Reinforcement specifications and testing • Transmission line profile design • Structure assembly drawings, including required tolerances for installation

Level B Documents	Description/Comment
Transmission Line – Other Documentation	Including, but not limited to the following: • Electrical design report, including conductor selection (size, current rating, resistance, number of circuits, type, strength, etc.), insulation, loading, clearances, conductor sagging, etc. • Earthing study and earthing design drawings • Specifications for all components, including conductors, insulators, OPGW and hardware. • Calculations to confirm audible noise, radio frequency interference, electric field and magnetic fields satisfy the regulatory requirements and Applicable Standards. • Work method statements, ITPs (inspection and test plans) and commissioning plans for all HV transmission line works, including concrete testing, foundations, pole assembly, pole erection, conductor and OPGW stringing, jointing and terminations • Drawings showing details of conductor clearances and member clearances • Drawings showing clearances of conductor sagging and existing vegetation and other objects • Line route survey drawings and data • Pole schedule • Line schedule • Design of access routes, including drawings • Details of provisions for climbing and working at heights • Signage
Transmission Line – Earthing Verification Report	Earthing Verification Report, which verifies through measurement of the as-built earthing systems, that the HV Transmission Line will be safe for the lifetime of the Facility. This shall include measurements of step and touch potentials.
Electrical / Control Drawings & Documentation	Single line diagram of the Wind Turbine(s), in sufficient detail to show all protective devices, overvoltage protection, isolation and earthing facilities; • Wiring diagrams (three-wire) for all main power and auxiliary circuits in the Wind Turbines • Control system block diagram of the Wind Turbines; • Wind Turbine earthing drawings • Wind Turbine 33 kV system interface drawings, showing MV switchgear and Wind Turbine Transformer • Drawings and schematics for WTG located MV switchgear (if applicable), including configuration, placement, connections, civil works and/or mounting arrangements, cable terminations, and • Vendor data sheets for main electrical components in the Wind Turbines, including generator, main circuit breaker and converter/inverter (if present)

Level B Documents	Description/Comment
Electrical Power System Studies and Design Calculations Reports	Electrical Design Report(s) with detailed calculations indicating method, assumptions and outcomes of design and dimensioning of all elements in the Wind Power Plant Electrical System, having regard to the potential output of the Wind Turbines, the characteristics of the Work, Owner's reliability and availability requirements and Prudent Industry Practices. The Electrical Design Report shall include without limitation: • Load flow study, including voltage levels at all buses, cable rating calculations and loss calculation at zero, partial and full loads, and annualized losses in percentage of annual energy • Fault study showing minimum and maximum fault levels at all buses • Soil Electrical Resistivity Survey results, in sufficient number of locations to allow design of the entire Wind Power Plant Earthing System • Earthing study, based on justifiable assumptions and proving conclusively that the Site shall be safe for the lifetime of the Facility, addressing transferred potentials and step and touch voltages • Protection study and protection settings report, showing compliance with Owner's requirements and other relevant requirements • Harmonics and flicker study • Insulation co-ordination study • Reactive Power and Voltage Control Report
Electrical System Optimization Report	Final optimization of power cable and overhead conductor size
Electrical Works Method Statement	Method statement for all Electrical Works.
MV/HV Works Electrical System Design Report	Design of proposed electrical systems including, but not limited to: • Single Line Diagrams (SLD) for MV/HV Substation, reactive plant and Collector System, incorporating protection (or provided separately) • Earthing GA drawings and schematic diagrams • Substation GA drawings, including overall GA drawing, MV Switchroom GA drawings (including MV and LV switchboards, protection panels, SCADA, battery / UPS, chargers, etc.), lightning mast locations • Schematic diagrams and distribution board schedules for MV Switchroom equipment, LV supplies and metering • Details of equipment redundancy • Electronic copies of all studies, models, rating evaluations, etc. performed for the above requirements. Specific software and version information to be provided by Owner.
Protection Settings Signoff	Written endorsement by the interconnection provider in respect of all protection settings in the Wind Power Plant and Wind Turbines
Reactive Plant Voltage Regulation & Reactive Power Control Design Report	Voltage regulation and reactive power flow control and coordination study to demonstrate the proposed methods of integration and coordination of voltage and reactive power control devices.
Wind Power Plant Cable Route Layout and associated design drawings	Wind Power Plant Cable Route Layout and associated design drawings including, but not limited to: • MV cable route diagram, including details of creek and road crossings • Trench layout diagrams, showing cross-section of all buried cable configurations • LV cable route diagrams between the Wind Turbines and transformer kiosks (if applicable)

Level B Documents	Description/Comment
WTG Transformer	WTG Transformer specifications, including MVA rating, nominal voltage rating, tap changer details, insulating medium, vector group, thermal ratings, temperature rise, fault ratings, insulation ratings, IP level, fire protection, corrosion protection, load and no-load loss guarantees, manufacturer and standards compliance. WTG Transformer design drawings, including enclosure, fittings, locations and bund details. WTG Transformer type test certificate and a fitness for purpose statement (considering environmental conditions, corrosion, cyclic loading, peak voltages and fire risk)
Detailed Function Specifications and Design Drawings	Detailed Functional specification and design drawings of all elements of the Wind Power Plant SCADA & Communications system, including but not limited to the following: • Network used to communicate with the Wind Turbines (transmission medium, network topology, communication protocols and fault tolerance) • Interfaces • Redundancy and UPS • Remote access • Viewing and display • Data collection and storage • Control • Reporting • Software and licenses • Comprehensive user manual explaining the operation and use of all the functions • Hardware manuals for all hardware and computers systems • Documentation including manuals, quality control, installation, commissioning and testing procedures
SCADA Design Report	Details of Wind Turbine interfacing, Wind Power Plant and Wind Power Plant HV/MV Substation and 33kV equipment with design inputs, design criteria, design outputs comprising: • Systems Architecture Diagram showing all components in block form, specifically identifying redundant elements and interfaces • System platform details including details of software OS & hardware for SCADA platform including details of redundant elements and expected availability • Data map and interfacing details • Identification of all data points, interfacing points, including how the interconnection and interfacings are to be provided as described in this document • Optic fiber architecture
SCADA System - Warranty Calculation Method & Results	Documentary evidence that the SCADA system is sufficient for recording and analysis of the data for the Warranty Tests; and confirmation and detailed report of how the SCADA system stores data and provides values to enable availability calculations.
Calibration Certificates	Copies of calibration certificates for all instrumentation mounted on all Met Masts, provided by recognized independent agencies and done in accordance with the appropriate calibration standards.

Level B Documents	Description/Comment
Met Mast Design Report	Specification and drawings for meteorological masts including but not limited to: • Mast general layout • Proposed locations and non-wake-affected sectors • Earthing and lightning protection • Mast instrumentation & mounting arrangements • Aviation warning markings (e.g. marker balls) • Enclosures and cabling • Fencing/protection • UPS • Power supply and SCADA connection
Met Mast Installation Report(s)	An installation report for each mast including, but not limited to: • Details of installer • Installation date • Grid coordinates of mast (including details of coordinate system and datum) • Elevation of mast above sea level • Mast and equipment details including, but not limited to: - Mast dimensions - Instrumentation types, serials numbers and installation heights and positions - Dimensions and orientations of all booms and arms installed on the mast - Data logger configuration and details - Commissioning details - Reference photos
Method Statement – Delivery to Site	For Main Transformer and other critical equipment and oversize loads
Method Statement – Commissioning	Method Statement describing pre-commissioning and commissioning tests on all items in preparation for completion of individual Section of Works and to reach Substantial Completion.
Reinforcement specifications & testing	Reinforcement specifications, testing, FATs
Reinforcement, Supplier Accreditation	Certificates confirming manufacturers and processors of steel reinforcement hold a valid certificate of approval.
Factory Acceptance Test Schedule	Test schedule for all major equipment included in the Work and as described in this document.
Factory Acceptance Tests, Certificates and Reports	Copies of test certificates for all routine factory tests applied to all major items included in the Work, including Wind Turbine components and electrical system components including, but not limited to, switchgear, power transformers, instrument transformers, protection relays and revenue metering systems.

Level B Documents	Description/Comment
Factory Acceptance Tests, Certificates and Reports, WTG Components	FAT certificates to be provided by Contractor shall include, but not necessarily be limited to, the following components: • Rotor • Blades • Gearbox (where applicable) • Step-up Transformer • Generator • Yaw System • Main Bearings • Service Crane • Wind Turbine Tower • Service Ladder • Service Lift • Fall Arrest and Safety Systems
O & M Manuals	Draft, comprising Overview and Manuals from key equipment suppliers
Permanent Building Designs – 3rd Party Approval	Permanent building designs shall be independently checked and approved by a certified structural engineer
Power Curve Test Procedure	Power Curve Test Procedure describing the procedure to be undertaken by the Power Curve Test Consultant to measure the power curves of the selected WTGs.
Proposal for Conducting the Power Curve Test	The Consultant shall prepare a report (First Report) describing the Consultant's proposals for conducting the Power Curve Test including: • Details of the equipment to be used • Any deviations between the actual conditions for the Power Curve Test and the requirements specified by the Power Curve Test Procedure • The methodology for dealing with those deviations • Details of the site calibration procedure
Testing, Inspection and Test Plans	For all parts of the Work
Type Test Certificates	Type test certificates for any piece of Plant or Equipment
Recommended Spares	Updated list of components and consumables that do not satisfy the Design Life for Work including additional information.
Project Management, Project Schedule	Updated and final Project Schedule as described in this document
Quality Management, Plans	Updated and final Quality Management Plans applicable to: • Design of the Work • Manufacture of the Work • Transportation and Storage of the Work • Installation and erection of the Work • Testing, Commissioning, and Substantial Completion of the Work This shall include, where appropriate, references to FATs of major components and key equipment and materials.
Quality Management, System Description	Updated and final Project specific quality management system
Emergency Response Plan	As described in this document.
Environment Management Plan	As described in this document and complies with Owner's EMP.
Environmental Monitoring Plan	As described in this document.

Level B Documents	Description/Comment
HSE, Management Plan	Updated and final as described in this document. This shall include a comprehensive list of all HSE Laws and Applicable Standards applicable to the Work.
HSE, Management System	Updated and final description of the Health and Safety, and Environment Management System
Performance Test	Final version
HSE, Risk Assessments and Register	As described in this document. Contractor is to provide the outcomes/actions from a risk assessment workshop with the associated risk register.
HSE, Updated Risk Register	Periodic submission of the risk register showing updates on risk assessment and control measures in place to address hazards
Documentation and drawings, 30% or Preliminary Design, Site Layout	For Construction layout drawing(s) of the site showing the location of: • Wind Turbines • Cable routes • Access roads • Laydown areas • Foundations/Footings • Meteorological stations • Site tracks • Crane hardstands • Borrow pits • Batch plant(s) • Construction compound • HV/MV Substation, and • Permanent and temporary buildings • HV Transmission
Documentation and drawings, 30% or Preliminary Design	For Construction documentation and drawings produced for all parts of the physical Work including all design documentation to substantiate the basis for design and fitness-for-purpose (i.e. Contractor's design calculations, etc.). Documentation shall be submitted in complete packets or document package in accordance with major sections of the Work for review by Owner including: • Wind Turbine(s) • Wind Turbine Foundations • Civil Works • Electrical System • Communications Network • SCADA System • Meteorological Station • Spare, Parts, Tools and Permanent Storage • HV Transmission

Level B Documents	Description/Comment
Documentation and drawings, 75% or Issued for Review, Site Layout	For Construction layout drawing(s) of the site showing the location of: • Wind Turbines • Cable routes • Access roads • Laydown areas • Foundations/Footings • Meteorological stations • Site tracks • Crane hardstands • Borrow pits • Batch plant(s) • Construction compound • HV/MV Substation, and • Permanent and temporary buildings • HV Transmission
Documentation and drawings, 75% or Issued for Review	For Construction documentation and drawings produced for all parts of the physical Work including all design documentation to substantiate the basis for design and fitness-for-purpose (i.e. Contractor's design calculations, etc.). Documentation shall be submitted in complete packets or document package in accordance with major sections of the Work for review by Owner including: • Wind Turbine(s) • Wind Turbine Foundations • Civil Works • Electrical System • Communications Network • SCADA System • Meteorological Station • Spare, Parts, Tools and Permanent Storage • HV Transmission
Documentation and drawings, 90% or Issued for Procurement Detailed Design, Site Layout	Updated For Construction layout drawing(s) of the site.
Documentation and drawings, 90% or Issued for Procurement Detailed Design	For Construction documentation and drawings produced for all parts of the physical Work including all design documentation and drawings for final approval prior to being issued for construction. Documentation shall include updates to rectify any issues not otherwise resolved in the Preliminary Design documentation. Documentation shall be submitted in complete packets or document package in accordance with major sections of the Work for review by Owner including: • Wind Turbine(s) • Wind Turbine Foundations • Civil Works • Electrical System • Communications Network • SCADA System • Meteorological Station • Spare, Parts, Tools and Permanent Storage • HV Transmission

Level B Documents	Description/Comment
For Construction documentation and drawings, 100%, Issued for Construction or, Site Layout	Updated For Construction layout drawing(s) of the site.
For Construction documentation and drawings, 100%, Issued for Construction	For Construction documentation and drawings produced to provide all required information to construct the Work. Documentation shall include updates to rectify any issues not otherwise resolved in the Final Detailed Design documentation. Documentation shall be submitted in complete packets or document package in accordance with major sections of the Work for review by Owner including: • Wind Turbine(s) • Wind Turbine Foundations • Civil Works • Electrical System • Communications Network • SCADA System • Meteorological Station • Spare, Parts, Tools and Permanent Storage • HV Transmission
Factory Acceptance Tests, Certificates and Reports, Electrical Works	FAT certificates to be provided by Contractor shall include, but not necessarily be limited to, the following components: • Transformers, including: - MV/HV transformer/s - Auxiliary MV/LV transformer/s - WTG MV/LV transformers - Reactive plant transformers (if applicable) • Instrument transformers (i.e. CTs, VTs) • Reactive plant equipment (if applicable) • HV and MV switchgear and switchboards • LV distribution boards (AC and DC) • Cabling (HV, MV, LV and fiber optic) • HV and MV surge arrestors • Protection relays • Metering systems (revenue, check and power quality) • UPS systems • Stand-by diesel generator, and • Switchroom batteries and chargers

Level C Documents	Description / Comment
Quality assurance packages	Complete sets of quality assurance documentation for each of the defined construction milestones referenced in Section 3.10 (commonly recorded via construction job books).
Grid Connection Documentation	Update to all required grid connection documentation
Wind Turbine, As-Built Drawings, Final	As-Built documentation and drawings of the following: • Nacelle • Hub (including electrical and hydraulic systems as applicable); • Blades • Tower sections including internals (platforms, ladders, hatches, control cabinets and safety equipment) • Gearbox (if applicable) • Generator • Mechanical braking system • Hydraulic systems • WTG Electrical cabinets • Safety equipment • Site specific modifications • Single line diagram of the Wind Turbine(s) using Australian Standard electrical symbols, in sufficient detail to show all protective devices, overvoltage protection, isolation and earthing facilities • Wiring diagrams (three-wire) for all main power and auxiliary circuits in the Wind Turbines • Wind Turbine earthing drawings • Wind Turbine MV system interface drawings, showing MV switchgear and Wind Turbine Transformer
Third-party Structural Design Certificate	Third-party Registered Professional Engineer's Certificate confirming the suitability of the WTG foundation(s) and that they are in accordance with the As-built drawings.
As-Built Drawings, Final, Cable Routes	A GIS database which shall include all as-built cable routes recorded in a minimum of 10 meter steps and in-line joints (if installed).

Level C Documents	Description/Comment
Electrical System, As-Built Documentation	Complete drawings including: • As-built SLD's for MV/HV Substation, reactive plant and Collector System. Protection SLD's to be incorporated or provided separately • As-built Earthing drawings • As-built MV cable route diagram, including details of creek and road crossings and in-line cable joint locations (if applicable). Diagram shall include GPS coordinates of Wind Turbines and meteorological masts • GIS database including all As-Built cable routes recorded in a minimum of 10 meter steps and in-line cable joints (if installed) • MV Protection Schematics • MV CB Control Schematics • LV Air CB Schematics • UPS Schematic • Battery Charger Schematic • Distribution Board schedules • Cable schedules (HV, MV and LV) • LV systems and auxiliary generator schematics And General Arrangement drawings including: • As-built MV/HV Substation GA drawings • As-Built MV Switchroom GA drawings, including MV and LV switchboards, protection panels, SCADA, battery / UPS, chargers, etc. • As-built WTG transformer kiosk GA drawings (if applicable), including LV cabling between WTG and transformer kiosk
Electrical System, Certificates of Compliance	All Electrical Certificates of Compliance
Transmission Line , As-Built Documentation	Complete As Built and General Arrangement drawings and installation and commissioning records including, but not limited to: • Foundations • Pole assembly • Pole erection • Conductor, and • OPGW stringing, earthing, jointing and terminations
Electrical Power System Studies and Design Calculations Reports, Updated	Updated Electrical Design Report following any design changes during construction.
As Left Settings	As left settings including: • Alarm set points • Complete I/O database including description of each I/O
Instrumentation	Copies of calibration sheets for all sensors/transducers as appropriate in accordance with the appropriate calibration standards. Sensors/transducers shall include those mounted on: • Temporary and Permanent Wind Turbine met masts • Switchgear • Monitored equipment • Statcom equipment, and • Power Quality Metering

Level C Documents	Description / Comment
SCADA System, As-Built Drawings	Comprehensive and complete drawings including, but not limited to: • Detailed architecture, interfacing and component product identification • Network Data Communication, detailed wiring diagram • Fiber network • Interfacing • Power supply – SCADA distribution board SLD
SCADA System, Documentation	The SCADA system shall be supplied with three sets of comprehensive, complete and up-to-date documentation packages relevant to all the hardware and software supplied. This shall include: • A comprehensive user manual explaining the operation and use of all the functions • Detailed descriptions of the underlying theory and calculations employed especially with regard to availability and power curve measurements. These shall include complete details of any data processing carried out by the Wind Turbine controllers • A complete electrical wiring diagram showing connections to the controller and the communications links • Hardware manuals for all hardware and computers systems • An administrator manual for system administration and configuration • Quality control, installation and commissioning documentation
Maintenance Log(s)	Each installed mast shall have a maintenance log detailing all work carried out on the individual mast. The maintenance log shall be such that can be used by Owner for the continuing operation of the mast over its Design Life.
Final Substantial Completion Test reports	Completed installation and commissioning checklists, including commissioning test results, for the entire Wind Power Plant Electrical Works, including, but not limited to, MV/HV Transformer/s, auxiliary transformers, Reactive Plant (if applicable), protection systems and switchgear, WTG step-up transformers and switchgear, MV cables, fiber-optic cables, metering, LV equipment, auxiliary generator, in-line cable joints (if applicable), earthing connections at MV/HV Substation and WTG's, terminations and joints.
Installation and Commissioning, Reports	The results of all inspections, checks and tests carried out, together with any subsequent analysis.
Power Curve Test Report and Certificate	Upon satisfactory completion or upon failure of the Power Curve Test, as the case may be, the Consultant shall issue to Owner a report and a Performance Test Certificate to that effect.
Testing, Reports	The results of all inspections, checks and tests carried out, together with any subsequent analysis including documentation of all Acceptance, and Performance Tests (if complete) and applicable certifications
HSE Risk Register - Final	Final risk register
As-Built Documentation and Drawings, Final, Site Layout	Updated As-Built layout drawing(s) of the site.

Level C Documents	Description / Comment
As-Built Documentation and Drawings, Final	As-Built documentation and drawings produced for all parts of the physical Work. Documentation shall be submitted in complete packets or document package in accordance with major sections of the Work for review by Owner including: • Wind Turbine(s) • Wind Turbine Foundations • Civil Works, including - Roads - Crane pads - Drainage - Earthwork and compaction • Electrical System • HV Transmission • Communications Network • SCADA System • Meteorological Station • Spare, Parts, Tools and Permanent Storage Shall include marked up Issued for Construction documentation or drawings to show any and all changes made during construction, including documentation of any and all non-conformances and rectification.
Punch List	Documentation listing and detailing any and all minor non-conformances and proposed rectification not required to be completed prior to substantial completion.
O&M Manuals	Complete and final O&M manuals, including: • Overview of the Wind Power Plant Works • All relevant specifications • All details for the safe and effective use, operation and maintenance of the complete Wind Power Plant Works

20 Appendix H-2 – Technical Specifications for Owned Solar Resources

Template provided in a separate document available for download on PortlandGeneralRFP.accionpower.com.

Portland General Electric Company

SOLAR RESOURCE TECHNICAL SPECIFICATION**

Renewable Energy Resources

****NOTE: PGE's final issuance of the 2016 Request for Proposals (RFP) for Renewable Energy Resources is subject to Oregon Public Utility Commission approval of both the draft RFP and the Petition for Partial Waiver of the Competitive Bidding Guidelines, including the expedited RFP timeline.**

May 23, 2016

Table of Contents

1. DEFINITIONS 2
2. SCOPE OF WORK 3
3. PLANT ELECTRICAL DESIGN AND EQUIPMENT REQUIREMENTS 21
4. PROJECT SUBSTATION 62
5. HIGH VOLTAGE TRANSMISSION LINE DESIGN AND EQUIPMENT REQUIREMENTS 77
6. PLANT COMMUNICATIONS NETWORK DESIGN AND EQUIPMENT REQUIREMENTS 84
7. SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA) OR DATA ACQUISITION SYSTEMS (DAS) 86
8. TELECOMMUNICATIONS FACILITIES 108
9. CIVIL/STRUCTURAL DESIGN AND EQUIPMENT REQUIREMENTS 112
10. CONSTRUCTION MANAGEMENT 117
11. ELECTRICAL EQUIPMENT INSTALLATION 119
12. COMMISSIONING, PERFORMANCE TESTING, AND PERFORMANCE GUARANTEE 138
13. APPROVED SUPPLIERS 139
14. EXHIBIT A – COMMISSIONING AND PERFORMANCE TESTING 143
15. EXHIBIT B – PERFORMANCE GUARANTEE 176

1. DEFINITIONS

As used in this Solar Resource Technical Specification ("Technical Specification"), the following terms have the meanings set forth below. Other capitalized terms used and not defined in this Technical Specification have the meanings given to them in the form of Engineering, Procurement and Construction Contract included in the RFP.

a. AC Collector System – A network of transformers connected together to transfer the System's generated power to the point of interconnection.

b. Agreement – The agreement to be executed by Owner and Contractor, pursuant to which Contractor will construct the System. To the extent applicable, the Agreement will be based on the form of Engineering, Procurement and Construction Contract included in the RFP.

c. Construction – The installation and implementation of all equipment required to operate the System, including but not limited to, clearing and grubbing, grading, pile driving, mechanical and electrical installation of the PV and SCADA equipment.

d. Contractor – Person or Persons responsible for constructing the System pursuant to the Agreement.

e. Effective Date – The date the Agreement becomes effective, as set forth therein.

f. Engineer – Contractor's engineer of record in charge of the design of the System, as further described in Section 2.6 of this Technical Specification.

g. Inverter – Converts the Direct Current power produced by the solar modules to Alternating Current power.

h. Owner – Portland General Electric Company and any successors or permitted assignee under the Agreement.

i. Point of Interconnection (POI) – The point at which the System connects to the utility grid.

j. Project – electric generation project that is the subject of the Agreement, as described in the Scope of Work.

k. Scope of Work –The general overview of the System design, as set forth in this Technical Specification. The Scope of Work as described in this Technical Specification describes the general requirements for the equipment, materials and design of the Project, but is not intended to constitute a detailed project-specific scope of work, as will be included in the signed Agreement.

l. Solar (PV) Module – A series of photovoltaic cells that converts sunlight into electricity, constructed into a unit for application in a PV System.

m. Step-Up Transformer – the equipment that transforms the voltage that is output from the inverter, to a higher voltage level, to match the utility's distribution grid level, or that of the AC collector system.

n. System – The generation facility, including all of the associated equipment and infrastructure necessary to produce electricity.

2. SCOPE OF WORK

2.1.1 The design specifications set forth herein shall be used to define general, design, equipment, and installation requirements, criteria, and specifications for the Work.

2.1.2 This Technical Specification is not intended to provide a detailed design specification for the System. It describes major equipment, materials, installation methods, quality, testing, and commissioning services to define project minimum requirements and performance standards.

2.1.3 If there are other or different requirements than are specified in this Technical Specification or the Agreement (including any exhibits thereto) that are necessary in order to provide Owner with a System that: (i) has no Defects, (ii) reflects Prudent Industry Practices; and (iii) is capable of performing on a sustained, fully operational basis to generate the electricity as described herein, Contractor is to satisfy such requirements as part of the Work.

2.2 Project Description

Owner is requesting proposals for a newly constructed solar power project meeting all requirements of the Agreement including but not limited to those listed in this Technical Specification.

2.3 General Requirements

2.3.1 The System shall be a fully functional, turn-key solar generation facility, for which Contractor will provide engineering, procurement, and construction services. The System shall be designed and constructed to adhere to all applicable codes and standards, along with any additional conditions set forth by local or state agencies.

2.3.2 **Engineering:** The engineering portion of the scope shall consist of system layout and design, including electrical, civil, and structural engineering. The Engineer shall ensure that all of the equipment specified in the design is in compliance with the standards set forth in this document.

2.3.3 **Procurement:** It is Contractor's responsibility to procure all of the equipment necessary for the construction of the project, with the exception of that which will be provided by Owner. Contractor shall supply Owner with documentation for all proposed equipment for Owner's approval, prior to purchase.

2.3.4 **Construction:** Contractor shall construct the System based on the Engineers' design standards; and shall use means and methods of construction that will ensure that the installation will last for the intended lifetime of operation.

2.3.5 Contractor shall be responsible for all reclamation activities as required for all areas disturbed during the performance of the Work.

2.3.6 Contractor shall be responsible for the establishment of appropriate O&M procedures, quality management system documentation and warranties for the Work.

2.3.7 Contractor shall plan and execute the Work so as to minimize the effect of work by others on its own operations and the effect of its work on the operations of others.

2.3.8 All equipment supplied by Contractor shall be supplied new, complete and operational and shall include all necessary accessories and incorporate all miscellaneous material, minor parts and other such items, whether or not the items are indicated on the drawings or in this document, where it is clearly the intention that they should be supplied or where they are required and necessary to complete and commission the equipment.

2.4 System Life

Contractor will design, engineer, procure, and construct the Project according to the following intended design life:

2.4.1 Civil Works (including racking system and foundations): 30 years

2.4.2 BOP Electrical Works (including collection system and substation): 30 years

2.4.3 Solar Modules: 25 years

2.4.4 Inverters: 25 years

2.4.5 O&M Building(if applicable): 30 years

2.4.6 Transmission Line: 60 years

2.4.7 Contractor shall provide the expected reliability for the first five years of operation of the Photovoltaic Modules, Inverters, Medium Voltage Padmount Transformers and the Main Step-Up Transformers specified in their bid.

2.5 Site Conditions

Contractor will ensure that all aspects of the Work are fit for its intended purpose and suitable for the current and reasonably predicted conditions at the Project Site through inspection, examinations, investigations, explorations, surveys, tests, studies and data collection. All inspections, examinations, investigations, explorations, surveys, tests, studies and data collection will be included in Contractor's proposal and thus, Contractor will not be entitled to any scope change based on results included in these investigations.

It is Contractor's responsibility to ensure that all aspects of the Work are suitable for the existing and predicted conditions of the Project Site including but not limited to:

- Climatic (including, but not limited to, both local and regional wind and snow loading)
- Environmental
- Geotechnical
- Transmission, and
- Hydrological conditions

If aerial survey techniques are employed, Contractor will validate aerial survey data with ground based data collection.

2.6 Engineer of Record

2.6.1 All engineering shall be performed under the responsible charge of the engineer of record, who shall be a registered professional engineer, registered in the corresponding discipline for the reports or drawings produced, and the state(s) in which the site is located. The registered professional engineer shall have experience and competence in the area of engineering being performed as defined by laws and regulations of the applicable jurisdiction.

2.6.2 Final "Issued for Construction" engineering drawings and reports shall be signed and stamped by the registered professional engineer in responsible charge of the engineering work.

2.7 Maintainability

2.7.1 The System shall be provided by Contractor to allow maintenance to be performed safely and efficiently without significant dismantling or disruption to other items or parts of the System or unduly curtailing power generation.

2.7.2 The System shall allow maintenance activities that can be performed by a limited crew using mobile plant and operating in remote locations.

2.7.3 Contractor shall provide sufficient access around all of the System, in accordance with good utility design practice and Applicable Standards, to allow effective maintenance and removal of items from service or parts thereof, while maintaining operation of the System unaffected by maintenance tasks.

2.8 System Safety

The System designed and provided by Contractor shall ensure satisfactory operation in which safety of personnel and continuity of service are the first considerations, and equally to facilitate inspection, cleaning, maintenance and repairs.

2.8.1 The design shall incorporate industry best practice and provision for the safety of all those concerned in the operation and maintenance of the System and of related works supplied under other contracts.

2.8.2 The System shall be designed and constructed so that it complies with all relevant health and safety requirements.

2.8.3 Contractor shall undertake risk assessments and processes in accordance with the relevant standards to ensure that the design complies with the safety requirements of Applicable Standards and this document.

2.8.4 All items supplied by Contractor shall be designed to ensure satisfactory operation under the environmental conditions prevailing at the Project Site and under such variations of load as may be met with under working conditions on the grid including those due to synchronization and electrical faults including short circuit.

2.9 Permits

Contractor will obtain and maintain, at its sole cost, all permits required to design, engineer, procure, and construct the Project.

2.10 Project Management Plan

2.10.1 Contractor shall develop a project management plan for the management and execution of all phases of the Work and shall address as a minimum:

- Construction project manager and key team members
- Communication
- Permits, licenses, certifications and agreements required
- Procurement and sub-contracting
- Project schedule and payment milestones
- Resource loading
- Environment, health and safety
- Management of interfaces

2.11 Project Schedule

Contractor shall develop a Project schedule, which shall be used as the baseline for tracking progress through the design, engineering, procurement, and construction of the Project.

Milestones will be identified to mark completion of specific activities as agreed to by Owner. The schedule will be updated on a regular basis as agreed to by Owner to reflect current progress and expected completion of activities.

Contractor will provide a guaranteed Project Substantial Completion date with associated damage provisions. Project Substantial Completion will be achieved per the Agreement.

2.12 Quality Control

2.12.1 Contractor shall operate a quality system equivalent to the ISO 9000 series of standards and as approved by Owner.

2.12.2 Contractor's quality assurance / quality control plan will be adequate to cover all construction operations.

2.12.3 Contractor will submit all quality assurance / quality control documentation to Owner to show compliance with the requirements of the Agreement.

2.13 Quality Assurance

As the market supports, Contractor shall select manufacturers that have furnished equipment of similar type and size specified which has been in successful operation for not less than the past 5 years. Due to rapid development of new equipment in the solar industry, it is reasonable to expect that a specific model number for a piece of equipment may not have been on the market for the duration specified above. Contractor shall refer to the Specific Vendors section of this document for a list of recommended suppliers. Deviation from the criteria in this section is acceptable, if Contractor can provide sufficient evidence to support the bankability and track record of a proposed vendor.

2.14 Training

2.14.1 Contractor will develop and provide training to Owner personnel in the safe operation of Project equipment including but not limited to modules, inverters, electrical collection system, and Substation.

2.14.2 Contractor will involve Owner's personnel during Project start-up activities.

2.14.3 Contractor will provide training materials and manuals for all equipment provided by Contractor, to facilitate a smooth transition of operational responsibility from Contractor to Owner.

2.15 Design & Engineering

2.15.1 Contractor will complete design and engineering services and will provide comprehensive drawings and specifications for a complete and fully operational Project that meets the requirements of the Agreement.

2.15.2 Contractor will submit 30% (preliminary) design packages for the entirety of the Project for Owner review. Such packages will include, at a minimum, drawings, specifications, and assumptions.

2.15.3 Contractor will submit 75% (issued for review), 90% (issued for procurement), and 100% (issued for construction) design packages for the entirety of the Project for Owner review. Such packages will include, at a minimum, drawings, specifications, design calculations, materials, and assumptions. 100% (issued for construction) design packages shall be issued prior to the commencement of construction.

2.16 Design & Engineering Documentation

2.16.1 An up-to-date printable index listing all previously issued Contractor drawings and specifications by number and title, showing the revision status of each drawing, shall be maintained and shall be available to Owner at all times.

2.16.2 Contractor shall develop a Design Package, associated documents, and reports for the Project inclusive of the following at the appropriate time during the project, as applicable: (The following list does not attempt to define all aspects of the design requirements, those will be defined later in this document, or in a supplemental document supplied by the owner at a later time).

- Index
- Circuit and raceway list
- Material safety data sheets (MSDS)
- Equipment list (issued within 6 weeks of 100% design review approval)
- Equipment Datasheets
- Recommended Spare Parts
- Major subcontractor equipment drawings
- Site Arrangement Drawings
- Piping and Instrumentation Diagrams – using ISA 5.X instrument and function symbology
- Module, Inverter, and Combiner Box Location and Serial Number Maps
- Inverter/Step-up Transformer Plan and Details
- Pre-Engineered Building, as applicable
- Control Building Plan and Details
- Foundation Plans and Details
- Fencing, gate, signage, and label details
- Road plans and profiles, as applicable
- Overall Electrical One Line and Three Line Diagrams

- Electrical One-Line Diagrams, both ac and dc
- Electrical Load List (motors, heaters, etc.)
- Lubrication Schedule
- Communication Drawing and Details
- Room and building layouts
- Fire Control Plan
- Substation and Switchgear Plan and Elevation, as applicable
- Switchgear Elementary Diagrams, as applicable
- Protective Relay Calibration tests, as applicable
- Interconnection Diagrams, both One-Line and Three-Line Diagram (when required by utility or Jurisdiction)
- Trenching Drawings
- Grounding and Bonding Plan and Details, including fence as applicable
- Building Architectural and HVAC Drawings
- QC/QA Manual (Project Execution Plant and Project Coordination Procedure Manual)
- Safety Plan
- Lighting Plans, as applicable
- Lightning Protection Plan and Details, as applicable
- Security Infrastructure of Electrical Equipment, Hardware and Software
- Fire Alarm and Detection Drawings, as applicable
- SCADA/DAS Block Diagrams and Architecture
- SCADA/DAS I/O List
- Index of Vendor Drawings
- Factory Test Reports on new equipment
- Manufacturer Field Service Reports
- Instrument List
- Installation Details
- Asset Maintenance Information
  - Asset Description
  - Equipment Type
  - Preventative Maintenance Interval and Tasks and Intervals
  - Recommended Critical Spare Parts
  - Condition Based Monitoring, as applicable:
    - Applicable test method
    - Applicable test criteria
- Performance Monitoring Information
  - Environmental Monitoring Equipment, e.g., prediction of local weather events.
  - Equipment Degradation Monitoring, e.g., panels failing before design life.
  - Correctable Condition Monitoring Equipment, e.g., dirty panels.
- Reliability Monitoring Information
  - Monitored Points
  - Monitored Points Warning and Trip Setpoints
  - Equipment alarm codes
- Calculations, as applicable
  - Assumptions and quantified constants used in calculations
  - Cable sizing and pulling calculations
  - EMF calculations
  - Conduit sizing calculations
  - Load calculations
  - Electrical losses

- Voltage drop calculations
- Short circuit calculations
- Reactive power capabilities and contributions
- Inverter saturation and output model calculations
- Overcurrent device coordination
- Arc flash calculations and labels
- HVAC calculations, as applicable
- Structural calculations

- Civil Studies
  - Surveys (geotechnical, topographic, building rooftop structural, other)
  - Grading plans and Hydrology study (if applicable)
  - Erosion control plans (if applicable)
  - Storm Water Pollution Prevention Plan (if applicable)
  - Road crossing plans for underground or overhead transmission line crossings of public Right-of-Way (if applicable)
  - Offsite road improvement plans (if applicable)
  - Utility improvement plans (if applicable)
- Commissioning, Normal Operation and Shutdown and Emergency Shutdown Procedures

2.17 Design Engineering Submittals

Each submitted drawing shall be unique and shall be clearly marked with the name of the project, facility name, facility designation, specification title, specification number, project equipment or structure nomenclature, component identification numbers and Owner's name.

2.17.1 Engineering Design Document and Drawings Formats

Drawings shall adhere to Owner's CAD Standards. All Contractor and Subcontractor drawings (including shop fabrication drawings) shall be submitted in the following formats:

- Drawings: AutoCAD Drawings (*.dwg) – the latest version as specified by Owner
- 3D Models: Navisworks (*.nwd), AutoCAD (*dwg), AutoDesk Design Web Format (DWF)
- Raster Image Files: Tag Image File (*.tif, *tiff)
- Adobe Portable Document Format (*pdf)

2.17.2 Document Format

Typical project lists shall be submitted in MS Excel format. Examples include, but are not limited to:

- Photovoltaic Module List
- Valve List (if applicable)
- Spare Parts
- Special Tools List
- Electrical Load Lists
- Equipment List
- Instrument List

- Lubrication Schedule
- DCS I/O List
- Cable and Conduit Schedule
- Pipe Line List (if applicable)

All PDF documents shall be unlocked, indexed, word searchable and editable. Project lists shall be submitted in MS Excel format.

2.17.3 Manuals

The electronic versions of the O&M Manuals shall be word searchable PDF format, fully indexed and shall not be protected. The index shall link to the pages referenced in the index and the bookmarks shall coincide with the required tabs in the paper form.

Manuals which contain information on multiple manufacturer models shall have the model used at projected clearly highlighted. Manuals shall include as a minimum:

- Maintenance intervals and tasks; including
- Procedures
- Tool
- Inspection criteria
- Troubleshooting guide
- Condition monitoring intervals and tasks, including procedure and criteria

2.17.4 Equipment Numbering

Contractor shall use Owner's equipment numbering scheme for all equipment. Owner's equipment numbering scheme shall also be on all Subcontractor drawings.

2.17.5 Equipment Information

Contractor shall provide as a minimum the information shown in the Project Equipment List Template for all equipment supplied for the project.

Contractor shall supply all spare parts and bill of materials for the project in the format shown in the attached Project Spares Specification.

2.17.6 Within 30 calendar days after finalizing the equipment selection, Contractor shall prepare and deliver to Owner the following documents:

- O&M Manuals – electronic draft version
- Recommended spare parts list
- Lubrication Schedule

2.18 Owner's Review

2.18.1 Owner's review of drawings and other submittals will cover only general conformity of the data to the design specifications, external connections, interfaces with equipment and materials furnished under separate specifications, and dimensions that affect plant arrangements. Owner's review does not include a thorough review of all dimensions, quantities, and details of the equipment, material, device, or item indicated or the accuracy of the information submitted. Review and comment by Owner of Contractor's drawings or other submittals shall not relieve Contractor of its sole responsibility to meet the requirement of the Agreement and to supply Work that conforms to the requirements of the Agreement.

2.18.2 Owner will review and supply comments on submittals for approval within a mutually agreed timeframe after receipt from contractor. Contractor will have 10 working days to respond, in writing to owner's comments. Some resolutions to comments may require an extended period, which shall be granted to the contractor upon owner approval.

2.19 Health, Safety and the Environment

2.19.1 Contractor shall have and maintain documentation detailing its HSE system and if combined, Contractor's policy is expected to have two separate and distinct sections related to: (1) Health and Safety and (2) the Environment.

2.19.2 Contractor shall be responsible that the health and safety requirements extend to all sub-contractor work associated with or included in the Agreement.

2.19.3 If requested Contractor will be required to provide documentary evidence to show compliance with the requirements of this document.

2.19.4 Contractor is required to have an operational HSE management system including, at a minimum a method for the identification of hazards during the execution of the Project and subsequently through the Design Life of the System through risk assessments, hazard reporting, planned inspections, regular maintenance of the System, and personnel qualification reviews.

2.19.5 Contractor will submit for approval by Owner the following management plans prior to commencing the Work:

- A Health and Safety Management Plan (HSMP);
- An Environment Management Plan (EMP); and
- An Emergency Response Plan (ERP).

2.19.6 Both the HSMP and the EMP shall be specific to the Agreement and Work.

2.19.7 The HSMP and EMP shall be reviewed at regular intervals as agreed between Owner and Contractor to ensure that it remains current and relevant to the Work.

2.19.8 The HSMP and EMP shall establish the process for incident reporting in accordance with the Contract requirements.

2.19.9 A formal risk register shall be created and used to record the identified hazards, risk assessment and risk control methods to be employed by Contractor throughout the duration of the Work.

2.19.10 Contractor shall provide a description of Contractor's permitting system and safe work procedures for the applicable high risk work associated with the Contract (e.g. management of hazardous substances, working at height, confined spaces, extremes of temperature and electrical switching, other where relevant).

2.19.11 Contractor shall notify Owner immediately of any incident, involving injury, property or environmental damage or near miss incidents that had the potential to impact HSE, which occurs during the carrying out of the Work.

2.19.12 Contractor shall comply with all relevant Applicable Standards and its obligations under the Contract including this document for the handling, storage and disposal of hazardous materials and solid waste.

2.19.13 Contractor shall be responsible for the safe disposal of all waste, toxic and hazardous materials during the course of the Work. Such disposals shall be in accordance with the requirements of the relevant Authorities.

2.19.14 Contractor shall be responsible for obtaining all approvals, permits or other authorizations required for the disposal of waste.

2.19.15 Contractor shall be responsible for providing adequate fire protection equipment for protection of the System during the course of the Work including any requirements stipulated in the planning permit such as the supply of fire water tanks.

2.20 Solar Field Layout

2.20.1 For a ground-mounted system, the area available for the PV arrays is limited by the geotechnical survey landscape, protected areas, and other site constraints specified in the ALTA Survey Map.

2.20.2 Design parameters other than those specified in this document shall be defined by Contractor.

2.20.3 Row spacing (frame to frame) shall be specified by Contractor, but shall be adequate to allow access for customary maintenance vehicles such as commercial mowing equipment suited for ground-mounted systems, and maintenance personnel for rooftop systems.

2.20.4 Module tilt shall be specified by Contractor, but shall be adequate to allow proper water shedding.

2.20.5 The inverters shall be specified by Contractor, but shall be commercially viable, as approved by Owner.

2.20.6 The dc to ac ratio, defined as the ratio of the sum standard test condition (STC) rating of modules to the sum nameplate rating of inverters (otherwise known as the inverter loading ratio – ILR), shall be defined by Contractor, but shall not violate requirements and limits of the inverter manufacturer.

2.21 Design Codes and Standards

2.21.1 Work performed under these Technical Specifications shall be in accordance with standard engineering practice and all of the latest codes and standards listed below and otherwise referenced herein in addition to any other requirements set forth in the Agreement. 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 on the Effective Date shall apply. The referenced codes and standards shall govern the Work, except where they conflict with Owner's specifications set forth in the Agreement, and in such case, the conflict shall be referred to Owner for final resolution.

- Local building codes and amendments.
- Local energy codes and amendments.
- Local environmental protection agency.
- Local soil erosion and sediment control regulations.
- American National Standards Institute (ANSI).
- American Society of Civil Engineers (ASCE)
- American Society for Testing and Materials (ASTM).
- American Institute of Steel Construction (AISC).
- American Concrete Institute (ACI).
- Occupational Safety and Health Administration (OSHA).
- United States Code of Federal Regulations (CFR).
- Institute of Electrical and Electronics Engineers (IEEE).
- International Electrotechnical Commission (IEC)
- International Electrical Testing Association Inc. (NETA)
- International Building Code (IBC).
- International Fire Code 2009.
- National Electrical Code (NEC).
- National Electrical Manufacturer's Association (NEMA).

- National Electrical Safety Code (NESC).
- National Fire Protection Association (NFPA).
- Underwriters Laboratories Inc. (UL).
- County and/or Local Authorities Having Jurisdiction (AHJ).

2.22 Electrical Design Criteria

2.22.1 The design shall take into account ambient temperature, relative humidity, elevation above mean sea level, and proximity to potentially corrosive environments. The electrical design shall take into consideration the available short circuit current, from the utility side, and ensure that all specified equipment meets the appropriate protection levels to prevent hazards or damage to that equipment or personnel.

2.22.2 All electrical equipment shall be designed in accordance with all applicable codes and standards, to ensure that it is safe to operate within the specified application, and that it will be reliable.

2.22.3 All design drawings and specifications produced shall be sealed by a Professional Electrical Engineer licensed to practice in the state where the Project is located. The professional Electrical Engineer of Record shall review drawings and specifications that are produced by other disciplines in order to ensure compatibility and consistency throughout the design.

2.23 Civil, Structural, and Architectural Design Criteria

2.23.1 The design shall take into account all applied loads including dead, live, impact, thermal, dynamic, settlement, movement, wind, snow, ice, seismic, and other loading conditions where appropriate. Temporary loads during maintenance and erection shall be considered.

2.23.2 All structures and structural elements, including array structures, shall be designed in accordance with all applicable local Building and Codes and standards pertaining to the erection of such structures.

2.23.3 All structural components, including array structures shall be designed in a manner commensurate with attaining a minimum 25 year design life. Particular attention shall be given to the prevention of corrosion at the connections between dissimilar metals.

2.23.4 All design drawings and specifications produced shall be sealed by a Professional Structural or Civil Engineer licensed to practice in the state where the Project is located. The professional Structural or Civil Engineer of Record shall review drawings and specifications that are produced by other disciplines in order to ensure compatibility and consistency throughout the design.

2.23.5 Steel structures shall be designed by either the allowable stress method (ASD) or load and resistance factor method (LRFD). Reinforced concrete structures shall be designed by the ultimate strength method.

2.23.6 Wind Loads

The Project design wind speed is as required by the local AHJ. All structures shall be designed per the 2012 or most recent applicable International Building Code (IBC) with local amendments or as required by the AHJ based on Contractor's overall system design components, at no additional cost to Owner, but in all cases Contractor is ultimately responsible for system survivability.

2.23.7 Site Flooding

For ground-mounted system, the Project Site shall be designed to handle runoff from a 100 year storm and mitigate flood risks from a 500-year storm event should the Project Site be determined to be within a FEMA Flood Zone.

2.23.8 Seismic Loads

Structures shall be seismically designed in accordance with the 2012 IBC with local amendments. Contractor shall determine the appropriate Seismic Design Category for the Project Site based on 2012 IBC and design the structures accordingly. For module support structure design only, Risk Category II shall be utilized to determine the importance factor. The module support structure shall be able to operate after a design seismic event based on the criteria above.

2.23.9 Factors of Safety

Minimum factors of safety for all structures, tanks, and equipment supports shall be as shown in the table below.

Table 2-1 Factor of Safety

PARAMETER	FACTOR OF SAFETY
Overturning	1.50
Sliding	1.10 for seismic load, 1.50 for wind load
Buoyancy	1.25
Uplift due to wind	1.50

2.23.10 Module support frames and foundation support systems shall be designed to allow the modules to function normally after a design wind event as indicated above. Calculations documenting the design, deflection, and functionality shall be submitted for review and approval prior to construction of any systems in the field.

2.24 Engineering Completion

2.24.1 No less than 10 business days prior to commissioning activities, Contractor shall prepare and deliver to Owner an:

- Operations and Maintenance (O&M) Manuals-Final. Vendor will submit the O&M manual in hard copy and electronic form. The O&M manual shall include as a minimum:
  - Equipment description/specifications
  - System description
  - Equipment startup procedures
  - Equipment shutdown procedures
  - Equipment warning and trip setpoints
  - Normal system operations controls
  - Abnormal system operations controls
  - Equipment fault codes
  - Trouble shooting guides
  - Maintenance intervals and tasks; including:
    - Procedures
    - Tools
    - Inspection criteria, as required
  - Troubleshooting guide
  - Systems Descriptions describing normal and abnormal control for system components
  - Equipment Startup Procedures
  - Equipment Shutdown Procedures
  - Normal system operations and controls
  - Abnormal system operation controls
  - Equipment faults codes
  - Condition monitoring intervals and tasks; including:
    - Inspection procedures
    - Inspection criteria

2.24.2 Within one 30 calendar days of completion of commissioning activities, the following submittals shall be provided to Owner as applicable.

- Protective relay calibration tests
- Trial operation of equipment – summary report
- Manufacturer field service reports

2.24.3 Contractor shall provide the following information and documentation upon Project Final Completion as applicable:

- Hard copy and electronic as-built revision of IFC drawings per Owner CAD standards.
- Electronic CAD versions of As-built revision of IFC drawings per Owner CAD standards
- Electronic CAD versions of vendor supplied equipment and wiring diagrams per OWNER CAD standards.
- Interconnection approvals

2.24.4 User manuals should not substitute for System Descriptions. A complete System Description shall be provided by Contractor for all systems and related equipment.

2.25 Delivery

2.25.1 Contractor shall bear the responsibility for delivery of equipment, spare parts, special tools, and materials to the site and shall comply with the requirements specified herein and shall provide required information concerning the shipment and delivery of the materials specified in this Contract. These requirements also apply to any sub-suppliers making direct shipments to the jobsite.

2.25.2 Owner or Owner shall, from time to time, at their discretion supply equipment, spare parts, special tools, and materials to the site. Contractor shall coordinate receipt of such items and shall apply all requirements set forth herein to those items.

2.25.3 Contractor shall, either directly or through contractual arrangements with others, accept responsibility for the safe handling and protection of the equipment and materials furnished under this Contract by Contractor before and after receipt at the port of entry. Acceptance of the equipment shall be made after it is installed, tested, commissioned, placed in operation and found to comply with all the specified requirements.

2.25.4 All items shall be checked against packing lists immediately on delivery to the site for damage and for shortages. Damage and shortages shall be remedied with the minimum of delay, at no additional cost to Owner when it is Contractor supplied.

2.25.5 Delivery of portions of the equipment in several individual shipments shall be subject to review of Engineer before shipment. When permitted, all such partial shipments shall be plainly marked to identify, to permit easy accumulation, and to facilitate eventual installation.

2.26 Storage

2.26.1 Upon delivery, all equipment and materials shall immediately be stored and protected by reasonable means until installed in the Work. It is assumed that all materials can be

received and stored at the project site. If offsite storage is required, it shall be coordinated and approved by Owner.

2.26.2 Stacked items shall be suitably protected from damage by spacers or load distributing supports that are safely arranged. No metalwork (miscellaneous steel shapes and reinforcing steel) shall be stored directly on the ground. Galvanized steel with architectural purposes shall be stored with appropriate spacers to protect against galvanic discoloring. Galvanic discoloring is not applicable to ground mount array piles for which some discoloring is acceptable. Masonry products shall be handled and stored in a manner to hold breakage, chipping, cracking, and spalling to a minimum. Cement, lime, and similar products shall be stored off the ground on pallets and shall be covered and kept completely dry at all times. Pipe, fittings, and valves may be stored outdoors, but must be placed on wooden blocking. PVC pipe, geomembranes, plastic liner, and other plastic materials shall be stored off the ground on pallets and protected from direct sunlight.

2.26.3 Motors, electrical equipment, and all equipment with antifriction or sleeve bearings shall be stored in weathertight structures maintained at a temperature above 60°F [16°C]. Electrical equipment, controls, and insulation shall be protected against moisture and water damage. Space heaters furnished in equipment shall be connected and operated appropriately to protect equipment from condensation.

2.26.4 Equipment having moving parts, such as gears, bearings, and seals, shall be stored fully lubricated with oil, grease, etc., unless otherwise instructed by the manufacturer. Manufacturer's storage instructions shall be followed by Contractor.

2.26.5 Equipment and materials shall not show any pitting, rust, decay, or other deleterious effects of storage when installed in the Work.

2.26.6 When applicable and reasonable, the packaging of spare units and spare parts shall be suitable for long-term storage in a damp location. Each spare item shall be packed separately and shall be completely identified on the outside of the container.

2.27 Handling

Stored items shall be laid out to facilitate their retrieval for use in the Work. Care shall be taken when removing the equipment for use to ensure the precise piece of equipment is removed and that it is handled in a manner that does not damage the equipment.

2.28 Miscellaneous

Contractor shall be responsible for any damage to the Project Site caused by it or its Subcontractors.

3. PLANT ELECTRICAL DESIGN AND EQUIPMENT REQUIREMENTS

3.1.1 The following sections provide equipment specifications and requirements for electrical equipment. Contractor shall select equipment manufacturers with sufficient capacity to produce and deliver required materials without causing delay in work.

3.1.2 Appendix A shows a list of preferred vendors that may be selected from. Deviation from the criteria in this section is acceptable, if the contractor can provide sufficient evidence to support the creditworthiness and track record of a proposed vendor.

3.2 Photovoltaic Modules

3.2.1 The modules shall be designed to produce electricity for a minimum of 25 years under the environmental conditions of the Project Site. The electricity generation capabilities of the modules shall meet or exceed the capabilities defined by the module electrical data sheet of the product. Annual degradation shall be specified by the manufacturer.

3.2.2 Solar PV modules shall comply with the following parameters:

3.2.2.1 Manufacturer. The module manufacturer shall be as agreed upon by Contractor and Owner or Owner's Engineer.

3.2.2.2 Manufacturer Experience. The manufacturer shall have at least five (5) years of experience manufacturing photovoltaic modules.

3.2.2.3 Manufacturing Capacity. The manufacturer shall have a current minimum manufacturing capacity of at least 100 MW per year.

3.2.2.4 Specifications:

- The manufacturer/supplier shall provide detailed electrical and mechanical specification sheets for the module.
- The manufacturer shall provide the estimated annual degradation of their module and justify the value provided with historical production data.
- The maximum allowable annual degradation for modules used on this Project shall be 0.5 percent.

3.2.2.5 Technology. The cell technology for the PV module shall be either mono or poly crystalline silicon, or "thin-film" technology such as amorphous silicon (a-Si) or cadmium telluride (CaTel).

3.2.2.6 Codes and Standards. Modules shall either be UL listed or certified by an OSHA-approved testing agency to meet the UL 1703 specification. The certificates of factory/laboratories tests and compliance to the

codes and standards referenced by the manufacturer shall be provided to Owner by the procuring Party.

3.2.2.7 Labeling. The modules shall be provided with a permanent label indicating, at a minimum, the following information:

- Make/model identities
- Electrical characteristics, including open circuit voltage (Voc); short circuit current (Isc); maximum power point voltage (Vmpp); maximum power point current (Impp); nominal power (W), maximum series fuse size
- Nominal power conditions, Standard Test Conditions (STC), Nominal Operating (NOCT), etc.
- Environmental operating conditions
- Compliances with standards (UL, IEC, CE, etc)
- Warnings of electrical hazard
- Maximum system voltage
- Date and location of manufacture, manufacturing code
- Serial number

3.2.2.8 Module Design and Construction.

- The modules shall be new and, in order to maintain the homogeneity of the plant, all cells and modules connected to the same single inverter shall be identical, and supplied by the same manufacturer.
- The modules shall include factory installed power conductors at least No. 12 AWG, rated at 600 V DC, 1000 V DC, or 1500V DC (as appropriate) with clearly defined polarities, weather-proofed, UV resistant/outdoor rated and with locking-type plug-in connectors of single polarity and with same environmental and electrical ratings as the power conductors.
- All modules of the same type shall have the same connectors.
- The modules shall include a grounding lug, grounding hole, or some other tested grounding attachment mechanism (applicable for framed modules only).
- The module, and framing where provided, shall be corrosion-resistant, resistant to damage from snow, wind, hail and windblown dust and sand.

3.3 Module Mounting System

3.3.1 The Module Mounting System shall meet the following specifications:

3.3.1.1 The design specifications for the foundations of the module mounting system ("mounting system") shall be provided by Contractor as part of the mounting system design specifications.

3.3.1.2 The mounting system foundation shall be designed to withstand the soil chemistry of the Project Site location (ground-mounted system) for a minimum of 25 years without replacement.

3.3.1.3 The foundation shall be designed to comply with all of the environmental conditions of the Project Site.

3.3.1.4 The mounting system shall be designed to withstand wind speeds up to the maximums specified by applicable codes, over its specified operating lifetime, without compromising its structural integrity for a minimum of 25 years.

3.3.1.5 The mounting system shall be able to operate normally after high wind conditions have been cleared.

3.3.1.6 The mounting system and modules shall be continuously bonded and grounded to the ground grid system.

3.3.2 In addition to meeting the requirements of the mounting system, Contractor in coordination with party procuring the mounting system for the Project, if other than Contractor, shall:

3.3.2.1 Provide detailed information on the materials and design of the mounting system.

3.3.2.2 Provide a detailed structural analysis of the foundations and demonstrate that the design conforms to the applicable standards and codes.

3.3.2.3 Ensure that the modules will stay attached to the mounting structure under all environmental conditions specified by applicable codes.

3.3.2.4 Ensure that the design of the mounting structure will specify the attachment of the PV modules to mounting structure in accordance with the mounting specifications provided by the PV module manufacturer.

3.3.2.5 Submit all structural designs and calculations for the mounting system to Owner for review and approval prior to purchase of any mounting system equipment.

3.3.2.6 For ground-mounted systems, prepare a design to mitigate the effects of corrosive soils on the structural support system, which includes adding sacrificial layer to the structural steel members, galvanizing and/or coating the structural steel members with additional epoxy coating.

3.4 Combiner Boxes

3.4.1 Each combiner box shall include a fused connection between any ungrounded DC circuit wiring from PV strings to provide over-current and short-circuit protection. When applicable, the grounded DC circuit wiring from PV strings shall be connected to a terminal block and bus bar and then connected appropriately to the ground. The combiner box output circuit (homerun) shall be provided with a load-break disconnect switch with exterior lockable handle, rated for the voltage and current of the combined PV strings.

3.4.2 The string fuses and fuse holders shall be finger-safe and rated according to the string DC current and voltage, and environmental conditions. The power terminal blocks shall be rated for use with both copper and aluminum conductors and rated to match maximum system voltage (continuous duty, 600 V DC, 1000 V DC, or 1500V DC, as applicable) and 90°C conductor temperature. The combiner box shall be equipped with a mechanical ground lug and bus, rated for terminations with Al/Cu grounding conductors. Short circuit withstand rating shall be 10 kAIC minimum.

3.4.3 The combiner box enclosure shall be nonmetallic, outdoor-rated, weatherproof, NEMA 4 or NEMA 4X, and the doors shall be easily interchangeable. The manufacturer shall supply a fully assembled combiner box and shall provide detailed drawings, specifications sheets, mounting instructions, and maintenance requirements of its product.

3.4.4 Each combiner box shall provide "touch-safe" power circuit terminations and include provisions for bolted terminations of the output power circuit to the inverter. Each combiner box shall include a provision for a padlock, including a padlock and key.

3.4.5 The combiner box door shall be interlocked with a load-break disconnect switch in such a manner that the door cannot be opened when the switch is "closed." In addition, the switch shall not be capable of being placed in the "closed" position unless the combiner box door is fully closed. An external door interlock defeat mechanism shall be provided to allow authorized personnel access to the interior of the combiner box while the switch is in the "closed position for periodic inspection, troubleshooting, and electrical field measurements.

3.4.6 The combiner box shall be listed to UL 1741 for use in United States applications/ IEC 60146-1-1 and CSA C22.2 No. 107.1 may be substituted if authorized by Owner.

3.4.7 The combiner box shall be rated for an operating temperature range of -20°C to +50°C.

3.4.8 Each combiner box shall be suitable for application of permanent labels in the field and shall include electrical warning labels. The combiner box shall provide a permanent warning label stating the following:

WARNING:
ELECTRIC SHOCK HAZARD
DO NOT TOUCH TERMINALS
TERMINALS ON BOTH THE LINE AND LOAD
SIDES MAY BE ENERGIZED
IN THE OPEN POSITION

DC VOLTAGE IS ALWAYS PRESENT
WHEN SOLAR MODULES
ARE EXPOSED TO SUNLIGHT

3.5 Inverters

Each solar PV inverter shall meet the following requirements:

3.5.1 The inverter shall include the necessary DC circuit breakers/disconnect switches, AC circuit breakers/disconnect switches, local controls, remote SCADA/DAS interface, grid operator

control interfaces, and accessories necessary for the inverter to function properly as part of a power generation facility.

3.5.2 Environmental ratings: -20° to +50°C (-4° to 122°F), Humidity: 15 % - 95%, non-condensing, 6,500 ft elevation.

3.5.3 Nameplate: >0.99 power factor above 20% rated power.

3.5.4 Inverters shall be capable of providing voltage regulating capability to regulate the voltage at the Point of Interconnection.

3.5.5 Inverters shall provide capability to operate in power factor control mode within plus or minus 0.90 pf.

3.5.6 Inverters shall include flicker mitigation.

3.5.7 Inverters shall be IEEE 1547 compliant, with allowances for variations to meet Utility specific requirements with approval by the Utility and Owner. Variations shall not defeat or bypass standard safety features or requirements. .

3.5.8 Output current harmonics shall contain <5% total harmonic distortion (THD) at rated power output, per IEEE 519.

3.5.9 Inverter CEC weighted efficiency shall be >97%, at or above 50% rated power, without medium voltage step-up transformer.

3.5.10 Inverters located outdoors shall be enclosed in lockable, NEMA 3R enclosures. The Supplier's design shall include an analysis of the maximum anticipated operating temperature to ensure that the manufacturer's recommended operating temperature is not exceeded.

3.5.11 Enclosure must have a door interlock system to prohibit the door(s) from being opened while energized.

3.5.12 The enclosure shall be arc flash safe, and be designed to channel energy upward and away from panel entry area.

3.5.13 Inverters shall incorporate a non-loadbreak, two (2)-pole, lockable disconnect switch for main DC power disconnect for maintenance personnel safety.

3.5.14 Inverter output shall be protected by a circuit breaker with short and long time adjustable over current protection. This circuit breaker shall be externally operated or Contractor shall furnish an external on/off (start/stop) switch.

3.5.15 Inverters shall be capable of rated output at 50ºC ambient or better without derating.

3.5.16 Inverters shall employ a maximum power point tracking scheme to optimize inverter efficiency over the entire range of PV panel output for the given Site design conditions.

3.5.17 Inverters shall be equipped with all hardware for data collection and communication to the central SCADA/DAS server, including the ability to write to the control registers to reset inverter and modify ac output parameters, including power factor and maximum power. Data collection points shall be integrated into the inverter monitoring and communications package. Data collection points included shall be (at a minimum):

- AC Voltage
- DC Voltage
- AC Current
- DC current per input
- Power (kW)
- Energy (kWh)
- Alarms
- Inverter temperature
- Inverter status and faults (including ground fault interrupts)

3.5.18 If a skid-mounted inverter package unit is used, it shall include a fused and disconnectable Control Power Transformer (CPT).

3.5.19 CPT shall be sized and single phase breakers shall be included to supply power to a convenience receptacle, inverter heaters or air conditioners (if required to meet manufacturer recommended humidity requirements), fluorescent light fixtures, HVAC (if required to meet manufacturer recommended operating temperature requirements), inverter control power, and power for tracker motors (if applicable).

3.5.20 Inverters shall be equipped with multiple fused, disconnectable DC inputs with built in current and fault monitoring for input to the SCADA system.

3.6 Met Station

Met station shall be equipped with all hardware for data collection and communication to the central SCADA/DAS server. Data collection points included shall be (at a minimum):

- Air Temperature
- Cell Temperature
- Relative Humidity
- Wind Speed
- Global Irradiance

3.7 Medium Voltage, Pad-Mounted Transformers

3.7.1 This section covers compartmented, tamper-resistant, weatherproof, medium voltage, pad-mounted transformers. Transformers shall be designed, constructed, and tested in accordance with the applicable standards of ANSI, NEMA, UL, and NEC, with the following list of specific standards, unless indicated otherwise:

- ANSI C57.12.00 and C57.12.27 (general)
- ANSI C57.12.70 and C57.12.80 (connections and terminology)
- ANSI C57.12.90 (test code)
- ANSI/IEEE C57.109 (transformer damage curves and protection)
- ANSI C57.12.26 (dead-front high-voltage bushings)
- ANSI/IEEE 386 (separable connectors)

3.7.2 Medium voltage, pad-mounted transformers shall meet the following requirements:

3.7.2.1 A nameplate with unit description shall be provided on each transformer.

3.7.2.2 Nameplates shall be black and white laminated phenolic material of suitable size, engraved with 3/4 inch [19 mm] high letters.

3.7.2.3 The engraving shall extend through the black exterior lamination to the white center.

3.7.2.4 An instruction nameplate shall be mounted inside the low-voltage compartment door and shall be readable with cables in place.

3.7.2.5 All doors giving access to high-voltage parts shall be posted with DANGER - HIGH VOLTAGE - KEEP OUT signs.

3.7.2.6 The signs shall be constructed of heavy gage metal, with red letters on a white background.

3.7.2.7 Transformer primary high voltage winding configuration shall be delta or wye-solidly grounded.

3.7.2.8 Transformer secondary low voltage winding configuration shall be three-phase, and shall comply with applicable inverter manufacturer step-up transformer requirements.

3.7.2.9 When two inverters are connected to the low voltage side of one transformer, the secondary low voltage winding configuration shall have two or more windings, as applicable for galvanic isolation as required per inverter types to be interconnected.

3.7.2.10 Frequency shall be 60 Hz.

3.7.2.11 For multiple transformers to be connected in series, transformer primary winding configuration shall be loop type with feed-through inserts and integral fused load-break switch.

3.7.2.12 The transformer tank and terminal compartments shall be bolted together to form an integral unit of weatherproof construction, suitable for outdoor installation.

3.7.2.13 The transformer shall be completely enclosed, with one high-voltage and one low-voltage compartment door, each independently operable.

3.7.2.14 No externally removable bolts, screws, or other fastening devices shall be used (with the exception of pentahead bolts for security) that provide access to the energized parts within the enclosure.

3.7.2.15 The enclosure shall be of tamper-resistant design.

3.7.2.16 Transformer shall have full height, air-filled, dead-front incoming and outgoing terminal compartments with hinged doors located side by side, separated by an isolation barrier.

3.7.2.17 The low-voltage compartment shall be on the right when facing the transformer.

3.7.2.18 The fastenings of the high-voltage compartment door shall be independently operable – such that opening of the high-voltage compartment is not predicated by opening of the low-voltage compartment.

3.7.2.19 Both compartment doors shall have a 3-point latching mechanism with vault type handle and provisions for a single padlock each.

3.7.2.20 The doors shall be equipped with stainless steel lift-off type pin hinges and doorstops to hold the doors open when working in the compartments.

3.7.2.21 The doorsills shall be removable to permit the transformer to be rolled or skidded into place over conduit stubs.

3.7.2.22 Each compartment shall be suitable for installation of incoming and outgoing cables through the bottom.

3.7.2.23 A tank-grounding pad shall be furnished in each compartment.

3.7.2.24 The tank shall be built with sealed construction, capable of withstanding 10 psi without permanent distortion. Transformer shall be self-cooled. Transformer fluid shall be mineral oil. A less-flammable or fire resistant hydrocarbon type (Cooper Envirotemp FR3, OAE), may be considered.

3.7.2.25 Transformers shall meet efficiency standards set forth in the Department of Energy “Energy Conservation Program for Commercial Equipment: Distribution Transformers Energy Conservation Standards; Final Rule,” published October 12, 2007.

3.7.2.26 Transformers shall be rated to withstand 5% THD, to accommodate inverter source operation.

3.7.2.27 The average temperature rise of the windings, measured by resistance, shall not exceed 65°C (or 55°C) when the transformer is operated at rated kVA output at an average ambient temperature of 30°C (or 40°C) over 24 hours, with a maximum of 40°C (or 50°C).

3.7.2.28 The primary winding shall have four 2-1/2 percent fully rated taps, two above and two below rated voltage.

3.7.2.29 The tap-changer shall be used only when the equipment is de-energized and shall be operated with a hot or hook-stick tool.

3.7.3 The basic impulse level (BIL) of the high-voltage windings shall conform to the following:

Table 3-1 Basic Impulse Level for High Voltage Windings

Phase-to-Phase Voltage (kV)	BIL Voltage (kV)
2.4	45
4.16 and 4.8	60
7.2 and 8.3	75
12.0 through 14.4	95
24.9 delta	125
24.9 wye	125
34.5 wye	150
34.5 delta	200

3.7.4 Transformers shall have the following impedances at their lowest self-cooled ratings:

Table 3-2 Medium Voltage Transformer Impedance Ratings

Transformer Size (kVA)	Impedance (percent)
75, 112.5 and 225	4.0
300 and 500	4.5
750 and 1000	5.75
1500 and 2000	5.75
2500 and 3000	5.75
3500, 3750 and 5000	6.5

3.7.5 Transformer impedance requirements may differ, depending on inverter manufacturer specifications. The inverter manufacturer's requirements shall supersede the impedance values listed in the above table.

3.7.6 The transformer tank shall be of sealed construction, with a welded cover.

3.7.7 A bolted tamper-resistant handhole shall be provided in the cover for access to internal connections.

3.7.8 The tank shall have provisions for installation by lifting, jacking, or rolling into position.

3.7.9 The transformer shall be equipped with a liquid level indicator; a pressure relief device; and standard provisions for filling, draining, and sampling, in a lockable cabinet outside the energized cabinets.

3.7.10 The high-voltage terminations and equipment shall be dead-front type conforming to ANSI C57.12.26.

3.7.11 Dead-front construction bushings shall be either universal bushing wells or one-piece integrated bushings for use with separable connectors.

3.7.12 Six bushing wells shall be provided with ratings of 200 A or 600 A as applicable.

3.7.13 Bushings shall be externally clamped and front removable.

3.7.14 Each bushing shall have an adjacent parking stand.

3.7.15 Transformer primary fuse and disconnect switches shall be furnished to isolate the transformer in case of an internal fault.

3.7.16 The transformer and switch configuration shall be designed for loop feed.

3.7.17 Switches shall be internal, liquid-immersed four-position load break type.

3.7.18 Switches shall be rated a minimum of 200 A or 600 A continuous, as applicable

3.7.19 Bayonet type fuses shall be provided and shall be liquid-immersed, expulsion fuses accessible through the primary compartment.

3.7.20 The fuses shall be removable for external replacement of fuse links using a hot-stick tool without disassembly of the primary cabinet.

3.7.21 The secondary terminations shall consist of low-voltage bushings.

3.7.22 The bushings shall be of molded epoxy, and shall be provided with blade-type spade terminals with NEMA standard hole spacing arranged for vertical takeoff.

3.7.23 The low-voltage neutral shall be an insulated bushing, grounded to the tank by a removable link (check with inverter manufacturer to ensure that there are no special provisions required).

3.7.24 Each transformer shall have alarm contacts for the following conditions: oil level, oil pressure, and temperature. Provisions for analog / digital output of oil pressure and temperature, voltage and current quantities, and ground-fault detection, shall be considered and provisioned for in the SCADA or Inverter communication requirements as directed by the O&M provider. Alarm contacts may be housed in an attached weather-proof cabinet outside either energized cabinet

3.7.25 All iron and steel surfaces, except stainless steel and machined surfaces, shall be shop painted with the manufacturer's standard coating to a minimum thickness of 3 mils.

3.7.26 Finish color shall be ANSI 61 (gray) for indoor and outdoor equipment, unless otherwise specified by Owner.

3.7.27 A sufficient quantity of additional coating material and thinner shall be furnished to permit field touchup painting of damaged coatings.

3.7.28 All tank cabinet and fin steel shall be painted in accordance with ANSI C57.12.28 with a final coat in light gray, wheat, or any earth tone. The paint finish shall be capable of passing the following tests:

3.7.29 A 1500 hour salt spray test per ASTM B117

3.7.30 A 1000 hour humidity test

3.7.31 An impact test per ASTM D-2794,

3.7.32 A three-day oil immersion test

3.7.33 All standard factory tests required by the ANSI/IEEE C57.12.90 test code shall be performed.

3.7.34 Completed test reports shall be provided.

3.7.35 Manufacturer shall allow the option for Owner to personally witness these factory tests on at least one production unit that will be delivered to the project site.

3.8 Lightning Protection

3.8.1 Lightning protection shall be determined in accordance with risk calculations included in NFPA 780 using lightning flash density maps, or as specifically required by Owner.

3.8.2 Lightning protection with traditional air terminals shall be provided atop the following structures:

- Inverter/transformer canopies
- Inverter walk-in enclosures
- Control building
- Other similar structures

3.8.3 Lightning protection equipment shall be either Class 1 or Class 2, depending on the height of the structure to be protected in accordance with NFPA 780. Lightning protection equipment shall include, but not be limited to, the following:

- Air terminals
- Air terminal supports
- Main conductor
- Bonding conductor

3.8.4 All lightning protection equipment shall be UL listed.

3.9 Raceways

3.9.1 Contractor shall design, provide, and install a complete electrical raceway and/or ductbank system as required by applicable codes and as specified herein. Cables supported in free air as approved by the NEC are acceptable for installation of module wiring and harnesses to the combiner boxes as applicable.

3.9.2 Conduits shall be EMT, RGS, LFMC, or PVC schedule 40 or 80, as applicable, and specified below.

3.9.2.1 Electrical Metallic Tubing (EMT)

EMT conduit shall meet the following requirements:

- Hot dip galvanized, corrosion resistant
- Listed to UL 797 and UL 514B
- Conform to ANSI C80.3
- Fittings shall be integral compression type and watertight

3.9.2.2 Rigid Galvanized Steel (RGS)

RGS conduit shall meet the following requirements:

- Hot dipped galvanized, corrosion resistant
- Listed to UL 6 and UL 514B
- Conform to ANSI C80.1
- Fittings shall be threaded type and watertight

3.9.2.3 PVC Schedule 40/80 Conduit

PVC Schedule 40/80 conduit shall meet the following requirements:

- Sunlight or UV Resistant
- Listed for UL 651
- Conform to NEMA TC-2

3.9.2.4 Liquidtight Flexible Metallic Conduit (LFMC)

LFMC conduit shall meet the following requirements:

- Hot dipped galvanized steel core
- Flame retardant PVC jacket
- Sunlight or UV resistant
- Moisture and oil resistant
- Listed to UL 360
- Fittings shall be threaded type and watertight.

3.10 Grounding

Grounding shall be designed and provided as required by NEC, NESC, IEEE, and local code requirements. In addition, specific requirements are listed below:

3.10.1 Ground grids or ground loops shall be provided under/around major electrical equipment (step-up transformers, medium voltage switchgear, inverters, etc.).

3.10.2 The grounding system shall consist of bare copper conductor and copper-clad steel or stainless steel ground rods.

3.10.3 The system shall be designed to protect Project personnel and equipment from the hazards that occur during power system faults and lightning strikes.

3.10.4 Conductors utilized for grounding shall be appropriate for the Project Site's soil conditions.

3.10.5 Contractor shall design the station grounding grid for adequate capacity to dissipate heat from ground current under the most severe conditions in areas of high ground fault current concentrations, and in such a way that it is possible to maintain grid spacing to achieve safe voltage gradients.

3.10.6 For ground grids below grade, each junction of the grid shall be bonded with exothermic welds.

3.10.7 Major items of equipment such as inverters and transformers shall have integral ground buses connected to the station ground grid.

3.10.8 Contractor shall route a grounding conductor parallel to all power conductors operating above 208Y/120 volts.

3.10.9 For grounded dc systems (inverter type determines), the module dc system grounding electrode(s) shall be common with, or bonded to, the ac grounding electrode as indicated in NEC Article 690.47. Module grounding shall be in compliance with module manufacturer recommendations for grounding.

3.10.10 Contractor shall perform grounding calculations in accordance with IEEE standards and submit to Owner for verification that step and touch potentials are within the acceptable limits. Design shall also conform to IEEE Standard 665. Contractor shall determine the values used in the calculations through testing and shall not use typical values or estimates.

3.11 Power and Control Wiring

Cables shall be selected with an insulation level applicable to the system voltage for which they are used and ampacities suitable for the load being served. The type of cable used shall be determined by individual circuit requirements, temperature, and individual equipment manufacturer's recommendations. Current carrying conductors shall be copper. All exposed wiring shall be clearly indicated as sunlight or UV resistant.

3.11.1 DC Cables (module to module or combiner box)

DC cables connecting modules to modules and modules to combiner boxes shall meet the following requirements:

3.11.1.1 DC cables shall be sized in accordance with the NEC requirements for "Solar Photovoltaic Systems" (Article 690) and shall be rated according to the maximum system voltage.

3.11.1.2 Conductors shall be sized accordingly taking into account any ambient temperature or ampacity de-rate factors and voltage drop considerations. DC cabling shall be sized to not exceed a maximum voltage drop of 2 percent at Standard Test Conditions.

3.11.1.3 "PV Wire" is required for dc string cables.

3.11.1.4 Conduit (flexible or rigid) shall be used for transitions "entering" and "exiting" the cable trench to meet NEC 300.5(D) requirements.

3.11.1.5 DC conductors installed in PVC conduit are acceptable.

3.11.1.6 Cable insulation levels shall be rated according to the maximum PV system voltage.

3.11.1.7 Insulation and jacket materials on all dc conductors, regardless of location, shall be made from thermoset materials such as XLPE or EPR. No thermoplastic insulation or jacket materials are permitted for dc conductors. Cable insulation type shall be sunlight resistant, rated for wet locations, and have a temperature rating of 90° C or better.

3.11.1.8 If wind gusts exceed 100 mph at the Project Site, exposed DC string wiring shall be secured at intervals of approximately 24 inches, on center, maximum.

3.11.2 DC Cables (combiner box to inverter)

DC cables connecting combiner boxes to inverters shall meet the following requirements:

3.11.2.1 Conductors shall be sized accordingly taking into account any ambient temperature or ampacity de-rate factors and voltage drop considerations. DC cabling shall be sized to not exceed a maximum voltage drop of 2 percent at Standard Test Conditions.

3.11.2.2 Conduit (flexible or rigid) shall be used for transitions “entering” and “exiting” the cable trench to meet NEC 300.5(D) requirements.

3.11.2.3 DC conductors installed in PVC conduit are acceptable.

3.11.2.4 Cable insulation levels shall be rated according to the maximum PV system voltage.

3.11.2.5 Insulation and jacket materials on all dc conductors, regardless of location, shall be made from thermoset materials such as XLPE. No thermoplastic insulation or jacket materials are permitted for dc conductors. Cable insulation type shall be rated for wet locations, and have a temperature rating of 90° C or better.

3.11.3 AC Power Cable (inverter output to step-up transformer, auxiliary power)

AC cables connecting inverters to step-up transformer, or for auxiliary power, shall meet the following requirements:

3.11.3.1 Copper conductor

3.11.3.2 All power and control cables shall be UL listed.

3.11.3.3 Cables shall be routed in UL listed wireway, conduit, direct buried PVC conduit, or underground duct banks, as required.

3.11.3.4 A maximum of 3 percent ac voltage drop is acceptable in other ac circuits not associated with solar power production.

3.11.3.5 Less than 600 VAC applications

- Cable insulation levels shall be rated 600 VAC.
- Conductors installed in PVC conduit are acceptable.
- Low voltage power cables for loads up to 480VAC and control cables (i.e., 120VAC) shall have copper conductor with 600 volt-class insulation.
- Power cables shall be Type XHHW-2 with concentric-lay, uncoated copper, strand B conductor, rated for normal maximum operating temperature of 90° C in wet and dry applications, cross-linked thermosetting polyethylene insulation, and conforming to ICEA S-95-658 (NEMA WC 70).

3.11.3.6 Between 600 VAC and 1000 VAC applications

- Cable insulation levels shall be rated 1000 VAC.
- Conductors installed in PVC conduit are acceptable.
- Insulation and jacket materials on all conductors, regardless of location, shall be made from thermoset materials such as XLPE. No thermoplastic insulation or jacket materials are permitted for conductors. Cable insulation type shall be rated for wet locations, and have a temperature rating of 90° C or better.
- In cases where inverter output voltage may exceed 1000VAC, a 2000VAC insulation rating is required.

3.11.4 Medium Voltage AC Power Cable (AC collection system)

AC collection system cables shall meet the following requirements:

3.11.4.1 Copper or Aluminum conductor.

3.11.4.2 In areas with higher ambient temperatures, larger conductors shall be used in accordance with the NEC for temperature correction, or higher temperature rated insulation shall be selected.

3.11.4.3 Conductor size and ampacity shall be coordinated with circuit protective devices.

3.11.4.4 Cables shall conform to ANSI/ICEA S-94-649, AEIC CS-8, and RUS U-1.

3.11.4.5 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.

3.11.4.6 AC collection cables shall be rated at for the appropriate voltage class with 100 or 133 percent TR-XLPE or EPR insulation, MV-105 copper or aluminum conductor, tape shield or concentric neutral, with an overall outer jacket suitable for direct burial.

3.11.4.7 Medium voltage power cable shall be installed in conduits, direct buried PVC conduit, or underground concrete-encased duct banks.

3.11.4.8 Medium voltage power cable phases shall be maintained in a trefoil configuration in all trenches and conduits. Cross-bonding the cable shields may be allowed as a supplement to, but not a replacement for, the trefoil configuration. Direct buried cables are not acceptable under concrete slabs, buildings, roadways, or other permanent structures.

3.11.4.9 In general, for medium voltage power cable using bare copper concentric neutral under jacket, the following guidelines shall be used unless design calculations indicate otherwise:

- Conductors smaller than 500 kcmil - full neutral
- Conductors at 500 kcmil - 1/3 neutral
- Conductors larger than 500 kcmil - 1/6 neutral

3.11.4.10 Tape shield may also be used, unless design calculations indicate otherwise.

3.11.4.11 Medium Voltage Splices

- Medium voltage splices shall be enclosed in a vault or junction box. There shall be no direct-buried splices. If vaults are used,

incoming medium voltage cable from each end shall loop once around the enclosure before splicing.

- Splice kits shall have a voltage rating that meets or exceeds the voltage rating of the medium voltage cable. Splice kits shall be cold shrink, inline, compression or crimp type, suitable for MV-105 cables. Hot shrink kits are not acceptable.
- The cold shrink splice body shall be a one-piece molded design made of formulated silicone rubbers.
- The cold shrink jacket shall be made of EPDM rubber for physical protection. The minimum BIL rating shall be appropriate for the voltage class and meet or exceed the requirements of ANSI/IEEE Standard 404.
- Splice kits shall be rated for continuous operation at 105° C and an emergency overload of 140° C.
- Splice kits shall be TE, 3M, or approved equal.

3.11.4.12 Terminations for cable onto transformer primary bushings or switchgear shall be made with 200 A minimum EPDM type elbows complete with junction modules, bushing inserts, parking stands, grounding wells, bushings, protective caps, standoff insulators, and other necessary accessories suitable for use with subsurface or pad-mounted installations, submersible to 10 feet of water. Termination kits shall be TE, or approved equal.

3.11.4.13 AC collection system cabling shall be sized to not exceed the “X” percent maximum voltage drop used in the energy production models. If NO value is provided, do not exceed 1.0 percent maximum voltage drop.

3.11.5 Grounding (medium voltage AC collection system)

Medium voltage ac collection system grounding cables shall meet the following requirements:

3.11.5.1 A minimum of 2/0 AWG bare or coated copper grounding conductor, in non-corrosive soils, shall be installed in the same trench, conduit, or raceway as the ac collector system cables.

3.11.5.2 In corrosive soils, an appropriate ground (e.g., insulated cable or tinned copper grounding conductor) shall be used in place of the bare copper grounding conductor.

3.11.6 Auxiliary Power Cables (lights, receptacles, computers, tracker motors and controllers, PLC, heating/ventilation)

Auxiliary power cables shall meet the following requirements:

3.11.6.1 Auxiliary power cables for loads up to 480 VAC and control cables (i.e., 120 volts ac) shall have copper conductor with 600 volt class insulation.

3.11.6.2 All power and control cables shall be UL listed.

3.11.6.3 Cables shall be routed in UL listed wireway, conduit, direct buried PVC conduit, or underground duct banks, as required.

3.11.6.4 A maximum of 3 percent ac voltage drop is acceptable in other ac circuits not associated with solar power production. The maximum voltage drop shall always be confirmed to against connected equipment's voltage operating range to ensure proper operation.

3.11.6.5 When not supplied by the manufacturer of the connected equipment, power cables shall be Type XHHW-2 with concentric-lay, uncoated copper, strand B conductor, rated for normal maximum operating temperature of 90° C in wet and dry applications, cross-linked thermosetting polyethylene insulation, and conforming to ICEA S-95-658 (NEMA WC 70).

3.11.7 Control Cables (alarms, contacts, etc.)

Control cables shall meet the following requirements:

3.11.7.1 Shall be Type THHN/THWN 600 volt rated with stranded, uncoated copper conductor, rated for normal maximum operating temperature of 90° C dry and 75° C wet applications, polyvinyl chloride insulation, jacket thickness of 4 mils minimum, and conforming to ICEA S-95-658 (NEMA WC 70) and UL 83.

3.11.7.2 Control cables shall be terminated with uninsulated ring-lugs, where applicable.

3.11.8 Analog Instrumentation (analog signals)

Cables for analog instrumentation shall meet the following requirements:

3.11.8.1 Twisted Shielded Pair type

3.11.8.2 16 AWG seven-strand

3.11.8.3 Concentric-lay

3.11.8.4 Uncoated copper conductor

3.11.8.5 Rated for normal maximum operating temperature of 90° C dry and 75° C wet applications

3.11.8.6 Polyvinyl chloride insulation not less 15 mils average thickness

3.11.8.7 Twisted pair of 1-1/2 inch to 2-1/2 inch (38.10 mm – 63.5 mm) lay

3.11.8.8 Shield consisting of combination aluminum-polyester tape and seven-strand #20 AWG minimum tinned copper drain wire

3.11.8.9 With shield applied to achieve 100 percent cover over insulated conductors

3.11.8.10 Jacket thickness of 4 mils minimum

3.11.8.11 Conductor color identification with one black conductor and one white conductor

3.11.8.12 Conforming to UL 62 for Type TFN, and UL 1277 for vertical-tray flame test requirements.

3.11.9 Fiber Optic Cable (SCADA)

Fiber optic cable shall meet the following requirements:

3.11.9.1 Single-mode or multi-mode, as applicable

3.11.9.2 6 strand minimum

3.11.9.3 OM3 cable for inside plant applications

3.11.9.4 Single armor (corrugated steel tape), single jacket when installed in conduit

3.11.9.5 Black polyethylene inner and outer jacket. Nominal wall thickness of 0.06 inches.

3.11.9.6 Gel filled

3.11.9.7 Overall water swellable barrier tape with 25 percent overlap

3.11.9.8 Tensile load (installation) of 600 lbs

3.11.9.9 Minimum bending radius 20 times cable diameter

3.11.9.10 Operating temperature -40° C to 70° C

3.11.10 Category 6 Cable (communications and analog signals)

Category 6 cable shall meet the following requirements:

3.11.10.1 Sunlight, oil, and gas resistant

3.11.10.2 Industrial grade

3.11.10.3 4 bonded pairs, #22 AWG

3.11.10.4 Solid copper conductor

3.11.10.5 Polyolefin insulation

3.11.10.6 Black PVC jacket, 0.03 inches

3.11.10.7 UL listed

3.11.10.8 Operating temperature of -25° C to 75° C

3.12 Site Lighting

3.12.1 Site lighting shall be provided at the following locations:

- All plant entrances
- Entry doorways to all buildings
- Parking areas

- Substation or switchyard

3.12.2 Site lighting shall include light fixture, mounting poles, lighting controls, etc., as applicable.

3.12.3 Light fixtures shall be suitable for outdoor locations in wet locations.

3.12.4 Light fixtures shall be light emitting diode (LED) type.

3.12.5 All site lighting equipment shall be UL listed.

3.12.6 Lighting control shall consist of a HAND-OFF-AUTO switch.

3.12.7 Photocells shall be used for automatic control.

3.12.8 Photocells shall be weatherproof, swivel adjustable, with built-in time delay to prevent accidental turnoff by momentary brightness.

3.12.9 Photocells shall be rated at 1800 VA, 120 volts ac.

3.12.10 Photocells shall be field adjustable from 1 ft/c turn-on to 15 ft/c turn-off.

3.13 **Site Security System**

Contractor shall provide a security system for the Project Site that meets the following requirements:

3.13.1 Fiber Sensys perimeter fence protection - single zone around the entire perimeter all fences.

3.13.2 Bosch Intrusion Alarm system - Bosch Panel, Bosch Keypad, Bosch output relays and position switches for all gates and building doors.

3.13.3 Access Control on all personnel gates, vehicle gates and building entry doors, arm/disarm reader.

3.13.4 Vicon CCTV System, consisting of eight exterior perimeter PTZ cameras and one camera at the control house entry door.

3.13.5 Provision of the required low voltage power supplies for the systems listed above.

3.13.6 Program and commission this system into the OWNER Security System with an OWNER representative.

3.13.7 All wiring shall be installed in raceways provided by Contractor.

3.13.8 Contractor will provide the wire from the control house to the gates, cameras and security fence.

3.13.9 The Project Site shall be enclosed by a steel expanded metal perimeter fence, constructed in accordance with the relevant Section(s) of the NESC and Owner requirements.

3.14 Low Voltage Dry-Type Transformers

Low voltage dry-type transformers shall meet the following requirements:

3.14.1 Low voltage dry-type transformers shall be provided in the phases, kVA, and voltages as specified on the drawings.

3.14.2 Transformers shall have copper windings.

3.14.3 Transformers shall be self-air-cooled, dry type, wall- or floor-mounted, and enclosed for wiring in conduit.

3.14.4 Transformer enclosures shall be NEMA 3X, weatherproof.

3.14.5 Transformers shall have at least two full capacity voltage taps.

3.14.6 Transformers shall meet NEMA TP1 guidelines for energy efficiency.

3.14.7 Transformers shall be UL listed.

3.15 Low Voltage Panelboards

Low voltage panelboards shall meet the following requirements:

3.15.1 Panelboards shall be dead-front with molded case circuit breakers of the size and type as specified on the drawings.

3.15.2 Panelboards shall be 120/240 volt, single phase, 208Y/120 volt, three phase, or 480Y/277 volt, three phase.

3.15.3 Panelboards shall have a flush-mounted or surface-mounted enclosure.

3.15.4 Enclosures shall be NEMA Type 1 for installations indoors, or NEMA Type 3R for installations outdoors.

3.15.5 The enclosure shall have a hinged trim (cover).

3.15.6 Breaker operating handles shall be accessible through a latched, lockable, door.

3.15.7 Circuit breakers shall be thermal-magnetic, bolt-in, individually front replaceable, and shall indicate "On," "Off," and "Tripped."

3.15.8 Breakers indicated as multiple-pole shall be common trip.

3.15.9 Breakers shall have interrupting ratings in excess of fault current required.

3.15.10 Handle clips to prevent casual operation of breakers shall be provided for 10 percent (at least two) of the breakers and applied to the circuits directed.

3.15.11 Breakers and provisions for future breakers shall be provided in the quantities, number of poles, and ampere ratings indicated on the drawings.

3.15.12 The panel shall have main and neutral buses insulated from the cabinet, and a ground bus.

3.15.13 Buses shall be copper, with ampere ratings and main lugs or breaker as indicated.

3.15.14 The ground bus shall be similar to a neutral bus and shall have a solid ground connection to the cabinet, a removable bond to the neutral bus, clamp type lugs for the ground cable in each supply conduit, and connections for a ground cable in each load conduit.

3.16 Medium Voltage Switchgear

Unless otherwise controlled by more stringent Utility stipulated interconnection requirements, medium voltage switchgear shall meet the following requirements:

3.16.1 Medium voltage switchgear shall be metal-clad or metal-enclosed of the configuration, size and type as specified on the drawings.

3.16.2 Switchgear shall conform to the standards of ANSI, NEMA, UL, and NEC, with the following list of specific standards:

- IEEE 48-90
- C37.04
- C37.06
- C37.11
- C37.20.2
- C37.09
- C37.90
- C37.90.1
- C57.13
- ANSI Z55.1
- NEMA SG-4
- SG-5-81

- AB-1-75
- TR-1-80

3.16.3 A master nameplate shall be attached to the switchgear giving switchgear designation, voltage and ampere rating, short circuit rating, manufacturer's name, general order number and item number.

3.16.4 Each circuit breaker and instrument on the front of the switchgear shall have a suitable nameplate.

3.16.5 Each incoming line section shall be furnished with a nameplate to indicate the power source, circuit, panel, or substation from which it is fed.

3.16.6 The nameplates for the distribution circuit breakers shall indicate the equipment fed through the breaker.

3.16.7 Nameplates shall be black and white laminated phenolic material of suitable size, and shall be engraved with 3/4 inch high letters for section and circuit breaker identity and 1/8 inch letters for other information.

3.16.8 The engraving shall extend through the black exterior lamination to the white center.

3.16.9 Each control device and each control wire terminal block connection inside the units shall be identified with permanent nameplates or painted legends to match the identification on the manufacturer's wiring diagram.

3.16.10 Frequency rating shall be 60 Hz.

3.16.11 Switchgear enclosure shall be NEMA Type 1 for indoor locations, or NEMA Type 3X for outdoor locations.

3.16.12 Switchgear lights, receptacles, heaters, and fans shall be served by an integral control power transformer.

3.16.13 All outdoor type switchgear shall be provided with weathertight gasketing on all exterior doors, removable covers, and panels.

3.16.14 The switchgear assembly shall consist of individual vertical sections housing various combinations of circuit breakers and auxiliaries, bolted together to form a rigid metal-clad switchgear assembly.

3.16.15 Each vertical section shall accommodate breakers stacked one-high or two-high.

3.16.16 Metal side sheets shall serve as grounded barriers between adjacent structures.

3.16.17 Solid removable metal barriers shall isolate the primary major sections of each circuit.

3.16.18 Two rear covers shall be furnished for each vertical section for circuit isolation and ease of handling.

3.16.19 The circuit breakers shall be three-pole, single-throw, and shall be furnished complete with all equipment on a draw out carriage.

3.16.20 The breakers shall be operated by a stored energy mechanism consisting of a heavy-duty spring, charged normally by a universal electric motor, and, in an emergency, by a manual handle.

3.16.21 The circuit breaker control voltage shall be as required.

3.16.22 Each circuit breaker shall contain three vacuum interrupters, separately mounted in a self-contained, self-aligning housing which can be removed as a complete unit.

3.16.23 The vacuum interrupter pole unit shall be mounted on glass polyester supports.

3.16.24 Each vacuum interrupter shall be provided with a contact wear gap indicator which requires no tools to indicate available contact life, and is easily visible when the breaker is withdrawn on the extension rails.

3.16.25 For ease of inspection and maintenance, the breaker front panel shall be removable when the breaker is withdrawn.

3.16.26 Interlocks shall be provided to prevent closing of a breaker between operating and test positions, to trip breakers upon insertion or removal from the housing, withdrawing a circuit breaker from the cubicle while the closing springs are charged, insertion of a breaker of incorrect ampere rating or inadequate interrupting capacity, and to discharge the stored energy mechanism upon insertion or removal from the housing.

3.16.27 The breaker shall be secured positively in the housing between, and including, the operating and test positions.

3.16.28 The main bus shall consist of rigidly supported, tin-plated copper bars of suitable design and cross-sectional area to satisfactorily carry the rated current without exceeding the specified temperature rise.

3.16.29 The bus shall have insulation, bus joint covers, and supports of molded epoxy that is nontracing, nonflammable, and nonhygroscopic.

3.16.30 Bus supports shall be glass polyester inserts.

3.16.31 The bus shall be capable of withstanding the magnetic forces imposed by short-circuit currents equal to the close and latch rating of the largest circuit breakers.

3.16.32 The current-carrying capacity shall be based on actual service conditions, including skin and proximity effect, insulation, steel enclosure, and an ambient temperature of 40°C.

3.16.33 The bus shall be derated in accordance with NEMA SG-5 for ambient temperatures higher than 40°C.

3.16.34 The bus shall be supplied in unit lengths that will permit the reassembly of the units in the field.

3.16.35 All joints shall have tin-to-tin contact surfaces and minimum contact resistance.

3.16.36 Joints shall be equipped with removable insulating fittings at least equal to the bus bar insulation.

3.16.37 To prevent undesirable or destructive mechanical strains in the bus supports and connections, provisions shall be made for bus expansion through an ambient temperature range of -30 to +50°C.

3.16.38 Expansion joints shall be supplied as necessary.

3.16.39 An uninsulated ground bus of tin-plated high conductivity copper, with momentary and short time ratings at least equal to those of the largest circuit breaker shall be furnished through the entire length of the switchgear.

3.16.40 All switchgear equipment requiring grounding shall be connected to this ground bus.

3.16.41 A clamp type connector shall be provided on each end of the ground bus for external connection of a 500 kcmil [240 mm^2] stranded copper grounding cable to the grounding system.

3.16.42 A clamp type connector shall also be provided in each vertical section for connection of stranded copper grounding cable run with incoming and outgoing phase wires, as indicated on the drawings.

3.16.43 Provide a grounding disconnecting device between each circuit breaker removable element and the equipment ground bus which shall maintain contact at all times, except when the primary disconnecting devices are separated at a safe distance.

3.16.44 Provide a static grounding device on each potential transformer drawout carriage to contact the primary fuses in the disconnect position.

3.16.45 Each drawout carriage shall be bonded to the ground riser bus assembly.

3.16.46 Each breaker shall be furnished with a sufficient number of auxiliary contacts and auxiliary switch contacts to provide all necessary interlocks for proper operation of the equipment.

3.16.47 Not less than two spare NO and two spare NC auxiliary contacts shall be furnished on each breaker.

3.16.48 In addition, mechanically operated auxiliary switches mounted in the stationary switchgear housing shall be provided with not less than two spare NO and two spare NC contacts.

3.16.49 All auxiliary contacts and auxiliary switch contacts, including spare contacts, shall be wired to terminal blocks for use with control circuits.

3.16.50 All current-carrying connections to the main buses shall be insulated copper of suitable capacity and shall conform to the requirements of the main bus insofar as bracing and temperature limits are concerned.

3.16.51 Connections to the bus shall be made with suitable bus clamps or bolts with lock washers, and the copper bars shall be tin-plated at current-carrying connections.

3.16.52 Molded removable covers or similar devices shall be used at connections to the bus.

3.16.53 Connections from the current transformers shall permit the transformers to be easily replaced.

3.16.54 Insulated cable connections shall be furnished for the potential transformers and control power transformers.

3.16.55 The thermal and mechanical ratings of the current transformers shall be coordinated with the circuit breakers. Shorting terminal blocks shall be furnished on the secondary of all current transformers. Current transformers rated 600 amperes and smaller shall be of the wound type, with tin-plated primary terminals and insulated to withstand ANSI standard test voltages for the switchgear.

3.16.56 The accuracy of these current transformers shall be suitable for the meters and relays specified with the normal burdens of the various devices, and not less than ANSI standard accuracy classification of 0.3 with burdens B-0.1 and B-0.5, and 1.2 with burden B-2.0.

3.16.57 A compartment enclosed by metal plates shall be provided to house separately the current transformers in each unit.

3.16.58 Metal barriers shall isolate each current transformer from other component parts and adjacent circuits.

3.16.59 Arc flash safe design shall direct energy from arc flash event to safe area.

3.16.60 Infrared windows shall be provided to allow thermographic inspection of the breaker, bus, and current transformers.

3.16.61 Potential and control power transformers shall be supplied in the quantities and of the ratings specified herein or specified on the drawings.

3.16.62 Potential or control power transformers up to 15 kVA single phase shall be mounted in a drawer or a tilt-out carriage in an auxiliary compartment.

3.16.63 Opening the drawer shall ground the primary fuses of the transformer and permit easy inspection, testing, and fuse replacement.

3.16.64 Shutters shall isolate primary bus stabs when drawers are withdrawn.

3.16.65 Control switches shall be 600 volt, 20 ampere, multistage rotary type with black handles.

3.16.66 Each switch shall have a fixed pistol grip handle with an engraved black plastic escutcheon plate.

3.16.67 All circuit breaker control switches mounted on the front instrument panels shall be equipped with red, amber, and green indicating lights.

3.16.68 Green lights shall indicate breaker trip and shall be wired in series with a breaker auxiliary normally closed contact and control switch slip contacts, so the light will not be energized when the breaker is operated by the control switch.

3.16.69 Each electrically operated breaker shall be provided with a two-pole control power disconnecting and protective device in the closing circuit and another in the tripping circuit.

3.16.70 The disconnecting and protective device shall be either a molded-case circuit breaker or an enclosed fuse pullout.

3.16.71 Additional control devices shall consist of auxiliary relays and switches, control wiring and operating mechanism required for the particular breaker, an operation counter, a manually operated trip bar or lever, and provisions for manual closing.

3.16.72 Switchgear protective relays shall be of the draw out type in a semiflush mounting case, with test switches and devices incorporated in the relay unit.

3.16.73 Relays shall have hand reset indicators.

3.16.74 Exposed metal surfaces of relays shall have a dull black finish. Relays shall be wired so that the tripping current of the circuit breaker trip coil will be interrupted by means other than relay contacts.

3.16.75 Relays shall have low burden, solid-state, microprocessor based circuitry and shall meet or exceed ANSI/IEEE standards.

3.16.76 All settings shall be stored in non-volatile memory.

3.16.77 Relays shall be manufactured by Schweitzer (SEL), GE Power Management.

3.16.78 Microprocessor based metering and protection units shall be capable of monitoring and displaying values of phase amperes, phase voltage, watts, vars, power factor, frequency, watt-hours, and watt demand shall be provided where shown on Drawings.

3.16.79 The protection functions shall include voltage phase loss, current phase loss, phase voltage unbalance, phase voltage reversal, overvoltage, undervoltage, and time delay for overvoltage, undervoltage, and phase unbalance.

3.16.80 Microprocessor based multiphase and ground, instantaneous and time overcurrent relay (devices 50/51 and 50N/51N) shall have programmable trip parameters (time curve, time dial, timed pickup and instantaneous) accessible from the front of the unit.

3.16.81 Push buttons and a digital display shall be provided for manual programming.

3.16.82 The relay shall have eight groups of time overcurrent curves selectable from the relay memory.

3.16.83 Fault records for at least four faults shall be stored in memory for use in trouble-shooting and system analysis.

3.16.84 Timed overcurrent pickup range for the relay shall be 25 to 250 percent of CT secondary amperes adjustable in steps of 1 percent.

3.16.85 Instantaneous current pickup range shall be 1 to 18 times phase pickup adjustable in steps of 0.1.

3.16.86 Time dial range shall have at least 32 selections for each curve.

3.16.87 A lockout relay (device 86), shall be wired to trip the bus tie and the associated incoming feeder breakers.

3.16.88 Utility metering sections shall consist of a sheet steel enclosed stationary cubicle of sufficient width to provide the specified spacing and clearance required by Owner.

3.16.89 The sections shall include the following equipment:

3.16.89.1 Set of draw out carriage and mounting provisions for metering potential transformers with primary windings connected line-to-line, and associated primary fuses. The potential transformers and fuses will be provided by the contractor.

3.16.89.2 Set of mounting provisions for metering current transformers. The current transformers will be provided by the contractor.

3.16.89.3 Set of primary leads for potential transformers. These leads shall be connected to the main bus and shall be coiled during shipment.

3.16.89.4 Set of secondary leads for the potential transformers. These leads shall be connected to a meter test block and shall be coiled during shipment.

3.16.89.5 Set of secondary leads for current transformers. These leads shall be connected to a meter test block.

3.16.89.6 Blank inner panel, not less than 30 inches [760 mm] wide and 30 inches [760 mm] high, with at least 15 inches [380 mm] clearance between the face of the panel and the front door, for field mounting of metering equipment.

3.16.89.7 Hinged door on the draw out side of the switchgear, with provisions for a padlock and a nameplate.

3.16.90 The switchgear manufacturer shall provide suitable terminal blocks for secondary wire terminations and at least 25 percent spare terminal points.

3.16.91 Switchgear secondary wire shall be 14 AWG, Type SIS, rated 600 volts, 90°C, and furnished with wire markers at each termination.

3.16.92 Wires shall terminate on terminal blocks with ring type, crimp on wire lugs, with marker strips numbered to agree with detailed connection diagrams.

3.16.93 Control wiring shall terminate in approved, molded, screw type terminal blocks.

3.16.94 All secondary and control wiring within the high voltage compartment shall be completely shielded in a protective grounded metal covering and shall be stranded.

3.16.95 Taps to switchgear alarm, direct current, potential, or other busses which cross several panels shall have terminal block connections arranged so that the tap can be disconnected without opening the associated bus.

3.16.96 A separate direct current power system shall be provided for the control circuits and shall have ample capacity for the control functions indicated and shall be maintenance-free, lead-calcium alloy grid type assembly in polypropylene – heat sealed case, complete with inter-cell connectors and electrolyte.

3.16.97 The DC system shall provide 48 or 125 volts direct current for operation of the breaker breakers and any controls deemed necessary for the safe operation of the switchgear in accordance with all codes.

3.16.98 The battery system shall consist of individual cells with all interconnections, mounted on a rack suitable for Seismic Zone 4.

3.16.99 The battery rack shall be painted with two coats of acid-resistant paint before assembly.

3.16.100 Switchgear batteries shall be installed with a rated 3-way load-break transfer switch, for compliance testing. The transfer position shall remain open.

3.16.101 The switchgear manufacturer shall confirm adequacy of proposed battery system based on the actual equipment installed.

3.16.102 The battery system shall be sized in accordance with IEEE Standard 485. Calculations shall be based on an 8-hour outage of the battery charger system with all the breakers tripping at the end of the 8-hour period.

3.16.103 The battery system shall be provided with complete hardware and software, Battery Monitoring System capable of automatically monitoring and communicating with the SCADA/DAS and displaying, battery voltage at minimum.

3.16.104 The charger shall be static type silicon rectifier with no moving parts and shall be equipped with automatic regulation and provision for adjusting the charging rate.

3.16.105 Redundant battery chargers shall be installed.

3.16.106 The output voltage shall be maintained within 1 percent from no-load to charger rated output amperes with AC input voltage variation of plus or minus 10 percent and input frequency variation of plus or minus 5-Hz.

3.16.107 Output voltage shall be provided with a suitable filter to allow the charger to be used as a DC power supply without battery.

3.16.108 The charger shall have sufficient capacity in order to provide the following:

- Supply the steady state load and float charge the battery between 2.20/2.24 volts per cell.

- Supply periodically and equalizing charge at 2.33 volts per cell.
- Supply the load demand without being connected to batteries
- Recharge the batteries from a 20 percent discharge condition to 80 percent of capacity within 8 hours.

3.16.109 The charger shall be equipped with all hardware for data collection and communication to the central SCADA/DAS server. Data collection points included shall be (at a minimum):

- Temperature
- Charge Voltage
- Charge Current
- Charger alarms/state

3.16.110 Special tools, instruments, and accessories required for proper maintenance; and special devices for lifting or handling shall be furnished. The following accessories shall be supplied with the metal-clad switchgear.

- Set of special wrenches or tools required for installation, operation, or maintenance of the equipment.
- Test cabinet with test jumper for testing breakers out of the housing, for mounting on the wall, and wired for a power source separate from the switchgear control bus.
- Breaker lifting device and transfer truck for moving the circuit breaker into and out of the breaker housing.
- Set of extension rails.
- Maintenance closing lever for closing the circuit breakers.
- Manual operating lever for moving the breaker element into and out of the operating position.
- Set of test plugs suitable for testing the relays.

3.17 GFCI Receptacles

Ground fault circuit interrupting receptacles shall meet the following requirements:

- Duplex type.
- 125 volts.
- 20 amperes.
- Differential tripping at 5 milliamperes.
- NEMA configuration 5-20R.
- Interrupting rating of 1,000 amperes without damage.
- No. 12 AWG copper TW wire insulated pigtails.
- Feed-through configuration for downstream protection.
- Conform to NEMA WD 1.
- UL listed.

3.18 Light Switches

Light switches for standard lighting systems shall meet the following requirements:

- 120 or 277 volts.
- 20 amperes.
- Screw terminals.
- One-way or three-way switches, as required.
- Totally-enclosed.
- AC type.
- Quite tumbler
- Suitable for 100 percent tungsten filament or fluorescent lamp loads.
- Weatherproof, gasketed enclosure
- High conductivity copper.
- Brown or ivory operating handles.
- Conform to NEMA WD 1.
- UL listed.

3.19 Disconnect Switches

Disconnect switches shall meet the following requirements:

- Voltage rating shall meet or exceed the circuit maximum possible voltage.
- Continuous current rating as specified on the drawings (minimum 30 A)
- Number of poles required to obtain disconnect rating and wired in accordance with manufacture's requirements.
- NEMA 3X enclosure or better
- Copper bussing or connection cables when available.
- Visible blades for Utility disconnects, and visible or indicators are allowed in other locations.
- Positive, quick-make, quick-break mechanisms
- Operating handle whose position is easily recognizable and which can be locked in the OFF position with three padlocks.
- The ON and OFF positions shall be clearly marked.
- Door interlock that prevents the door from being opened while the operating handle is in the ON position.
- Conform to NEMA 3X, or 4/4X standard.
- UL listed.

3.20 Junction Boxes

Junction boxes shall meet the following requirements:

- Indoor boxes (larger than switch, receptacle, or fixture type) and gutters, shall be constructed of sheet steel, shall be galvanized after fabrication.

- Bolt-on junction box covers 3 feet square or larger, or heavier than 25 lbs, shall have rigid handles.
- Covers larger than 3 by 4 feet may be split.
- Junction boxes and covers shall be traffic rated if subject to vehicle traffic.
- Above-ground junction boxes shall be bordered by red-colored bollards for traffic protection.
- Boxes shall be sized in accordance with the minimum requirements of the National Electrical Code, including space for full size continuations of all underground conduits not originally continued. Where requirements are not explicitly stated within the National Electric Code, owner underground medium-voltage design standards shall be used.
- Conduit arrangement shall leave maximum space for future conduits.

3.21 Concrete Pull Boxes

Concrete pull boxes shall meet the following requirements:

- Pre-cast reinforced concrete body.
- Pre-cast reinforced cover.
- If subject to traffic, concrete pull boxes and covers shall be HS20 traffic rated.
- Extensions, as necessary.

3.22 Arc-Flash Hazard Design Requirements

3.22.1 Systems and equipment shall be designed and furnished to minimize worker exposure to potential arc flash hazards to the extent practical. At a minimum, the auxiliary electrical system shall meet the requirements of NFPA 70E and IEEE 1584.

3.22.2 At a minimum, switchgear shall be provided with remote breaker racking devices and, if provided, local breaker controls operable in the “connected” position shall be located outside the flash protection boundary. The use of high-speed relaying, “maintenance switch” schemes or other method to minimize available incident energy levels is acceptable. Alternatively, switchgear of Type 2 arc-resistant construction, in accordance with IEEE/ANSI C37.20.7, may be provided.

3.22.3 Contractor shall calculate incident energy levels for each bus in accordance with the method contained in IEEE 1584, Guide for Performing Arc-Flash Hazard Calculations. Results shall be summarized into a Flash Hazard Analysis report which shall be submitted to Owner for review and approval. At a minimum, the Flash Hazard Analysis report shall contain the following information:

- Tabulation of worst-case results for each bus, including:
- Voltage
- ID of protective device clearing the fault
- Total arcing current at arc fault

- Total fault clearing time
- Incident energy level
- Working distance
- Flash protection boundary
- Hazard/risk category

3.22.4 As a minimum requirement, labeling shall be provided per NFPA 70E.

3.23 Utility Scale Meteorological Stations

Contractor shall supply and install one stand-alone central meteorological monitoring station. The station shall have a data sampling rate of at least 4 seconds. The average of these samples shall be recorded at a minimum time interval of 15 minutes. The station shall have autonomous storage of a minimum of 15 days of data, and shall have continuous remote network access. The station will track global horizontal irradiance (GHI) and insolation over time, plane-of-array (POA) solar irradiance and insolation over time, ambient temperature, module temperature, and other parameters using the following instruments:

3.23.1 One primary POA pyranometer at the same tilt of the array placed adjacent to the secondary POA pyranometer in a location free of shade all year. Pyranometer shall be a Kipp & Zonen Model CMP 11 or Owner-approved industry equivalent. Heated and dried with heater/desiccant attachment if location has snow.

3.23.2 One secondary POA pyranometer at the same tilt of the array placed adjacent to the primary POA pyranometer in a location free of shade all year. Pyranometer shall be the same model as the primary POA pyranometer. Heated and dried with heater/desiccant attachment if location has snow.

3.23.3 Three or more module temperature sensors, with accuracy of +/- 1 degree Celsius or better. These sensors shall be of the platinum RTD variety attached to back of modules halfway down a row with a thermally conductive adhesive at the base, mid-level and top of a row. Temperature sensors shall be installed at the center of a cell and installation location on the modules shall be consistent amongst the site.

3.23.4 One ambient temperature sensor enclosed in a naturally aspirated radiation shield and installed at a height similar to the average height of the arrays. Accuracy of this device shall be +/- 1 degree Celsius or better.

3.23.5 One primary horizontal pyranometer placed adjacent to the secondary horizontal pyranometer in a location free of shade all year. Pyranometer shall be a Kipp & Zonen Model CMP 11 or Owner-approved industry equivalent. Heated and dried with heater/desiccant attachment if location has snow.

3.23.6 One Remote Terminal Unit / data logger to condition the instruments' signals, record data and communicate to the SCADA server or DAS provider.

3.23.7 One anemometer and one wind vane, installed at the average array height in a location that does not shade the array at any time of the year. Anemometer shall be accurate to within +/- 1 m/s or better, and wind vane to within +/- 5 deg or better.

3.23.8 One barometric pressure sensor, accurate to +/- 1mbar or better.

3.23.9 One relative humidity sensor, accurate to +/- 2 percent or better.

3.23.10 The records stored at the meteorological station shall be time stamped and collected at a sampling rate of at least 4 seconds. The records shall be automatically flushed every 15 days to avoid overflow. The data logger shall include its own power backup system that may or may not be connected to the SCADA UPS system, to allow for standalone operation for at least 5 days. The meteorological station shall include a communications port compatible with a standard laptop computer running Windows OS to be able to read and download data on site. The access to the data logger shall be password protected and Contractor shall provide the required software, cables and instruction manual to connect to the port and access the data.

3.24 Distributed Solar Measurement Stations

Contractor shall supply and install a distributed solar measurement station if the plant's rated capacity is greater than 10 MW, and another centrally-located station for each 10 MW block thereafter. The stations shall have a data sampling rate of at least 4 seconds. The average of these samples shall be recorded at a minimum time interval of 15 minute. These stations shall have continuous remote network access. The stations will track insolation and module temperature. The stations should including the following instruments for each station:

3.24.1 One primary POA pyranometer at the same tilt of the array. Pyranometer shall be a Kipp & Zonen Model CMP 11 or Owner-approved industry equivalent. Heated and dried with heater/desiccant attachment if location has snow.

3.24.2 One or more module temperature sensors, with accuracy of +/- 1 degree Celsius or better. This sensor should be attached to back of modules with a thermally conductive adhesive in the middle of a row at the mid-level of a row.

3.24.3 One ambient temperature sensor enclosed in a naturally aspirated radiation shield and installed at a height similar to the average height of the arrays. Accuracy of this device shall be +/- 1 degree Celsius or better. Required for first distributed station, optional thereafter.

3.24.4 One anemometer and one wind vane, installed at the average array height. Anemometer shall be accurate to within +/- 1 m/s or better, and wind vane to within +/- 5 deg or better. Required for first distributed station, optional thereafter.

3.24.5 One barometric pressure sensor, accurate to +/- 1mbar or better. Required for first distributed station, optional thereafter.

4. PROJECT SUBSTATION

4.1 General

4.1.1 Contractor will design, construct, test and commission a Project substation that is the primary interface between the System and the high voltage (HV) bulk electrical system (BES) of the incumbent utility ("Project Substation"). The Project Substation will be divided into two main sections.

- A HV voltage section that ties the Project Substation to the BES at the Point of Interconnection (POI), and
- A medium voltage (MV) that ties the Project Substation to the collection system of the System.

4.1.2 The HV section of the Project Substation will be configured based on the nature of the interconnection to the POI. In general, two basic types of interconnection are possible, dictating two different HV configurations. The types of interconnection contemplated for this specification are:

- A radial interconnection to an existing HV substation, owned and operated by the incumbent utility; and
- A line tap interconnection to an existing HV transmission line(s), owned and operated by the incumbent utility.

4.1.3 For a radial interconnection, the HV section configuration, as a minimum, shall consist of:

- A full tension deadend structure to support the gen-tie line from the Project Substation to the POI (see Section 8);
- 3 - 1Ø Line Arrestors;
- Combination metering class, HV, PT and CT devices (unless the utility chooses to meter at the POI);
- A motor operated, SCADA connected, Line Disconnect Switch;
- A high side generator step up (GSU) transformer SF6 circuit breaker, with 2 sets of 3Ø, gang operated, breaker isolation switches;
- A GSU transformer rated to support the maximum output of the System, equipped with both high and low side station class lightning arrestors;

- A 34.5 kV low side, SF6 circuit breaker, with 2 sets of 3Ø, gang operated, breaker isolation switches;
- A protective relaying scheme and attendant equipment appropriate to protect all HV, MV and transmission line equipment.

4.1.4 A communications and control system to facilitate both local and remote control of the Project Substation.

4.1.5 Interconnecting bus work, jumpers, terminations, cabling, conductors and hardware necessary to interconnect all equipment.

4.1.6 Support structures, insulators, foundations and hardware necessary to isolate all energized parts from earth.

4.1.7 A complete, interconnected grounding system sized to limit step and touch potentials during high voltage faults.

4.1.8 Note that all HV devices shall be rated commensurately with the nominal operating voltage of the POI.

4.1.9 It may be necessary under some circumstances to utilize two or more GSU transformers, based on the size of the proposed Project. Under such circumstances, the radial configuration will be expanded to accommodate the ultimate size of the Project.

4.1.10 For a Line Tap interconnection, the HV section configuration, as a minimum, shall consist of:

- At least two, full tension deadend structures to support the existing transmission lines;
- At least two sets of 3 - 1Ø Line Arrestors;
- At least two motor operated, SCADA connected, Line Disconnect Switches;
- At least three SF6 circuit breakers connected in a ring bus configuration, with 2 sets of 3Ø, gang operated, breaker isolation switches for each circuit breaker;
- Combination metering class, HV, PT and CT devices;
- A GSU transformer rated to support the maximum output of the System, equipped with both high and low side station class lightning arrestors;
- A 34.5 kV low side, SF6 circuit breaker, with 2 sets of 3Ø, gang operated, breaker isolation switches;

- A protective relaying scheme and attendant equipment appropriate to protect all HV, MV and transmission line equipment;
- A communications and control system to facilitate both local and remote control of the Project Substation;
- Interconnecting bus work, jumpers, terminations, conductors and hardware necessary to interconnect all equipment;
- Support structures, insulators, foundations and hardware necessary to isolate all energized parts from earth; and
- A complete, interconnected grounding system sized to limit step and touch potentials during high voltage faults.

4.1.11 Note that all HV devices shall be rated commensurately with the nominal operating voltage of the POI.

4.1.12 It may be necessary under some circumstances to utilize two or more GSU transformers, based on the size of the proposed Project. Under such circumstances, the ring bus configuration will be expanded to accommodate the ultimate size of the Project.

4.1.13 Contingent upon operating voltage of the HV section of the Project Substation, adequate space will be provided to expand the Project Substation to include up to six breaker positions.

4.1.14 For voltages of 345 kV and above, the Line Tap configuration will be modified to support a breaker and a half configuration.

4.1.15 The MV section shall be comprised of a set of parallel radial feeders to interconnect the collection system to the Project Substation. As a minimum, the MV section shall include;

- 34.5 kV SF6 circuit breakers, equipped with three phase, gang operated breaker isolation switches and a by-pass switch for each collection system feeder;
- 34.5 kV station class arrestors at the termination point of each collection system feeder;
- Interconnecting bus work, jumpers, terminations, conductors and hardware necessary to interconnect all equipment;
- Support structures, insulators, foundations and hardware necessary to isolate all energized parts from earth; and

- A complete, interconnected grounding system sized to limit step and touch potentials during high voltage faults.

4.1.16 Note that 34.5 kV Indoor Metal Clad Vacuum circuit breakers may be considered at the discretion of Owner.

4.1.17 The specific characteristics of the required systems and equipment are described in subsequent sections.

4.1.18 Phase to phase and phase to ground conductor clearance criteria will be in accordance with Owner Substation Design Standards. If required for equipment access, clearances will be increased.

4.1.19 Studies to be completed as part of Project Substation design will include, at a minimum, in both report and software-specific file format, where applicable:

- Short circuit analysis(EasyPower file)
- AC and DC system studies
- Bus ampacity study
- Direct stroke protection analysis for lightning
- Arc flash hazard analysis, EasyPower file
- Grounding study (CDEGS file)
- Relay coordination study
- Insulation coordination study
- Electro Magnetic Compatibility (EMC) Study

4.1.20 All design choices should be based upon results from the above mentioned studies. Contractor is responsible for obtaining all necessary data needed for the studies mentioned above.

4.1.21 The Project Substation shall minimize electrical losses as far as is economically advantageous. Contractor shall use the value defined in Section **Error! Reference source ot found.** in determining the value of any energy gained/lost in the optimization process.

4.1.22 Specific Owner requirements include:

- SEL GPS clock for relay time synch
- All intelligent electronic devices shall be provided with an Ethernet port and DNP 3.0 TCP/IP communication protocol if available or Modbus TCP/IP protocol if DNP is not an available option.
- Test switches on all trip, close and wetting voltage connections. Slip links or disconnecting terminal blocks on all other connections.
- Redundant relays, including lockouts
- Preference for open air breakers (SF6 insulated) on the 34.5 kV side of the substation

4.1.23 Non-insulated ring type terminal connectors shall be used on all control circuits as well as current and potential transformer circuits. All other terminal connectors for conductors smaller than 8 AWG shall be non-insulated ring type or preinsulated spade type. The indent mark form the crimp tool must be clearly visible.

4.2 Security

4.2.1 The Project Substation shall be enclosed by a steel expanded metal perimeter fence, constructed in accordance with the relevant Section(s) of the NESC and Owner Substation Design Standard.

4.2.2 The Project Substation shall have access control and monitoring provisions to ensure that Owner is able to capture, record and monitor all personnel, authorized or unauthorized that enter the site area. Contractor shall coordinate the preferred access control methodology with Owner along with additional provisions such as video monitoring and motion detection.

4.3 Substation Foundations

4.3.1 All foundations for substation support structures and equipment pads shall be designed in accordance with applicable building codes, the recommendations of the Geotechnical Engineer (including consideration for wind and seismic withstand capability), and Owners Substation Design Standards.

4.3.2 Blasting to facilitate the Substation foundation is not permitted without authorization from Owner.

4.3.3 Precast trenches will be free of water and firm throughout and during the life time of the substation.

4.3.4 Transformer pads for main power transformers shall be designed based on Owners Substation Design Standards. The containment pit should be sized accordingly based on oil capacity and estimated volume of rain water with quench rock surrounding the transformer capable of containing the complete volume of transformer oil plus an additional 6" of rain water Oil containment shall include active monitoring for oil detection along with EMS/SCADA alarm points.

4.4 Potential Transformers

4.4.1 All potential transformers used for metering shall be of the wire wound type with shell or core construction. They shall be at least 0.3 class outdoor units with NEMA pads. Contractor shall determine the rating, connection type and turns ratio based on applicable system studies and metering system designs.

4.4.2 Potential devices shall meet the requirements of IEEE C57.13-2008

4.4.3 Capacitive Coupled Voltage Transformers (CCVT) may be used for detection or verification of line or bus potential only

4.4.4 Capacitive Coupled Voltage Transformers shall be of the passive filter type.

4.4.5 Capacitive Coupled Voltage Transformers shall be of the passive filter type.

4.5 Current Transformers

4.5.1 All MV current transformers shall be connected through an indoor, panel mounted, current test switch, specifically a States Type FMS or ABB equivalent. Each current transformer neutral shall be brought into the control building for single point grounding within the associated protection relay panel.

4.5.2 Provisions shall be made to enable the secondary leads of all current transformers to be shorted via removable links.

4.5.3 Current transformers to be used for metering shall be of at least 0.3 accuracy class with a rated overload factor of 2.0.

4.5.4 Current transformers shall meet the requirements of IEEE C57.13-2008

4.6 Generation Step Up (GSU) transformers

4.6.1 The GSU transformer(s) shall be sufficiently sized to allow the full Project capacity to be delivered to the POI at the maximum of its ONAN / ONAF / ONAF rating.

4.6.2 The GSU shall be new, outdoor, non PCB mineral oil filled, 3Ø, 60Hz, Cooling class ONAN/ONAF/OFAF, 65°C Rise. The main step-up transformer(s) shall be in accordance with the requirements set forth in Table 3 herein, at a minimum.

Table 4-1. Substation Transformer Specifications

Description	Value
Quantity	1
Type	Mineral Oil filled, hermetically sealed, outdoor installation
Voltage ratio	TBD* / 34,500 / 13,200 Volts (HV / MV / TV)
Phases	3
Windings	3 (HV, MV, Tertiary)
Steady state temperature rise	65°C above ambient
Frequency	60 Hz
Impulse levels	TBD kV (HV), 200 kV (MV), 110 kV (Tertiary)
Vector group	Grounded wye
Cooling	ONAN / ONAF / ONAF
Tapping range	±5%, 2.5% steps, manual control DETC Contractor shall determine the need for an OLTC based on the results of applicable system studies. If an OLTC is specified it shall have a ±10% range with 32 0.625% taps. If employed the OLTC shall have provision for remote or local control.
Paint finish	ANSI 70 sky grey color
Guaranteed losses	TBD
Temperature gauge	Required
Pressure level indicator	Required
Pressure relief device	Required
Oil sampling valve	Required
Filling orifice	Required
Tank ground tag	Required
Oil level indicator	Required
Oil Gas Analyzer	Serveron TM
Bushing CTs	Minimum of two sets on both primary and secondary windings. Class to be determined by relaying scheme.
Grounding	Solid (primary and secondary windings) Buried delta (tertiary winding)

4.7 High Voltage Circuit Breakers

4.7.1 HV and MV circuit breakers shall be rated and selected based on the requirements of Owner Substation Design Standards.

4.7.2 Basic parameters for HV circuit breakers are SF6 insulated, three-pole, single throw, with dead–tank design and dual trip coils.

4.7.3 Basic parameters for MV circuit breakers are vacuum interrupters, three-pole, single throw, with dead –tank design.

4.7.4 All circuit breakers shall contain instrument transformers for metering and/or protective relaying applications.

4.8 Disconnect Switches

4.8.1 Disconnect switch placement and selection is based on Owner Substation Design Standards. Disconnect switches are typically placed in the following locations:

- HV Line Disconnect
- HV Breaker Disconnect
- MV Line Disconnect
- Breaker Disconnect
- MV Capacitor & Reactor Switch
- MV Grounding Transformer Switch
- Disconnect switches are typically manually operated, 3 gang, non-load break, outdoor rated and provide the ability to ground
- All disconnect switches shall be three phase, gang operated devices
- Where motor operators are employed, provisions for de-coupling the motor and manual operation shall be provided
- A DNP 3 compatible SCADA interface shall be provided with all motor controllers

4.9 Grounding Transformers

4.9.1 Grounding transformers shall be sized to effectively ground the portion of the collection system circuit that is disconnected from the main Project Substation 34.5-kV bus when the Project Substation feeder or collector breaker is open. However, at a minimum, grounding transformers shall be capable of carrying 300A per phase for 10-seconda and 900A in the neutral to ground circuit for 10 seconds.

4.9.2 Grounding transformers shall be 3-phase, and may be configured either Wye-Delta or Zig-Zag.

4.9.3 Grounding transformers installed inside or near the outside of the substation fence shall be installed with ground-fault detection provisions.

4.9.4 The cable design is not permitted to include splices. Whenever possible all conductors and cables should be a single continuous run.

4.9.5 No splices shall be made in conductors for instrument circuits or control circuits. Shields may be spliced where necessary to permit connection to the station ground. Power cable circuits may be spliced only by methods and at locations acceptable to Owner.

4.10 Surge Arrestors

4.10.1 All surge arresters should be sized according the results of the insulation coordination study.

4.10.2 HV & MV surge arrestors shall meet the requirements of ANSI C62.11 for Station Class installation in a 60-Hertz outdoor installation.

4.10.3 Equipment surge arrestors shall be station class, metal-oxide type surge arrestors for outdoor use and polymer housing. Surge arrestors shall be shatterproof.

4.11 Rigid Bus

4.11.1 Design of the bus systems shall be in accordance with IEEE 605 and Owner Substation Design Standard, at a minimum.

4.11.2 Loading and seismic performance shall be in accordance with the Project design and Project Site location. Such information is subject to verification by Contractor.

4.11.3 Station post insulators shall be of sufficient strength to support the rigid bus and shall be ANSI 70 gray color.

4.12 Connectors and Fittings

4.12.1 Connectors and fittings shall be of the proper size and design to assure permanent, secure, and low-resistance connections.

4.12.2 Connectors and fittings shall be in accordance with ANSI C119 & CC 1 along with requirements of Owner Substation Design Standard.

4.12.3 Rigid bus connections to transformers, breakers, CCVTs, or freestanding current transformers are prohibited.

4.13 Grounding System

4.13.1 The grounding system/grid shall be installed throughout the Project Substation.

4.13.2 The ground grid shall be designed in accordance with IEEE 80 and Owner Substation Design Standard.

4.13.3 The system shall be designed such that Project Substation personnel are protected from step and touch hazards that can occur as the substation grounding system provides the earth return electrode during power system phase to ground faults.

4.13.4 Contractor shall perform ground resistivity testing prior to final design to determine ground analysis parameters. The ground resistivity shall be measured with the methods given in IEEE 81.

4.13.5 Ground conductors shall be sized for fault duration of 0.5 seconds.

4.13.6 Equipment grounds shall conform to the following general guidelines:

- Grounds shall conform to the NESC.
- All equipment grounding connections shall be connected to the ground grid.

4.13.7 The ground grid shall extend at least three (3) feet outside the perimeter fence of the Project Substation and shall be bonded to the fence, according to Owner Substation Design Standards, and as required to meet acceptable levels of both touch and step potential and ground potential rise.

4.13.8 A minimum of six (6) inches of washed crushed aggregate shall cover the entire Project Substation footprint, including those areas reserved for future build-out and five (5) feet outside the Project Substation security fence, in order to help reduce touch and step potentials. A greater level of washed crushed aggregate shall be installed if necessary to meet the Requirements and satisfy the recommendations set forth in the geotechnical engineering report. The minimum resistivity shall be 3,000 ohm-meters. Crushed rock shall conform to ASTM C33, gradation 1.5 to No. 8 particles. Additional design criteria should be considered for vehicular access to the Project Substation.

4.14 Lightning Protection

4.14.1 Lightning protection shall be designed in accordance with IEEE 998, Owner Substation Design Standard, and the results of the lightning protection study.

4.15 Lighting

4.15.1 A lighting system shall be furnished for the Project Substation based on the requirements of Owner Substation Design Standards. The lighting system shall provide personnel with illumination for Project Substation operation and maintenance under normal conditions, and means of egress under emergency conditions.

4.15.2 Lighting levels shall meet, at a minimum, the requirements of the NESC, including Table 111-1 therein.

4.15.3 Outdoor lighting shall be LED type.

4.16 Equipment Labelling

4.16.1 All major equipment and devices shall be properly labeled with nameplates that meet Applicable Standards (including those for safety) and other Requirements.

4.16.2 Equipment labelling conventions shall follow Owner Substation Design Standards, as applicable.

4.17 Electrical Equipment Enclosures

4.17.1 Control cabinets, pull boxes, and junction boxes shall be in accordance with NEMA standards and type number and shall be suitable for the Project location conditions. Minimum design shall be:

- (1) Indoor: NEMA 1
- (2) Outdoor: NEMA 3R, stainless or aluminum.

4.17.2 All enclosures shall be provided with pad-locking provisions.

4.17.3 Junction boxes shall be located adjacent to roadways, and be surrounded by a minimum of four (4) bollards of a red color.

4.18 Battery System

4.18.1 All battery systems shall conform, at a minimum, to the Applicable Standards of IEEE, ANSI, and NEMA.

4.18.2 Batteries shall be provided with racks, connection devices, tools, instruction books, protection shield covers, rail protection system, and other standard items. They shall also include redundant fans for the required ventilation.

4.18.3 Contractor shall supply provide, at a minimum, one complete set of 125 VDC station batteries. For HV sections with a nominal operating voltage of 230 kV or higher, two redundant sets of station batteries will be provided.

- Contractor will provide one fully rated, self-cooled battery charger for each battery set provided, capable of recharging the batteries within eight hours while serving continuous load. The chargers will be served from the Project Substation AC system.

4.18.4 For the Project Substation, Contractor shall provide one (1) DC system, including, but not limited to, batteries, two (2) battery chargers, safety fused disconnect switch, a battery disconnecting means and panel boards.

- Fused disconnect switch shall be a 3-way make-before-break transfer switch between the battery cells and an open ‘alternate’ position, feeding the chargers

and DC load. DC 'transfer' position shall be left unconnected in the switch panel, reserved for future NERC testing.

4.19 Raceway

4.19.1 Raceway shall conform, at a minimum, to the recommendations included in IEEE 525 and Owner Substation Design Standard.

4.19.2 Individual raceway systems shall be established for the following services:

- (1) 600-volt control cable.
- (2) Special electrical noise-sensitive circuits.

4.20 Control and Protection

4.20.1 Contractor will design, procure, construct and test the control and protection system for the Substation. The system will include, but not be limited to, protective relays, indication meters, revenue meters, switches, instruments, devices, and wiring. Relay panels will be installed in the Substation control room.

4.20.2 Contractor will provide drawings sets, for review, comment, and approval by Owner consistent with requirements set forth in Section **Error! Reference source not found.** and nclusive of one-line drawings, three-line drawings, control panel arrangements, fabrication details, bill of materials, nameplate lists, DC control schematics, AC schematics, circuit schedules, auxiliary equipment schematics, wiring diagrams, index sheets, and legends.

4.21 Protective Relaying

4.21.1 Relaying will provide secure and selective isolation of equipment when necessary. Redundant primary and secondary schemes will be included for all high voltage equipment.

4.21.2 All relays will be wired to a central communication processor which will integrate all relaying.

4.21.3 Protection will be included for breakers, bus, transformers, HV & MV lines, capacitors, and inductors.

4.21.4 Protection specifications include:

- Transformers
  - (1) set of CTs, 1 high, 1 low – 2 x SEL-787E
  - (2) More than 2 sets of CTs – 2 x SEL-487E
- Bus

- (1) 15kV, or lower, switchgear – 1 x SEL-587Z
- (2) All other bus configurations:

  (a) 6 or fewer positions on ultimate build out – 2 x SEL-487B

  (b) 7 or more positions on ultimate build out – 2 x 3 x SEL-487B

– Feeder (15kV and below)

- (1) No remote source (radial circuit) – 2 x SEL-751A
- (2) Possible remote source (including bus ties) – 2 x SEL-751

– Collector circuits (34.5kV)

- (1) 2 x SEL-751

– Line – 2 x SEL-411L
– Owner has standard part numbers for each relay type; deviations from those part numbers need to be approved in advance.
– All relays shall communicate to Owner SCADA via DNP 3.0 over Ethernet.
– Redundancy

- (1) Redundant CTs and VT secondaries shall be used in all cases except:

  (a) 15kV and lower balance of plant circuits

  (b) SEL-587Z applications

  (c) Transformer neutral CTs when multiple CTs are not available

– DC Circuity should be fully independent between relays; sourced from separate battery systems.

- (1) Circuits associated with a single close coil may have a single DC circuit connected to each relay.

– Lockout Relays

- (1) Electroswitch per Owner design masters.
- (2) Two per zone

  (a) Fully redundant for tripping, common close block circuits.

  (b) Tripped by local protection as needed, tripped by adjacent zones for breaker failure.

– Test Switches

- (1) FT type test switches shall be provided for:

(a) Each protective relay shall have sufficient positions to accommodate the following circuits. Name plates shall be provided to identify the purpose of each test switch.

- Each AC circuit to the relay, one switch position per voltage circuit and two per current circuit.
- Positive and Negative side of relay power.
- Both sides of each output used to trip (breaker or lockout) or close.
    - Input wetting voltage.

(b) Each lockout relay shall have sufficient positions to accommodate each trip circuit.

- Wiring
    - (1) All schematics shall be per Owner design masters where such exist
    - (2) All wires provided with wire labels at each end per Owner design master
    - (3) All crimped lugs shall be non-insulated ring lugs.
    - (4) Any terminal on the Phoenix blocks on the SEL-7xx relays that requires more than one conductor shall utilize an appropriate crimped ferrule.
    - (5) All SIS wiring shall be appropriate for the Phoenix blocks on the SEL-7xx relays, 41 strand #14.
    - (6) All CT circuits from field to relay racks shall terminate on shorting terminal blocks. All other circuits shall terminate on slip link terminals.
    - (7) All cables provided with cable tags at each end per Owner design master
- Racks
    - (1) 36” rack design, one rack per zone of protection. Rack design masters will be provided.

4.22 Metering

4.22.1 The Plant shall be metered at the Point of Interconnection in accordance with Interconnection Agreement requirements. The meters shall be electronic meters approved by the TSP; and Contractor shall be responsible for obtaining meter approval.

4.22.2 Check meters

- In addition to the revenue metering equipment required by the Interconnection Agreement, redundant SEL-735 meters shall be provided to meter net plant output.
- Check meters shall have full power quality monitoring capability.
- At a minimum the metering equipment will meet the following specifications:

- (1) Current Transformers: +/- 0.3% @ B0.1 - 1.8 ohms, 10% - 100% rated current
- (2) Voltage Transformers: +/- 0.3% through B. ZZ @ 90% through 110% of nominal voltage

4.22.3 LV Supply

4.22.4 Contractor shall provide the most cost efficient design for the Substation LV power supplies incorporating the following requirements:

- Normal supply shall be a metered service from the local utility, if so required by local statues. Else, this service shall be the back-up source.
- Backup-supply shall be fed via MV through a local transformer at any time the MV system is energized;
- Normal and Stand-by supplies shall never be paralleled.

4.22.5 The backup supply may be obtained from the existing distribution network in the area, provided that reliability is demonstrated and that the supply is not sourced from the same substation/s that the HV supply is derived from.

4.23 EMS SCADA System

4.23.1 EMS SCADA system is to include RTU, HMI, SCADA Input/Output devices and an Ethernet network connecting intelligent electronic devices, designed and constructed according to owner design masters.

4.23.2 Contractor shall provide a complete EMS SCADA drawing set, including network block diagrams, schematics and wiring diagrams created according to owner design masters.

5. HIGH VOLTAGE TRANSMISSION LINE DESIGN AND EQUIPMENT REQUIREMENTS

5.1 General

5.1.1 The HV Transmission Line shall be designed, assembled, constructed and tested consistent with all Applicable Standards including:

- ANSI / IEEE C2 – National Electric Safety Code
- ASCE 48-11 - Design of Steel Transmission Pole Structures
- ASCE Manual No. 74 - Guidelines for Electrical Transmission Line Structural Loading, 2010, Third Edition
- IEC 60826 - Design criteria of overhead transmission lines
- IEEE-738 - Standard for Calculating the Current-Temperature Relationship of Bare Overhead Conductors

5.1.2 Furthermore the HV Transmission Line shall be designed, assembled, constructed and tested in accordance with local and international industry best practice and guidelines and achieve compliance with the requirements of:

- RUS Bulletin 1724E-200 – Design Manual for High Voltage Transmission lines
- IEEE P1863 - Guide for Overhead AC Transmission Line Design
- IEEE Std. 524, 1992 - IEEE Guide to the Installation of Overhead Transmission Line Conductors
- Project Approvals
- Owner Standards
- Any other relevant requirements of local, state and national authorities

5.2 Line Route and Access

5.2.1 The line route and pole locations shall be in accordance with the Project Approvals.

5.2.2 Transmission Pole Spotting Criteria:

- Minimize contact with environmentally sensitive areas, streams, forested areas, or other valuable natural habitats.
- Minimize contact with property parcels that have incompatible zoning or land use planning classifications.
- Minimize contact with areas where terrain or drainage would interfere with transmission line construction and maintenance.
- To the extent practical, if any existing structures require replacement, the structure should be replaced on a structure-for-structure basis. All new structures will be placed as close as possible (either ahead or back along the center-line) to the existing structures.
- The structures at line angle points (P.I.s) will be placed in the same location as the existing structures. Temporary structures will be used during construction to support

the existing circuit in order to remove the existing P.I. structure and replace with a new structure.

- Where the rights-of-way are sufficiently wide, new structures will be placed along side of the existing structures to facilitate a 10-hour return to service time of existing transmission lines during construction.
- Some structure locations may be shifted significantly for more optimal design or as dictated by environmental factors.

5.2.3 Perform any field surveys to acquire topography and other field data, as necessary, for transmission line design. Provide all electronic copies of the associated AISC survey files to Owner. Contractor shall be responsible for the staking of all proposed locations for core borings, Right of Way acquisition and any other associated engineering activity such as wetland delineation.

5.2.4 Perform subsurface utility analysis to address construction access and external loading limits for all foreign utility crossings.

5.2.5 Design solutions and obtain crossing approvals for all foreign utility crossings from other owner utilities (e.g. power lines, state or county roads, communications cables, railway lines, gas pipelines, etc.).

5.2.6 Review to determine whether any Federal Aviation Administration regulations apply, provide written notification to those agencies for their review and acceptance, incorporate any requirements in the design and note any specific construction details on the new drawing set. Aviation marker spheres shall be used as part of the construction requirements on all prominent crossings, such as limited access highways, river or major ravines. Any aviation marker lights that are required must have an automatic monitoring system installed with each light.

5.2.7 Acquire transmission line right-of-way covering the line from the collector substation to the POI.

5.2.8 Minimize disturbance areas, damage to cultivated crops or pastureland and avoid native vegetation sensitive areas as far as possible.

5.2.9 Drainage and erosion control shall meet the requirements of Clause **Error! Reference ource not found.**.

5.2.10 Reinstate and re-vegetate all disturbed areas.

5.3 Foundations for Poles or Towers

5.3.1 Pole or tower foundations shall be designed in accordance with the Applicable Standards, and meet requirements of the geotechnical report, as well as requirements for concrete in this specification.

5.3.2 All transmission line custom steel pole structures and any guy anchors shall be supported by drilled reinforced concrete caissons. The foundations shall be designed per current industry standards and the designer shall use Ensoft, inc's LPILE-CADD-foundation design computer program.

5.3.3 FAD Program inputs (pole loading, soil conditions data from core borings and Geo – Tech report output) and output results shall be provided to Owner. Contractor must perform a geotechnical and subsurface investigation at each foundation structure location that will include a boring to determine the soil parameters to be used in the design.

5.3.4 If shallow bedrock is encountered in the soil borings, the caisson foundations shall be designed to be embedded into solid rock a length equal to at least one caisson diameter.

5.3.5 The ultimate strength of overturning moment and uplift of the foundation shall not be less than 1.25 times the design factored load reactions of the structure. The ultimate strength of foundations subjected primarily to compression load shall be not less than 1.10 times the design factored load reaction of the structure. Overturning moment foundations designed by rotation or pier deflection performance criteria shall use factored structure reactions for determination of the foundation performance.

5.3.6 The minimum caisson diameter for each structure shall be the custom designed steel pole manufacturer's anchor bolt circle diameter including sufficient allowance to place the concrete while encompassing the anchor bolt cage (including template) and rebar with a minimum 6" of cover. However, the minimum desired shaft diameter shall be no less than 5.50 feet. The maximum shaft diameter is desired to be the minimum pier diameter plus 1.00 foot.

5.3.7 The pedestal height above ground line shall be designed with a minimum of 12 inches of reveal above final grade unless prior approval is given by Owner.

5.4 Design

5.4.1 Owner requires preparing the line design utilizing PLS-CADD. A copy of the final PLS--CADD design file shall be provided electronically to Owner.

5.4.2 All final drawings shall be approved and sealed by a Registered Professional Engineer certified within the state of proposed construction.

5.4.3 Contractor will stake and acquire a core boring and a geotechnical report for each structure site and perform a customized foundation design for each structure.

5.4.4 Contractor shall determine and specify all of the associated hardware that will be required for the OPGW installation along with splice locations determined. The hardware specified must meet the wire manufacturer's specifications and utilize their recommended supplier.

5.4.5 Contractor shall locate all proposed OPGW splice locations at easily accessible structures. Slice points shall also be located near other telecom utility crossings or a point nearest to a telecommunication provider's infrastructure if a crossing doesn't exist.

5.4.6 Contractor shall comply with the manufacturer's recommendations and Applicable Standards for all assemblies and installation of poles, conductors and other components.

5.4.7 All new Transmission structures should be direct embedded Round Wood Pole (Monopole, H-Frame style, or 3-Pole style) or Tapered Tubular Steel supported by a drilled reinforced concrete foundation. Tapered Tubular steel pole structures and associated attachments shall be weathering steel or galvanized steel.

5.4.8 Conductor installed should be one of Owner's standard conductors. Conductor shall be single bundled. The use of multiple bundled conductor shall be approved by Owner.

5.4.9 All insulators, style and manufacturer, shall be pre-approved by Owner. Non-Ceramic insulators are not permitted to be used for voltages above 138kV. For 230kV lines, insulators must be toughened glass (Seves) or Porcelain (NGK).

5.4.10 Contractor shall hire an Engineer to complete a grounding study, incorporating the mutual coupling and induced voltage of the phase conductors and shield wire(s). This study shall inform the grounding scheme for the Transmission Line and OPGW system to ensure public and worker safety. This study is required to be presented to the owner prior to completion of the Transmission Line Design.

5.5 Assembly and Installation

5.5.1 Contractor will provide off-loading and secure storage facilities and shall be held responsible for the proper protection and safekeeping of all material until the completion date. Contractor shall be held responsible for any loss or damage to material after delivery.

5.5.2 Contractor will verify and confirm the quantities of material supplied by vendors. Conductor used is to be optimized to obviate excessive waste. A nominal amount (dependent on the terrain - max. 5%) of phase and earth conductor will be allowed for sags and jumpers.

5.5.3 The applicable type of tower shall be erected on the completed foundation. In the case of self-supporting tower concrete foundations, towers shall not be erected until the concrete has had at least 14 days in which to cure, or test breaks have proved the Design strength of concrete has been achieved, whichever is later. In the case of guyed tower concrete foundations and/or anchors, towers shall not be erected until the concrete has had as least 21 days in which to cure, or test breaks have proved the Design strength of concrete has been achieved, whichever is later. Guyed steel structures are discouraged and require approval from Owner.

5.5.4 All design tolerances shall be documented and provided to Owner and achieved.

5.5.5 Substantial temporary conductor supports shall be used, or equally effective measures taken, to prevent encroachment of statutory clearances, or other clearance requirements stated in the permits, between the conductor being strung and other power or communication lines, roads or railways being crossed.

5.5.6 Suitable structures under each phase will be erected to protect all fences from conductor damage during stringing.

5.5.7 Temporary changes in poles, fixtures or conductors of lines being crossed will only be carried out if accepted by Owner. Contractor shall indicate any changes considered necessary and will co-ordinate any changes with the owner of the service.

5.5.8 Contractor will endeavor to arrange that all crossings be made with the crossed line de-energized. The time of line outages shall be kept to the absolute minimum. All preparatory work shall be done prior to the work permit coming into effect. Upon completion of the work, Contractor shall immediately notify the applicable utility that lines are clear and release the working permit.

5.5.9 All phase and earth conductors shall be tension strung. Stringing shall be done in daylight hours only.

5.5.10 The equipment and methods used for stringing the conductors shall be such that the conductors will not be damaged. Particular care shall be taken at all times to ensure that the conductors do not become kinked, twisted, bird-caged or abraded in any manner.

5.5.11 Contractor shall make suitable arrangements for temporary staying of towers, and anchoring of conductors when necessary. Conductors may not be anchored to any portion of any tower, except strain towers, and then only at the points designed for conductor attachment. Temporary anchoring to footings and guy anchors will not be permitted. Where temporary anchoring is required, suitable temporary anchors shall be provided. Installation and removal of temporary anchors will be Contractor's responsibility

5.5.12 All conductors shall be strung by the controlled-tension method by means of rubber faced, double bullwheel-type tension stringing equipment. This equipment must be so designed that there shall be no conduction of the heat generated by the braking action, to the bullwheels. There shall be appropriate mechanical braking on the reels to prevent loose conductor between the reels and the bullwheels, but sufficient tension to pull the conductor in between layers remaining on the reel. Brake controls shall be positive and fail-safe in order to minimize the danger of brake failure.

5.5.13 The tension shall be controlled individually on each conductor, and when the desired tension is obtained, the same constant tension shall be held so long as the brakes are left at this setting. Tensions, while pulling, must be sufficient to clear all obstacles safely without damage to the conductor. At no time shall the pulling tension exceed the tension shown on the sag charts.

5.5.14 Adequate protection shall be provided where there is danger of conductors being damaged by vehicles or other equipment and objects. Conductors shall not be left in contact with the ground, vegetation or any conducting or semi-conducting material. Wood lagging or similar material shall be used to protect the conductor when working at ground level.

5.5.15 Before stringing commences, Contractor will be required to compress sample phase and earth conductor mid span joints, as well as phase conductor dead/end assemblies on site using the matched and numbered dies and compressors intended to be used on the line during stringing. The length of conductor between any two fittings on the sample shall be not less than 100 times the overall diameter of the conductor. At an acceptable testing authority a tensile load of about 50% of the breaking load of the conductor shall be applied and the conductor shall be marked in such a way that movement relative to the fitting can easily be detected. Without any subsequent adjustment of the fitting, the load shall be steadily increased to 95% of the breaking load and then reduced to 90% of the breaking load and maintained for 1 min. There shall be no movement of the conductor relative to the fitting due to slip during this period of 1 minute and no failure of the fitting. The conductor shall then be loaded to failure, and shall again withstand a minimum load of 95% of the minimum breaking strength of the conductor for it to be deemed acceptable. If the sample fails this test, a further three (3) samples shall be tested and will all be required to pass the above. A copy of the test report shall be provided to Owner prior to stringing.

5.5.16 Records of temperature, sag and tension for each section regulated shall be kept by Contractor, and a copy supplied to Owner.

5.5.17 OPGW shall be installed for the dual purpose of providing a lightning shield for the conductors and fiber-optic communications. A minimum of 48 individual fibers shall be provided in the OPGW conductor.

5.5.18 All conductor shall be Sagged using the T-t Transit method and by installing a dyno at the far end of the deadend section. The Transit targets and dyno shall confirm adequate sag has been reached. Identical processes shall be followed when installing additional phases in the same deadend section.

5.5.19 Structures requiring guy wires will have fencing to protect them from wildlife and vehicles.

8.5.19 Fire preventative coating will be applied up to 8ft on structures if wooden products used.

5.6 Earthing

5.6.1 The earthing system shall clearly and demonstrably ensure the safety of personnel, the public and equipment under all normal and abnormal operating conditions and all fault conditions.

5.6.2 The earthing system shall ensure that there is no risk to personnel, the public or livestock of electric shock (e.g. transferred potential, step voltages and touch voltages).

5.6.3 Pole structures shall have a maximum footing resistance of 10Ω, unless a requirement for lower resistances is determined by the earthing study.

5.7 Comissioning

5.7.1 Contractor to provide owner with as-built LiDAR survey of complete Transmission Line. The Survey of existing facilities shall be commissioned and completed within 1 month of conductor installation.

5.7.2 Contractor to provide owner with IR survey of entire transmission line after the line has been energized and is delivering not less than 80% of anticipated nominal load.

8.7.3 Contractor to provide owner with Corona survey of the entire Transmission Line after the line has been energized and is delivering not less than 80% of anticipated nominal load.

6. PLANT COMMUNICATIONS NETWORK DESIGN AND EQUIPMENT REQUIREMENTS

The solar plant communications network shall connect to all inverters and Meteorological Stations on the Project Site and shall connect to the terminal points as specified in this document, including but not limited to the TSP communication network.

Contractor shall be responsible for achieving a fully functional communications link between the SCADA server(s), each of the inverters and the Meteorological Stations.

6.1 General

6.1.1 The communications network will connect to the terminal points as specified, be compliant with Applicable Standards, and meet any additional requirements of the TSP Interconnection Agreement.

6.1.2 Fiber optic cables shall be used for the communication network.

6.1.3 The communications network shall be suitable for the Project Site, including:

- Immunity from the effects of fault and lightning currents
- The expected ambient temperature range
- Geotechnical conditions
- Protection from pests and rodents

6.1.4 No joints in the fiber-optic cable are permitted.

- Prior to fiber-optic cable installation, all cable will be inspected and tested with optical domain reflectometer.

6.1.5 Communications network requirements

- Underground fiber optic cable shall be as follows:
  - Conduit EPDM SDR 11 minimum
  - 12 fiber for individual collector circuits
  - For rodent protection a combination of the following methods shall be used
    - Non-armored fiber-optic cable in Pest Duct
    - Non-armored fiber-optic cableinstalled in a minimum of 4” schedule 40 PVC or HDPE innerduct
    - Armored fiber optic cable
    - Any concreted encased duct bank or metallic conduit
    - Any owner approved substitution that achieves equal protection from rodent damage
  - Collapsed fiber-optic ring system layout design, installation and testing.
- The communication network will be designed for a minimum of one (1) GB bandwidth

- The fiber-optic cabling will be either 12 strand multimode or 12 strand single mode, as applicable and consistent with standard industry practice
- Fusion splicing will be used if required, and completed in above-ground pedestals.
- Splice vaults shall be composed of reinforced concrete or fiberglass and equivalent in size to 4'x4'x4' with interior racking to mount splice case off the bottom of vault. Vault shall have an open bottom with gravel base.
- Extra fiber-optic cabling (slack) will be included at each end of all cable runs consistent with standard industry practices
- The communication system will have a maximum attenuation of 0.35 dB/km at 1310 nm or 0.25 dB/km at 1550 nm and will include a minimum system margin of between four (4) and six (6) dB
- In the event fiber-optic cables are placed in trenches with wiring associated with other parts of the System, underground rated subduct that also provides the ability to eliminate or decrease damage due to wildlife infestation. will be used to protect and separate the cable

  – Redundancy

    - The communications network shall have redundancy, so that the failure of a single component or communications link in the Communications Network shall not result in the loss of communication to more than one Wind Turbine, Meteorological Station, Terminal Point or Interface.

    - Redundancy may be achieved by using ring topology for the fiber-optic network such that communications can be maintained to all Wind Turbines in the event of a break in one of the cores of the fiber-optic cable. Re-routing of data shall take place automatically and not require manual intervention.

7. SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA) OR DATA ACQUISITION SYSTEMS (DAS)

7.1 SCADA/DAS General Requirements

7.1.1 SCADA system or DAS shall meet the specifications described in the below sections and any other specifications required by Authorities Having Jurisdiction (AHJ) or the interconnecting Utility.

7.1.2 SCADA systems with servers and data historians hosted in data centers, as opposed to at project sites, will be considered. DAS with servers and historians hosted in data centers are required.

7.2 Networking

7.2.1 Contractor shall furnish all devices necessary to implement the communications networks design as specified herein. These devices shall be installed in system cabinets and may include, but not be limited to, communications Modules, modems, hubs, routers, switches, line drivers, receivers and transmitters, protocol converters, fiber-optic patch panels, fan out kits, media converters, signal conditioners, prefabricated cables, and cable adapters/ connectors.

7.2.2 The SCADA/DAS System shall support RS-232, RS-485, and RS-422 as required by monitored equipment.

7.2.3 The SCADA/DAS System shall support TCP/IP as required by monitored equipment.

7.3 Protocols

All devices shall support either Modbus or DNP3. All other protocols must be approved by Owner before use. Owner will only consider open protocols managed by an independent organization. Contractor shall provide a comprehensive list of all protocols which are supported by the system being proposed.

7.4 Access Types

Native access shall mean the user is equipped with a copy of the native SCADA/DAS software permitting the user (with authentication) to full access of the SCADA/DAS system.

7.5 Users

Users shall be organized into groups based on permission level. Permissions shall be assigned to groups, and alarm notifications shall be sent to groups. Group privileges shall be configurable.

7.6 Submittals

7.6.1 Contractor shall provide a list of documents and drawings Contractor intends to submit for Owner review during the course of the Project. This should include, but not be limited to the following: point lists, SCADA/DAS diagram, I/O connection drawings, network layout, sensor locations, sensor orientations, point addressing scheme, sample HMI (human-machine interface) screens, sample web interface screens (if different from HMI), performance ratio and other applicable calculations, grounding requirements, datasheets for all hardware and software.

7.6.2 Contractor shall provide a summary of optional components that Contractor recommends Owner consider for enhanced performance monitoring, including a statement regarding the benefits of purchasing such options.

7.7 Nameplates and Tagging

7.7.1 Nameplates shall be furnished and installed on the exterior of all major SCADA/DAS equipment, including all operator interface cabinets/consoles, control and electrical panels, and cabinets.

7.7.2 Equipment designation nameplates shall be furnished and installed on the front and back interior of all cabinets and panels. This provides for equipment designation with doors removed. Internal nameplates shall also be furnished and installed for all cabinet and panel internal components including, but not limited to, internal devices, Modules, and terminal blocks (identification scheme to be finalized during detailed design).

7.8 Security System Integration

The system shall have the capability to integrate with a security system to, at minimum, indicate whether any security alarms exist. Security alarms shall be accessible from the alarm screen and home screen.

7.9 Uninterruptible Power Supply

The uninterruptible power supply (UPS) system shall provide for up to 4 hours of backup power to the equipment.

7.10 Serial Cabling

Serial networks shall use only shielded cable and shall be selected based on the serial interface and maximum distance to monitored equipment.

7.11 Requirements for New DAS System

The DAS system shall be composed of a primary DAS gateway, remote server, web interface, and all necessary communications equipment and cabling to communicate with all monitored equipment. The DAS gateway shall be installed in the shade.

7.12 DAS Monitored Equipment

7.12.1 The DAS system will be responsible for communication, monitoring and data acquisition with the following equipment: combiner boxes (if they contain string monitoring equipment), inverters, meteorological stations, and revenue meters.

7.12.2 Contractor shall provide all hardware and drivers to communicate with Owner-furnished foreign devices, such as the Data Processing Gateway.

7.12.3 The communications medium shall be twisted shielded copper conductors for indoor locations and those areas not subjected to induced signal noise. For communications networks routed outdoors or in areas where induced signal noise is probable, fiber-optic cable shall be used.

7.12.4 Contractor shall furnish all devices necessary to implement the foreign device interfaces (FDI).

7.13 Requirements for New SCADA System

7.13.1 Standards

Work performed under these specifications shall be in accordance with the codes and standards referenced herein. 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 Owner's specifications. In case of conflict, the latter shall govern to the extent of such difference.

Table 6-1 SCADA Standards

Work Element / Component	Standard

Work Element / Component	Standard
Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange	EIA RS-232-D
Racks, Panels, and Associated Equipment	EIA RS-310-D
Electrical Characteristics of Balanced Voltage Digital Interface Circuits	EIA RS-422-A
Standard for Electrical Characteristics of Generators and Receivers for Use in Balanced Digital Multipoint Systems	EIA RS-485
Standard for SCADA and Automation Systems	IEEE C37.1
Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus	IEEE C37.90.1
Recommended Practice for Data Communications Between Remote Terminal Units and Intelligent Electronic Devices in a Substation	IEEE 1379
Standard Digital Interface for Programmable Instrumentation	IEEE 488.1
Standard Codes, Formats, Protocols, and Common Commands	IEEE 488.2
Guide for Installation of Electrical Equipment to Minimize Electrical Noise Inputs to Controllers from External Equipment	IEEE 518
Binary Logic Diagrams for Process Operations	ISA S5.2
Graphic Symbols for Process Displays	ISA S5.5
Environmental Conditions for Process Control Systems	ISA S71.02
Functional Diagramming of Instrument and Control Systems	Formerly SAMA PMC22.1
Information Technology-Open System Interconnection-Basic Reference Model	ISO OSI 7498-1
Enclosures for Electrical Equipment	NEMA 250
Enclosures for Industrial Controls and Systems	NEMA ICS6
National Electrical Code	NFPA 70
Cabinets and Boxes	UL 50
Industrial Control Equipment	UL 508

7.13.2 Scope

Scope of supply shall include furnishing a complete SCADA system as described in this specification.

7.13.3 SCADA Equipment

7.13.3.1 The SCADA system shall be composed of a primary SCADA server, backup SCADA server, web server, SCADA historian server, SCADA workstation, , and all necessary communications equipment and cabling to communicate with all monitored equipment.

7.13.3.2 All equipment shall be installed in cabinets, consoles, or panels furnished by Contractor, suitable for the operating environment. All SCADA equipment shall be installed in a 19 inch rack. All SCADA hardware shall have clearly marked indicator lights on their front panels. All SCADA equipment shall be protected by surge suppression equipment that complies with IEEE C37.90.1.SCADA Monitored Equipment.

7.13.3.3 The SCADA system will be responsible for communication, monitoring, data acquisition, and control (where required) with the following equipment: combiner boxes (if they contain string monitoring equipment), inverters, meteorological stations, revenue meters, protective relays, high voltage circuit breakers, and step-up transformers.

7.13.3.4 Contractor shall provide all hardware and drivers to communicate with Owner-furnished foreign devices, such as the Data Processing Gateway.

7.13.3.5 The communications medium shall be twisted shielded copper conductors for indoor locations and those areas not subjected to induced signal noise. For communications networks routed outdoors or in areas where induced signal noise is probable, fiber-optic cable shall be used.

7.13.3.6 Contractor shall furnish all devices necessary to implement the foreign device interfaces (FDI) noted herein. FDIs are defined as any device installed by or for the use of a third party. These devices shall be installed in system cabinets, and may include, but not be limited to the following: communications modules, modems, hubs, routers, switches, protocol converters, fiber-optic patch panels, media converters, signal conditioners, and prefabricated cables.

7.13.4 Spare Capacity

7.13.4.1 The SCADA system shall provide spare hardware capacity for up to 20 percent input/output (I/O) after full buildout without requiring

additional hardware or server licensing. The SCADA system servers shall provide spare capacity for up to 100 percent additional I/O after full buildout without requiring the SCADA server hardware or software to be upgraded. That is, an updated license may be required to accommodate additional I/O, but no other software upgrades or additions shall be required.

7.13.4.2 The SCADA rack shall provide for 12U of spare space after the full build-out.

7.13.5 SCADA Location

7.13.5.1 The SCADA hardware rack and direct interface shall be located in the System substation building, the System O&M building, or as agreed upon by Contractor and Owner.

7.13.5.2 The room in which the SCADA is located shall be environmentally controlled to a temperature range of 50 to 78° F, humidity range of 20 to 40 percent, and provide air filtration to meet the manufacturer's recommendations for the SCADA equipment and other sensitive electronic equipment.

7.14 SCADA Cyber Security

Contractor shall furnish and configure the following security features as part of the SCADA system to be compliant with meet NERC Critical Infrastructure Protection (CIP) and purchaser's internal standards.

7.14.1 Security Center

1. Contractor shall provide a security center to accompany the SCADA system.
2. Contractor will supply all necessary servers, one local view station, and any necessary networking devices to connect the Security center to the SCADA system
3. Each security appliance (with the exception of the vulnerability scanner) must reside on its own virtual machine operating in separate subnets, with strict access rules governing which communications are allowed into and out of the networks.
4. Security appliances:
    a. Patch Management:
        i. Contractor shall supply an on-site patch management server capable of deploying patches for all software, hardware, and integrated third-party applications within the SCADA system, security center, and all other sub systems
        ii. Vendor shall evaluate, test, and provide appropriate patches to all devices and software within the SCADA system, security center, and all other sub-systems

iii. Patches will be provided on a monthly basis
iv. The patch management server will compile a comprehensive, centralized view of the patch status of each computer through agent-based scans, which will be capable of being displayed on a graphical dashboard. This information will also be integrated into the SIEM.
v. Patch Management functions will operate in a virtualized environment, utilizing agents installed on SCADA system, security center, and other subsystem devices.

b. Malware prevention
   i. All Windows endpoints within the SCADA system, security center, and any other sub-system will have host-based whitelisting
   ii. Malware prevention will provide centralized configuration and control of malware prevention agents that reside on each client.
   iii. Malware prevention agents will restrict which executables can run on the client by creating a whitelist of programs that are allowed to run; anything not on that list will be permitted to run.
   iv. Malware detection will be reported to the SIEM, and standard reports must be capable of running on an automated schedule
   v. Malware prevention functions will operate in a virtualized environment, utilizing agents installed on SCADA system, security center, and other subsystem devices.

c. Backup and Restoration
   i. Contractor shall provide an on-site backup server to schedule and preform automatic backups
   ii. Contractor shall provide a Network attached Storage (NAS) to store backups
   iii. Contractor shall provide specific recovery instructions for all devices
   iv. All capable devices within the SCADA system, security center, and any other sub-system shall be backed up
   v. Other devices within the SCADA system, security center, and any other sub-system, such as networking devices, shall have their configurations, firmware, and any other applicable configuration files pulled automatically on a scheduled basis
   vi. All backup files shall be encrypted
   vii. Backup and restoration functions will operate in a virtualized environment, utilizing agents installed on SCADA system, security center, and other subsystem devices.

d. Anti-Virus
   i. The Vendor shall integrate approved anti-virus software for all Windows systems within the SCADA system, security center, and all other sub systems.
   ii. Vendor shall provide an on-site Anti-Virus management server to apply updates to end point software

iii. All Windows endpoints will have host-based anti-virus software running at all times
iv. Vendor shall provide updated anti-virus definitions on a weekly basis
v. The anti-virus software will automatically detect, repair, and quarantine any spyware, adware, viruses, and other malicious intruders
vi. The anti-virus software will be installed on a dedicated anti-virus management station and will be used to:
    1. Integrate client software
    2. Configure and manage SCADA clients
    3. Distribute anti-virus signatures
    4. Generate anti-virus status reports
vii. Client anti-virus software will continually monitor client's machine for known viruses, the client must be installed and configured such that it does not adversely affect the operation of the SCADA system or delay operator actions
viii. The anti-virus software will provide a standards set of reports that can be run on an automated schedule and will be incorporated into the SIEM. The reports that will be included with the anti-virus software will be, at a minimum:
    1. Viruses report
    2. Protection status report
    3. Protection coverage report
    4. License usage report
    5. Anti-virus software version report
    6. Users of infected computers report
    7. Most infected users report
    8. Anti-virus database usage report
    9. Incompatible applications report
    10. Errors report
ix. Anti-virus software must also have the ability to create custom reports
x. Anti-virus functions will operate in a virtualized environment, utilizing agents installed on SCADA system, security center, and other subsystem devices.

e. Vulnerability Scanner
    i. Vulnerability scanner will perform scheduled scans to identify missing patches, viruses, identify vulnerabilities, detect out-of-date anti-virus signatures, etc. so they are remediated before they can are exploited
    ii. The vulnerability scanner will be capable of running detailed configuration checks that enumerate ports, users, shares, groups, agents, and services. Scans will be users-scheduled to collect information that is integrated with the SIEM.
    iii. Vulnerability scanner can reside on the same device virtualized environment as another security appliance.
f. Security Incident and Event Manager (SIEM)

i. The SIEM will provide centralized collection and correlations mechanisms to monitor and report on the SCADA system security posture.
ii. The SIEM functions will consolidate and normalize all event logs generated by a variety of firewalls, NID devices, anti-virus products, anti-malware products, Netflow, vulnerability scanners, SCADA servers, etc.
iii. The SIEM shall simplify large amounts of disparate types of data in order to provide an indication that a security event may be happening.
iv. The SIEM shall be capable of running customizable reports on an automated schedule
v. Contractor must supply a NAS for all log storage
vi. The SIEM appliance shall be compatible with existing Owner centralized SIEM
vii. The SIEM device can be standalone or virtualized, but must be agreed upon by vendor and purchaser.

5. Security Center Computer requirements
    a. Server:
        i. General
            1. Each server shall be an independent Microsoft Windows based computer capable of stand-alone operation.
            2. Servers shall connect to SCADA system through an Ethernet NIC
            3. Rack mountable
            4. Servers shall be configured for redundancy complete functionality shall be available with the loss of any server
        ii. Operating System: Microsoft Windows Server 2012 R2 or as recommended by vendor
        iii. Storage
            1. Raid 5 with minimum of 5 drives
            2. Hard drives:
                a. 1 terabyte per virtual machine
                b. SATA Interface
            3. Hot-plug hard drives
        iv. Memory: Minimum 32 Gigabyte RAM per Virtual Machine
        v. CPU Cores: Minimum 4, Intel Xenon or greater, minimum speed 3.0 GHz
        vi. Network Interface: Minimum 5 NICs, 1Gbps
        vii. Power: hot pluggable redundant power supplies
        viii. Virtualization: Up to 4 Virtual Machines per physical host
        ix. Manufacturer: VMWare or Microsoft Hyper-V
        x. Manufacturer: Dell PowerEdge R730 or greater
    b. View Node:
        i. General

1. Each server shall be an independent Microsoft Windows based computer capable of stand-alone operation.
2. Servers shall connect to SCADA system through an Ethernet NIC
3. Rack mountable

ii. Operating System: Microsoft Windows 2010, 64 bit.
iii. Storage: 500 Gigabyte solid state drive
iv. Memory: Minimum 32 Gigabyte RAM
v. CPU Cores: Minimum 2, Intel Xenon or greater, minimum speed 3.0 GHz
vi. Network Interface: Minimum 1 NICs, 1Gbps
vii. Video Interface: Support up to 2 HDMI video outputs
viii. Monitors:
1. Quantity: 2 monitors per view Node minimum
2. Resolution: 1920 x 1080
3. 24 inch diagonal
ix. Manufacturer:
1. Dell Precision Rack 7000 Series or greater

c. Network Attached Storage (NAS)
i. General
1. NAS shall be connect to SCADA system through an Ethernet NIC
2. Rack mountable
ii. CPU architecture: 64 bit
iii. CPU Cores: Minimum 4, 3.0 GHz
iv. Memory: Minimum 4 Gigabyte RAM
v. Drive bays:
1. Minimum 12 drives
2. Hot-swappable
3. 1TB per drive
vi. Network Interface: Minimum 2 NIC, 1Gbps
vii. Power supply: Redundant failover
viii. Manufacturer: Synology

d. Networking Devices
i. Cisco iOS
ii. Netflow capable
iii. Rack mounted
iv. FirePOWER services (for firewalls)

7.14.2 Device Management

1. Networking Devices

a. All networking devices shall receive validated patches from the vendor via the patch management server
b. By default, all networking devices will be managed by Owner, with the option of dual management (Owner and vendor) as required
c. All networking devices shall have all un-used ports disabled
d. post-contract award, the vendor shall provide documentation on all network devices installed with security settings
e. All network devices provided by the contractor shall be capable of generating Netflow data
f. If critical devices, needed to operate SCADA system effectively, do not inherently generate Netflow data, the contractor shall provide Netflow generators to simulate Netflow.
g. Firewalls
    i. Firewalls will be implicit deny with exceptions
    ii. Firewalls will be designed with both ingress and egress rulesets
    iii. Post-contract award, vendor all provide information on all communications through the firewalls
    iv. Firewalls will be Cisco iOS based with FirePOWER services
    v. Firewalls provided must meet all VPN Requirements
h. Network Intrusion Detection (NID)
    i. All communications between different subnets or networks shall be monitored using Network Intrusion Detection System (NID)
    ii. All External access points shall be monitored at the Firewall level, capable of blocking unauthorized traffic
    iii. Contractor shall provide any additional NID appliances
    iv. NID devices shall be Sourcefire appliances
    v. All NID/NIP devices (including firewalls) must be capable of talking up to, and receiving updates from, a purchaser owned Sourcefire management server

2. End Devices
    a. Examples of end devices include, but are not limited to, servers, HMIs, RTUs, controllers, sensors, actuators, meters, and inverters
    b. Post-contract award the vendor shall provide documentation detailing all applications, utilities, system services, scripts, configuration files, databases, and all other system requirements for all end devices
    c. Vendor shall provide documentation of all services required and justification for why they are necessary
    d. Vendor will remove and/or disable all software components not required for operation prior to the FAT
    e. Vendor shall configure devices with least privilege file and account access and provide documentation of the configuration

f. Vendor shall disable (through software or physical disconnection) all unneeded communication ports and removable media drives. Vendor will provide documentation that this has been completed prior to the SAT
g. Vendor shall incorporate a patch management process for all devices (in accordance with patch management section)
h. Vendor shall incorporate host-based appliances for all endpoints required by the security center
i. Pre-contract award the vendor will provide information on the patch management process
j. Vendor shall verify that the additional of security features does not adversely affect connections, latency, response times, and throughout, including during the SAT
k. Vendor is responsible for providing hardware capable of performing its normal functions in addition to all required the security functions

7.14.3 Account Management

1. All default and guest accounts will be removed prior to the FAT
2. Vendor will supply a list of accounts which need to be active and which can be disabled. Purchaser will approve these accounts in writing
3. Contractor will supply a domain controller to manage all windows-based machines and accounts
4. Contractor will supply an Authentication, Authorization, and Accounting (AAA) server for authenticating VPNs and all networking accounts, and device accounts
5. Vendor will hand over management of domain controllers and AAA server post-SAT
6. All account activity, as well as failed login attempts, will be logged and sent to the SIEM
7. All accounts within the SCADA system, Security system, and DMZs will adhere to least privilege permission schemes
8. Pre-contract award, vendor shall provide a separation agreement to determine how vendor employees who have sensitive knowledge of purchaser's control system and who leave their position or have responsibilities changed will be prohibited from disclosing that knowledge, where disclosure could lead to a reduction in security
9. Vendor shall notify purchaser within 12 hours of a vendor employee, who has access to the SCADA system or any sub-system, quits or is terminated with cause
10. Vendor shall notify purchaser within 3 days when a vendor employee, who has access to the SCADA system or any sub-system, retires or changes position to where they no longer need access to the system
11. All accounts will be role based with restricted permissions
12. No local accounts shall be enabled within the SCADA system, where technically feasible

7.14.4 Network Design:

1. Vendor will provide a mechanism for alerting purchaser in the event of a vulnerability or exploit that affects the SCADA system within a pre-agreed upon time frame

2. Vendor shall disclose the existence and reasons for any identified backdoor codes
3. FTP, telnet, and HTTP shall be disabled on all SCADA devices and replaced with SFTP, SSH, and HTTPS or encrypted alternatives where needed
4. SSH, HTTPS, and RDP will be the only methods to remotely log into the site devices, authenticated by the AAA server, and may only originate from inside the SCADA system or
5. Network Segmentation
    a. In addition to all existing DMZs, the SCADA system shall be segmented in a logical manner, to be agreed upon by the vendor and purchaser.
    b. Vendor shall provide ACLs, port security address lists for all communications between subnets
    c. Vendor shall provide and document secure network architecture where higher security zones originate communications to less secure zones
    d. Vendor shall provide and document all communication paths between networks of different security zones
    e. Vendor shall provide a mechanism for isolating specific subnets if they are known to be causing harm to the SCADA system
6. Wireless Communications
    a. Wireless technologies such as microwave, cell, Bluetooth, Wi-Fi (802.11x), ZigBee, WirelessHART, or other wireless technologies shall not be used within the SCADA system or any sub-system
7. Management Tools
    a. Contractor shall provide management tools specific to the hardware and software included in the SCADA system, security system, test environment, or any other sub-system
    b. All tools will be licensed to incorporate all devices provided
    c. Any licensing must be transferable if any device is replace for any reason
    d. Additional licenses shall be available for purchases

7.14.5 Remote Access

1. All remote access traffic will be fully encrypted
2. All remote access will require 2 factor authentication
3. All access points including routable connections, serial links, or other communication methods will be documented and supplied by the vendor
4. All remote access will be managed by purchaser, in cooperation with vendor
5. No vendor (including SCADA vendor) shall have access to SCADA network or equipment remotely without owner authorization
6. Web Access
    a. Under no circumstances will the SCADA system have direct access to the internet
    b. All web (HTTP/HTTPS) access will be performed through a web-proxy

c. Vendor shall provide documentation of input sanitation for all web form inputs including, but not limited to, prevention of command injection, SQL injection, directory Traversal, RFI, XSS, and buffer overflow
d. Vendor shall provide an independent, third party assessment of all web-based interface software

7. VPN Access
    a. All remote access to the control system network must be performed through a VPN
    b. VPN terminal server shall be located in a DMZ
    c. VPN terminal server shall have monitoring software installed to record and forward pre-encrypted traffic to the NID device
    d. VPNs must utilize multifactor authentication (e.g., security token, known key, and/or certificate)
    e. VPN connections shall have communication logging, alarming, and monitoring to protect SCADA system from unauthorized modification or use
8. Dialup and dedicated phone lines
    a. Dial-up and dedicated phone lines will not be used within the SCADA network, security network, or any other sub-system

7.14.6 Physical Security

1. Contractor shall provide a lockable or locking enclosure for all control system components
    b. Core equipment, such as any backbone switches, SCADA servers, Remote access terminals, Firewalls, Routers, etc. must be locked, at minimum, by a non-reproducible keycard. Access to these cards and equipment must be logged, and this system must electronically record and timestamp who enters the room (e.g. AMAG)
    c. Remote equipment, such as remote switches, controllers, media converters, PLCs, RTUs, and other end devices must be secured, at a minimum, by a non-reproducible key or keycard. Access to these keys and equipment must be logged
2. Contractor shall verify and provide documentation that unauthorized logging devices are not installed (e.g. key loggers, cameras, and microphones)
3. All physical security networks must be separate from SCADA networks

7.14.7 Incident Response/Disaster Recovery

1. Pre-contract award vendor shall provide Incident Response and Disaster Recovery plans
2. Vendor must incorporate purchaser's specific IR/DR plans if there are any deficiencies

7.14.8 Test environment

1. Contractor shall provide equipment for a test environment to simulate standard operating conditions. The purpose of this system is not to completely reproduce the SCADA system, rather it should mimic key features of the system for testing purposes.

2. Contractor shall include all hardware necessary to generate this environment including, but not limited to, SCADA servers, HMIs, Firewalls, Routers, Switches, Controllers, Protocol Converters, etc.
3. Contractor shall include all software licenses and patches for all equipment in the test lab
4. This network must be capable of testing patches, backups, and preforming penetration tests
5. Test environment will be solely managed by purchaser

7.14.9 Awareness Training

1. Before any user is granted access to the SCADA system, they must undergo a purchaser approved security training
2. This training must be renewed on an annual basis for all personnel that interact with the SCADA system
3. Vendor may provide their own training; however purchaser must verify that this training meets purchaser's requirements
4. Vendor is responsible for insuring their personal complete cyber security training in the required time if they elect to train their own personnel
5. If vendor does not wish to have their own training, purchaser will provide training to vendor personal
6. All records of this training must be provided to purchaser before a vendor employee is granted access to the SCADA system

7.14.10 Acceptance Tests

1. Factory Acceptance Test (FAT)
    a. Vendor shall provide current configuration files for all devices
    b. Firewall rules, as well as all other access control mechanisms, will be enabled throughout the duration of the FAT
    c. Devices will have logging enabled and logs will be provided to owner at the end of the FAT
    d. All Firewall rules will be reviewed during the FAT
2. Site Acceptance Test (SAT)
    a. Vendor shall ensure all devices are patched to their most current level
    b. Vendor shall provide current configuration files for all devices
    c. Firewall rules, as well as all other access control mechanisms, will be enabled throughout the duration of the SAT
    d. Devices will have logging enabled and logs will be provided to owner at the end of the SAT
    e. All Firewall rules will be verified at the SAT
    f. Vulnerability scans must be performed on critical system components as part of the SAT
    g. Remote access and remote access restrictions must be tested as part of the SAT

h. Vendor will disable, remove, or modify all vendor-owned accounts or negotiate account ownership of these accounts as part of the SAT
i. The vendor will create a baseline of system communication and configurations at the time of the SAT to be provided to the purchaser.
j. Vendor shall document the results of any NID tuning signatures and adjusting thresholds to reduce false positives and minimize false negatives.

7.14.11 SCADA Data Highway Communications Network

The system communications networks shall include a redundant control processor to control processor data highway communications network (a backup SCADA server meets this requirement). The capability shall be provided for connection of future nodes to the data highway communications network, such as additional control and operator interface processors, monitors, programming devices, or FDIs to other systems. The data highway communications network shall be expandable to accept at least 100 percent future additional nodes. The system shall be designed so that new nodes can be added without shutting down the system or causing a loss of control, information display, or alarm information.

7.14.12 SCADA Operator Interface Communications Network

a. The system communications networks shall also include an operator interface communications network for data transfer from the data highway communications network to the operator and operator/engineer interface processors, monitors, keyboards, and printers.

b. All Ethernet based communication networks shall use Category 6 or better unshielded twisted pair (UTP) for cables run inside buildings and multimode, fiber-optic cable for cables run outside or between buildings. Twisted pair cable networks shall conform to 100BASE-TX or 1000BASE-T or newer requirements. Fiber-optic cable networks shall conform to ISO 8802.3 100BASE-FX or 1000BASE-SX or newer requirements. The network shall be designed for maximum speed through the use of Gigabit (or faster) components where possible.

c. Switch ports shall be capable of both 100 Mbps and Gigabit operation, full and half duplex. Switch ports shall be auto sensing so that the correct network bandwidth is applied to the connected equipment.

d. Maximum network segment lengths shall conform to the IEEE 802.3 standard requirements.

e. Ethernet networks shall use a port switched configuration with redundant network hardware, and shall minimize the use of non-switching hubs.

f. Switches shall be auto-sensing with remote management capability. All cabling required to perform remote management (setup) of the switches shall be provided by Contractor.

7.15 SCADA Hardware

7.15.1 SCADA Server

a. A primary SCADA server shall be provided. The primary SCADA server shall run the HMI. The primary SCADA server shall run the communications engine for communicating with all monitored equipment. The primary SCADA server shall be installed with a copy of each manufacturer's software for all monitored equipment (inverters, met station, relays, etc.)

b. The primary SCADA server shall be an industrial grade server with Microsoft Windows Server (version to be approved by Owner; Vista and Windows 7 are not acceptable), and at minimum, 4 GB RAM, removable media storage for backup, 100 Mbps NIC, 4 USB ports, 3 GHz dual core processor, 19 inch flat screen display with a minimum resolution of 1600 x 1200, and a RAID array with a minimum of 500 GB useable storage space.

c. The primary SCADA server shall meet the recommended system configuration of all SCADA software installed.

7.15.2 SCADA Server Backup

a. The backup SCADA server shall meet the same requirements as the primary SCADA server. The backup SCADA server shall automatically become the primary SCADA server if the primary SCADA server ceases to operate.

b. The backup SCADA server shall relinquish control of the network when the primary SCADA server resumes control, with bumpless transfer of communication.

7.16 SCADA Software

7.16.1 General

a. Colors shall be used consistently throughout all software (HMI screens, etc.) Red shall indicate energized, closed, live. Green shall indicate de-energized, open, tripped. Yellow shall indicate loss of communication with a device.

b. No SCADA software shall require a hardware key.

c. Software shall fully support redundant servers and networks, as described herein.

7.16.2 Lockout/Tagout (LOTO)

a. SCADA software shall include a LOTO facility that allows the operator to indicate that a device is being locked/tagged out and a description of the service being performed. Contractor shall provide device tagout logic and operator interface configuration for all equipment included in the scope of Contractor's programming services for control.

b. The SCADA server shall note the time the LOTO tag was entered in the software and the time that the device in question changed state. LOTO data shall be stored in the historian.

7.16.3 General Logs

The SCADA server shall provide facility to enter general log information with customizable categories and time stamp.

7.16.4 Editors/Tools

a. SCADA server shall include software tools to edit/build HMI screens, edit/build reports, edit alarm thresholds, edit user group memberships, edit group privileges, etc. Software tools provided shall include provision to edit/update the points list and device address/mapping.

b. Contractor shall provide a complete list of all software included as part of Contractor's proposed SCADA system for Owner's approval.

c. The HMI builder application shall be of the "drag-and-drop" type and not require programming knowledge to: add symbols to a screen, add conditional logic for color coding, change colors, line widths, line types, etc.

d. Each engineer/operator workstation in the SCADA system shall include a complete set of user-friendly interactive control and information display editors for generation and modification of the displays, macros, custom shapes, and custom colors. The editors shall be of the latest technology including a mouse driven GUI using windowing technology (i.e., drag/drop, cut/copy/paste, etc.) The interactive editors shall allow the user to build, inspect, or modify any display using any or all of the textual, geometric graphic, or symbolic features of the system. New displays shall be able to be created starting from a blank screen or by recalling existing displays, editing, and storing the new display under a new file name.

e. The SCADA system shall allow the user to create and store frequently used shapes and symbols representing plant and process equipment. These symbols shall be available for use in any process control display. The symbols shall have the capability to be located at any place on a display, to be rotated to any orientation, to be magnified or reduced, to be given any color, and to be dynamically linked to any system variable. The system shall include a library of Contractor's standard set of geometric symbols (similar to ISA S5.5 symbols) related to System equipment. The system shall provide the capability to save user defined groups of geometric graphic elements as macro symbols that can then be imported into other process control displays.

7.16.5 Process Logic

Provision shall be made to write simple control algorithms to control equipment and generation alarms based on the status or value of data points. Control algorithms shall be

prevented from energizing equipment when other upstream or downstream equipment is in an unacceptable state. Program logic and screen editing shall be in SAMA format.

7.16.6 Calculated Points

The SCADA server shall generate the calculated points listed on the points list. Calculated points shall be available for use on HMI screens, trending and reporting as if they were raw data points. Provision shall be made for the creation of additional calculated points.

7.16.7 Historian

a. Historian data shall be available to the trending and reporting screens of the HMI. Historian data shall include all points in the SCADA system. Provision shall be made for future expansion.

b. The historian shall support 5 years of full data access without requiring backup media to be used. Provision shall be made for regular backup to removable media. Communication shall be via open protocol.

c. The historian shall be OSI PI historian or Open Protocol Communication. An unlimited site license and two remote site access licenses shall be provided.

7.17 SCADA HMI Functional Requirements

The HMI screens shall meet, at a minimum, the following functional requirements.

7.17.1 Home Screen

a. The home screen shall be a graphical view of the entire System with device icons to represent field equipment and/or systems.

b. This view shall display the most important real-time information from each device (including inverters, revenue meter, meteorological stations, etc.) and shall use color-coded icons to denote status (e.g., inverters, relays and meters shall display power, current, and voltage.)

c. Clicking on a device shall open up a device screen (see below) to display additional details regarding each device and provide control functionality.

d. The home screen shall display a System layout that approximates the actual relative physical location of equipment with device labels that match design drawings and equipment labeling.

e. The home screen shall display a data table of key metrics, including kW, power factor, MWh, yield, irradiance and performance ratio for the current date, month to date, year to date, and lifetime.

f. The home screen shall display a short alarm list of all un-acknowledged alarms and any severe acknowledged alarms that have not been cleared.

7.17.2 Electrical One-Line Screen

The electrical one-line screen shall provide a simplified single-line diagram of the System, including all inverters and higher voltage equipment with key operational metrics. Equipment shall be appropriately color-coded to indicate device state. Equipment shall be represented by appropriate electrical symbols. Clicking on a device shall access the device screen for that device.

7.17.3 Device Screens

Selecting a device from either the home screen or electrical one-line screen shall produce a device screen displaying (or making available) all data points associated with that device. Device screens shall provide a facility for control of the device (reference point list for typical control devices.)

7.17.4 Alarm Screen

a. The alarm screen shall display all alarms. Alarms shall be sortable by acknowledgment status (acknowledged or not acknowledged), alarm status (still in alarm or cleared), alarm code, and device ID.

b. Alarms shall use the date/time stamp of the alarm from the device (where supported).

c. Alarms shall be configurable such that any data point can have upper and lower thresholds set to trigger an alarm. Alarms shall also be configurable such that any data point can have a threshold set over time to trigger an alarm. The SCADA system shall also include an audible alarm that shall have adjustable volume control. The audible alarm shall be user configurable for different tones or patterns to distinguish between a minimum of four alarm priority levels. The system shall use global alarm acknowledgment, allowing a single acknowledgment from any workstation, whether designated as the alarm workstation or not, to acknowledge that alarm on all workstations and to silence the audible alarm.

7.17.5 Trending Screen

a. Graphical and tabular representation of data shall be supported. The graphical view shall support two vertical axes and shall support trending of up to 12 variables.

b. The trending screen shall allow for a user-selectable time scale and shall have built in support for selecting common date ranges (today, yesterday to today, week to date, last 7 days, last 30 days, last 365 days, month to date, year to date, lifetime.)

c. Selecting a point in the graph shall display the raw data for that point.

d. The trending screen shall allow a customized chart/table to be saved as a report for use by the reporting engine (refer to reporting screen below) or for future use in other applications.

e. The SCADA system shall allow any system variable to be trended and shall allow points from short-term and long-term storage to be trended. The trend display period between points on trends using data from short-term and long-term data storage shall be the same as the storage frequency selected for those points.

7.17.6 Reporting Screen

a. A reporting engine shall be provided allowing for reports to be generated from any data point. Contractor shall indicate if this engine is part of the SCADA package, the historian, or a separate package (like Crystal Reports).

b. The reporting screen shall allow for simple mathematical operations and display of results on reports (e.g., sum, average, minimum, maximum.)

c. Reports shall be exportable in CSV format and Adobe PDF format.

d. Reports shall be configurable to run automatically based on thresholds being reached or regularly scheduled.

e. Reports shall be configurable to automatically email the report to specific groups.

7.18 Remote Access

7.18.1 Full Access

Remote access shall be provided utilizing Microsoft Terminal Services or equivalent for remote access of the SCADA server, SCADA backup server, SCADA Web server, SCADA historian and SCADA workstation. The system shall support up to three concurrent remote users in addition to a local user.

7.18.2 Web-Based Access

a. Contractor shall provide the hardware and software necessary to allow remote access of near real-time process information by any Intranet or Internet web browser on any connected personal computer (PC). There shall be no software-based limit on the number of concurrent connections. Web access shall be separated from the SCADA servers by a firewall.

b. Remote access shall provide for functionally equivalent read-only access as if user was operating the SCADA server or SCADA workstation directly. The interface shall provide the ability to convert HMI graphics to web-based objects to allow graphics access from standard web browsers. The interface shall be dynamic and shall not display data older than 5 minutes.

7.18.3 DNP Slave

a. The SCADA server shall include DNP slave protocol for communication with a higher, supervisory system. The configuration shall include provision for setting the DNP address for the System and mapping any data points required.

b. The DNP slave shall provide for control access, support DNP report by exception, and shall include the ability to be polled by two separate DNP masters.

7.18.4 Vendor Access

No vendor (including the SCADA system vendor) shall have access to the SCADA network or equipment remotely without Owner authorization.

7.19 Optional Future Requirements SCADA

The SCADA supplier shall comply with all telemetry requirements set forth by the utility, system operator or balancing authority.

7.20 Data acquisition

7.20.1 All points necessary to monitor and operate the System shall be listed on the points list and shall be collected and accessible through the SCADA server and HMI.

7.20.2 All points shall be assigned a uniquely identifiable number such that they are available programmatically for alarming, trending, reporting, and screen building.

7.20.3 Refer to the sample SCADA points list (I/O list) included in Appendix I as an example of the points list format and minimum information required.

7.20.4 Contractor shall add I/O card and termination information to the database. In addition to providing information on active I/O, Contractor shall populate the database with the hardware information for all available spare points on all cards.

7.21 Control

7.21.1 All control commands shall require a two-step (select before operate) process. Additionally, the user must acknowledge and follow the control requirements (if applicable) by the interconnecting authority.

7.21.2 Users shall have read-only access to the following items:

7.21.3 Web access with near real-time updates at a frequency of no less than 15 minutes or at rate prescribed by the TSO.

7.21.4 Remote access through a web-based interface that provides access to the HMI screens, including access to the point database information and live and historical trend data.

7.21.5 Project's TSO revenue meter and all Project meter data at the Project Site.

7.21.6 Real time access to the Project's Scheduling and Logging for the TSO client application.

7.22 Utility and Grid Operator Connectivity Requirements with SCADA/DAS

Contactor shall comply with all requirements of the Utility, Independent System Operator (ISO) or other agencies as required.

8. TELECOMMUNICATIONS FACILITIES

8.1 SUMMARY:

A. This Section summarizes the communications systems Contractor shall provide as part of its proposal. The proposal shall address three aspects of the telecommunications design.
   1. Intra-site Communications - the Network shall primarily be an Ethernet Fiber network to support intra-site data and voice communications needs.
   2. Substation Interconnect - Contractor shall incorporate plans for the communications needs required to interconnect the facility to the bulk electric power system. This may include transfer trip and any of special or remedial protection schemes needed for the interconnection of the facility to the bulk electric power system. This design shall meet any requirements from the interconnecting utility, the Public Utility Commission, and/or the Independent System Operator for SCADA or Metering.
   3. PGE Connectivity - to support remote monitoring and operation of the facility. This will include one or more data links back to PGE operations center. This shall include connectivity for both the Primary SCADA link as well as the plant operational data link serving plant operations such as sending operational and maintenance data to a historian, allowing remote access and control, and voice communications to the facility.

8.2 TELECOMUNICATIONS APPROACH

Contractor shall provide a bid that both meets these specifications and allocates a budget for the design, procurement, and construction of these telecommunications facilities. The site network and the interconnection requirements should be known and the design and costs of these facilities should be accounted for and well understood. The communications link to Owner will depend greatly on the location, size, and type of facility proposed, and therefore Contractor shall propose a solution that meets these functional specifications. During negotiations this aspect of the design may be revised based on site specific conditions. An allowance for each of these three sections (Intra-site Communications, Substation Interconnect, and Owner Connectivity) shall be provided. The proposal price will not be revised if the ultimate solution remains within these allowances.

8.3 TELECOMUNCATIONS FACILITES

A. The following shall be provided both during and after construction:
   1. Communications during construction: Contractor shall provide a communications network to be used during construction, and specifically communications services to

the on-site trailers used during construction. A minimum of 5 Mbps Ethernet link shall be provided to each PGE trailer, along with (2) phone lines per trailer, which may be either VOIP or POTS. The Ethernet link shall only be dedicated to PGE and no other users. Contractor shall further provide any communications circuits needed for their own use. In addition each trailer shall be equipped with one 7' tall 19" wide communications rack and 20 A of AC power for PGE IT to install routers/switches used to distribute data connections.

2. Intra-Site Network: Contractor shall provide a data network that extends from a central substation or maintenance office to all equipment enclosures throughout the facility that house microcontroller equipment.
    a. This network shall be constructed such that it supports the following applications:
        (1) Shall support the Real-time control for the operation of the plant.
        (2) Shall support remote monitoring for Owner to gather operational data from microprocessor-controlled equipment.
        (3) Shall support monitoring of weather information.
        (4) Shall allow Owner to remotely access remotely configurable equipment to make settings changes and firmware upgrades.
        (5) Shall support the use of Voice at each enclosure, desk, conference room, or security control point.
        (6) Shall support the use of Video where required for security and operations of the plant.
        (7) Shall include Wireless Access Points in Office locations
    b. The network shall be capable of meeting the following specifications:
        (1) Use IP/Ethernet communications over a fiber and copper network.
            (a) At least 60 Strands of single mode (SM) fiber shall be installed between all buildings as part of the project. Fiber shall be configured in a logical ring and where possible into a diverse optical ring.
            (b) Category 6 copper shall be used for all connections between switches and equipment within a building.
        (2) Use gigabit Ethernet connections
        (3) Use VLANS for segmentation of traffic
        (4) Use Quality of Service to Prioritize traffic flows
        (5) Use Rapid Spanning Tree or other advanced ring convergence protocols.
        (6) Support POE where phones or wireless access points are installed.
        (7) Use managed equipment that support the following:
            (a) Centralized authentication via RADIUS or TACACS
            (b) Centralized logging via Syslog
        (8) Use hardened network equipment rated for the environment in which it will be installed.
3. Interconnection to Bulk Electric Power System:
    a. Build any fiber, microwave, or leased facilities needed in order to tie facility into bulk electric power system.
    b. Follow Western Electricity Coordinating Council (WECC) teleprotection standards.
    c. Meet utility interconnection standards.
4. PGE Communications Circuits :
    a. Contractor shall provide the following communication circuits, each with the respective parameters given. These communications circuits can be delivered over the one or more aggregate leased circuits if possible. These circuits may make use of a private data network or a leased facility from a common carrier. Contractor's proposal shall include the capital cost for construction, as well as the estimated monthly recurring cost if applicable. PGE shall not be responsible for any communication links required by manufacturers, such as for remote access by the turbine or generator manufacturer. Contractor shall make use of Owner equipment listed below in Section 7.04-K – Telecommunications Equipment, where such equipment is required:

Circuit Name	LOC A	LOC Z	Type	Capacity	Latency	Avail.	Circuit Description
O&M POTS LINE	O&M	PGE WHQ	FXS	64 kbps	100 msec	99.99%	PHONE LINE
O&M CORPORATE NETWORK	O&M	PGE WHQ	ETH	20 Mbps	100 msec	99.99%	CORPORATE NETWORK SERVICE
O&M SECURITY ETHERNET	O&M	PGE WHQ	ETH	1.5 Mbps	0.5 sec	99.99%	CORP SECURITY LAN
SUB SECURITY ETHERNET	SUBSTATION	O&M	ETH	1.5 Mbps	0.5 sec	99.99%	CORP SECURITY LAN
SUB REMOTE ACCESS LAN	SUBSTATION	PGE WHQ	ETH	1.5 Mbps	0.5 sec	99.99%	REMOTE ACCESS FOR PROTECTION & AUTOMATION GROUP
SUB COMM TECH LAN	SUBSTATION	PGE WHQ	ETH	1.5 Mbps	0.5 sec	99.99%	REMOTE ACCESS FOR COMM TECHS
SUB SCADA	SUBSTATION	PGE WHQ	RS-232	64 kbps	1 sec	99.99%	SERIAL DNP 3.0 SCADA
SUB AGC SCADA	SUBSTATION	PGE WHQ	RS-232	64 kbps	1 sec	99.99%	SERIAL DNP 3.0 AUTOMATIC GENERATION CONTROL
SUB PHONE	SUBSTATION	PGE WHQ	VoIP	64 kbps	100 msec	99.99%	PHONE LINE FOR CONTROL HOUSE
SUB ACCESS CONTROL POTS	SUBSTATION	PGE WHQ	FXS	64 kbps	100 msec	99.99%	PHONE LINE FOR SECURITY ACCESS CONTROL
SUB SECURITY POTS	SUBSTATION	PGE WHQ	FXS	64 kbps	100 msec	99.99%	PHONE LINE FOR SECURITY
INTERCONNECT METER POTS	SUBSTATION	PGE WHQ	FXS	64 kbps	100 msec	99.99%	PHONE LINE FOR INTERCONNECTING UTILITY METER
INTERCONNECT PHONE POTS	SUBSTATION	PGE WHQ	FXS	64 kbps	100 msec	99.99%	PHONE LINE FOR INTERCONNECTING UTILITY PHONE

8.4 TELECOMUNCATIONS EQUIPMENT & INSTALLATION

A. In each major facility provide space for (4) adjacent Communications racks. For the Plant and Switchyard/Substation facilities, locate the Communications racks in the same room or

adjacent to the relay equipment racks. For the O&M Building or Administration Building, in addition to the Communications racks, provide (4) racks for IT Operations and (2) racks for Corporate Security Operations. Locate the Communications racks in the same room or adjacent to racks dedicated for IT Operations and Corporate Security. Each room to include 4'x8' fire-rate plywood backboard (white).

B. In the O&M or Administration Building, provide a Communications room of at least 240 sq. ft., with dimensions of 12' x 20'. For the Switchyard/Substation, the Control House shall be of adequate size to accommodate the telecommunications equipment, -48 VDC charger, and -48 VDC battery, as well as any additional equipment required in preceding or proceeding sections.
C. Provide a -48VDC power system capable of supplying the load with an 8 hour reserve time at each major facility.
D. Provide a SATRAD-G2 satellite phone system with exterior antenna, rack mount equipment, and a dedicated desk phone (PSTN Interface).
E. Communications equipment shall be grounded per Motorola R56 standards in O&M and Administration Buildings. Grounding in the Switchyard/Substation shall follow standard industry practices, and single point grounding methodology.
F. Installation of fiber optic cable shall meet TIA-568C or later, in addition to any other relevant industry standards. Intra-site fiber optic cable shall be installed in innerduct, within appropriate PVC conduit, cable trench or ducting.
G. OPGW fiber optic cable shall be installed in the shield wire position for any new transmission line installations.
H. Contractor shall provide diagrams or drawings matching existing PGE documentation standards for all building/room plans, cable routing, equipment racks, equipment wiring, and circuit schematic diagrams for all installed telecommunication facilities.
I. All equipment and systems shall be tested to ensure desired performance, and the results shall be submitted to Owner in writing. Communications systems shall not be considered approved for operation until the testing results are reviewed and approved by Owner or a designated Owner's representative.
J. All installed cabling shall be labeled to allow Owner or an independent third party to locate and document individual cables at each termination point.
K. Equipment specified for this project shall be of the same manufacturer and model as Owner uses in their existing communications systems:
    1. Dual-post Rack – Chatsworth "Clear", 19" x 84"
    2. Ethernet Switch – Cisco
    3. VoIP Phone - Cisco
    4. Wireless Access Point – Cisco
    5. SONET Fiber Node – Fujitsu 4100 ES shelf and support cards
    6. T1 Multiplexer – RAD MP4100 shelf and support cards
    7. DSX-1 Cross-connect panel – Telect 28-port; 010-0128-0101
    8. Fiber Patch Panel – Clearfield FxDS, with SC/UPC Connectors
    9. ADSS Fiber Cable – OFS AT-3BE17NT-060-CMEA (60-CNT)
    10. OPGW Fiber Cable – AFL DNO-8234 (48-CNT)
    11. -48 VDC Fuse Panel – Telect GMT Dual Feed 20/20-position
    12. -48 VDC Charger Panel – Valere; CK4D-ANL-VC shelf, min 24 hours battery recharging capability while under load
    13. -48 VDC Battery (Plant or Switchyard/Substation) – C&D (flooded), min 8 hours carry time
    14. -48 VDC Battery (O&M or Admin Building) – C&D (flooded) or East Penn Deka Unigy II (VRLA) with one-piece base and interlocking cells, min 8 hours carry time

9. CIVIL/STRUCTURAL DESIGN AND EQUIPMENT REQUIREMENTS

9.1 Site Development and Earthwork

9.1.1 For ground-mounted system, environmentally and culturally sensitive areas shall be identified and protected during construction. Contractor shall comply with permits and instructions from the governing AHJs with respect to the required environmental and archaeological surveys. Contractor shall coordinate the grading activities with the onsite certified specialist(s) on a daily basis or as required by the local authority.

9.1.2 All earthwork shall be per the site's Geotechnical Engineering Report's recommendations. A 3rd party materials testing program will be implemented in parallel with earthwork and structural operations.

9.1.3 All grading shall be per an agreed upon vertical tolerance prior to commencement of construction. An As-Built surveying verification program shall be coordinated and approved prior to construction. Clearing and Grubbing

9.1.4 All site preparation shall be per the Geotechnical Engineering Report recommendations, as required for installation of the specific site improvements within the construction drawings.

9.2 Disposal of Unusable Soils

Excavated materials suitable for fills per the Geotechnical Engineer's recommendations shall be spread uniformly across the Project Site. These materials shall be graded and compacted so as to not interfere with proper drainage from the Project Site. Unused materials shall be disposed of away from the Project Site unless otherwise approved by the Customer.

9.3 Proof Rolling

Following stripping and rough grading, exposed surfaces are to be proof-rolled under observation by the Geotechnical Engineer of record to detect soft spots and assess sub-grade suitability for the proposed improvements.

9.4 Erosion Control

9.4.1 Temporary facilities shall be provided for control of wind and water erosion and turbid runoff during earthwork and land disturbance operations and from graded areas until they are stabilized. Temporary facilities shall be acceptable to the proper AHJ. Contractor shall be responsible for obtaining any necessary erosion control and dust control Permits.

9.4.2 Permanent erosion control facilities for surface runoff as required for ditches and slopes, such as riprap, headwalls, grass, rock surfacing, and slope pavement shall be provided and be acceptable to the proper AHJ.

9.5 Dust Control

Contractor shall be responsible for dust control during construction operations and shall adhere to all applicable codes and requirements of the governing AHJ(s). Water shall be used to control dust as required. Dust palliatives if allowed by applicable law and applicable permits shall be used to control dust on all unpaved roads and any other non-vegetated areas as necessary to comply with the project's dust control plan or environmental permits.

9.6 Existing Underground Facilities

Contractor shall be responsible for identification, protection, redesign, relocation, or removal of underground lines, services, obstructions, or other facilities present at the Project Site. Contractor shall contact underground service alert for location of underground utilities at least 48 hours prior to commencement of construction – phone (Dial 800-332-2344) or 811. Contractor shall verify all existing utilities prior to beginning of any work on the Project Site.

9.7 Excavation

9.7.1 Contractor shall be responsible for dewatering and shoring of excavation works.

9.7.2 All excavation shall be carried out and supported in such a manner as to prevent flooding or ponding of water and damage or interference to structure services, or stored equipment/materials.

9.7.3 The Work shall include removing and disposing of unsuitable materials, such as organic matter, from areas on which fill is to be placed, and excavating and deposing of materials from area where existing grade is to be raised. Unsuitable material will be disposed of properly, as defined by the governing AHJ. Grading of cuts, fills, and drainage ditches shall be provided as required within the approved construction drawings.

9.8 Grading

Finish grading at the Project Site shall be sloped to deter surface ponding and promote surface drainage away from equipment and structures and to provide release. Grading within the PV arrays shall meet the requirements specified by the manufacturer of the module mounting system. All grading and drainage shall be per the approved Civil Engineering plans.

9.9 Fill

9.9.1 Fill materials shall be suitable for the intended purpose and shall not include materials hazardous to health, materials susceptible to attack by ground or ground water chemicals, materials susceptible to swelling or shrinkage under changes in moisture content, highly organic or chemically contaminated materials, or any other unacceptable materials.

9.9.2 Areas to be backfilled shall be prepared by removing unsuitable materials. The bottom of excavations shall be examined for loose or soft areas. Such areas shall be excavated fully backfilled with compacted fill.

9.9.3 Areas below foundations shall be over excavated to the depth below the bottom of foundations specified by the Geotechnical Engineer and backfilled with approved engineered fill. Areas below pavement shall be over excavated to the depth below the bottom of pavement specified by the Geotechnical Engineer and backfilled with engineered soil type A-2 or better (AASHTO Soil Classification System).

9.9.4 Backfilling shall be done in the layers of uniform thickness of six (6) to eight (8) inches or as recommended by the Geotechnical Engineer. Soil in each layer shall be properly moisture conditioned to facilitate compaction to achieve the specified density, within -2 percent to +4 percent of optimum moisture content or as directed by the Project Geotechnical Engineer. In order to verify compaction, representative field density and moisture-content tests shall be taken during compaction.

9.9.5 Granular load-bearing backfill shall be sound, durable coral rock; crushed rock; clean sand; and/or gravel.

9.9.6 Selected suitable backfill material shall be approved material in accordance with the soils report, and shall not contain organic material or rocks larger than three (3) inches. Contractor is responsible for verifying acceptability of excavated soils for fill and for providing suitable fill material from other sources.

9.9.7 Trench bedding material shall be clean sand, as required. If suitable for use, Contractor may use excavated material for trench bedding.

9.9.8 Where it is necessary to remove only a portion of the unsuitable materials and backfill, the backfilling operation shall begin by stabilizing the existing materials to enable proof rolling or normal construction equipment to operate thereon.

9.10 Compaction

9.10.1 Compaction of fill materials shall be carried out as soon as practicable after deposition of fill materials. Fill shall be compacted to the densities appropriate to the design requirements, fill type, and depths of layers.

9.10.2 Structural fill supporting foundations, roads, and parking areas shall be compacted to a minimum of 95 percent of the modified proctor maximum dry density, in accordance with ASTM D1557, or as specified by the Geotechnical Engineer. Embankments, dikes, and backfill surrounding structures shall be compacted to a minimum of 95 percent, or as specified by the Geotechnical Engineer. General backfill shall be compacted to at least 95 percent, or as specified by the Geotechnical Engineer.

9.11 Site Restoration

All Site development areas disturbed during construction shall be stabilized, re-vegetated as required, and restored in accordance with the Project Site grading plan and storm water pollution prevention plan (SWPPP) prepared by Contractor and approved by the Customer. The SWPPP shall be prepared in accordance with ODEQ requirements.

9.12 Testing and Inspections

9.12.1 A program shall be utilized for testing soils during earthwork and when underground Services and foundations are installed. The program shall include the following:

9.12.2 In-place representative field density tests shall be performed, at the frequencies specified below or as approved by the Geotechnical Engineer of Record, in accordance with ASTM D2922. The following frequencies shall be increased in areas where apparent difficulties exist:

Table 9-1 Testing Frequencies

Fill Class	Testing Area	Frequency / Cubic Yards per Test
A	Structural Fill and Foundation Subgrades	250 (or 1600 ft^2 of each lift, once per work shift, or one per foundation, whichever is more frequent)
B	Backfill Surrounding Structures	(Same as Class A)
B	Roads, Shoulders, and Parking Lots	650
C	General Backfill	1800

9.12.3 If a compacted area fails to meet the specified compaction requirements, two additional tests shall be performed for that area. If the results of either of the two additional tests

prove unsatisfactory, the area shall undergo additional compaction and testing until test results meet the minimum compaction requirements.

9.12.4 Records of inspection and testing of soils to ensure compliance with design assumptions shall be turned over to Customer and shall comply with Prudent Industry Practices and the requirements of applicable Law and the local authority regarding notification and inspection.

9.12.5 Testing and inspections of structures shall be in accordance with the state building codes and other licensing requirements.

9.12.6 Concrete test cylinder sets shall be taken at the minimum rate of one set per day, but not less than once for each 150 cubic yards for slabs, foundations, or walls. Concrete test cylinder sets for paving shall be taken at the minimum rate of one set per day, but not less than once for each 150 cubic yards, nor less than once for every 5,000 square feet. As a minimum, one set of cylinders shall be taken for each equipment foundation, with the exception that one set of cylinders may be made for each concrete truck load where multiple small foundations are poured from a single load. Test procedures shall be in accordance with the appropriate ASTM standards. Copies of test data shall be provided to the Customer.

9.12.7 Contractor shall utilize a system to validate type and grade of high-strength bolts by sampling and metallurgical testing.

9.12.8 A testing program of high-strength bolts and nuts shall be conducted by Contractor to ensure that each bolt shipment meets the appropriate ASTM standards for dimensional tolerances and material quality.

10. CONSTRUCTION MANAGEMENT

10.1 Project Management

10.1.1 All materials, workmanship, and testing shall be in accordance with the appropriate specifications, standards, and codes of practice. Methods of Contractor's quality control shall be clearly established and documented.

10.1.2 Working methods shall ensure the construction of stable structures able to withstand all applied loadings during construction and for the design life of the Project without collapse, failure, or excessive deformation such as to cause any damage, loss of function, or durability problems.

10.1.3 A permanent Project benchmark shall be established on the Project Site by Contractor based upon US Geological Survey (USGS) vertical datum NAVD88. Settlement monitoring points shall be provided. The existing elevation at each such settlement monitoring point shall be inscribed on an embedded brass marker before setting of equipment.

10.2 Waste Management

Contractor shall manage construction waste such that it does not disturb Host or construction progress. Waste shall be hauled away at Contractor's expense.

10.3 Dust Control

Contractor shall implement dust control measures at the Project site during construction, as applicable. Dust levels shall be kept at a minimum at all times during construction.

10.4 Temporary Utilities

10.4.1 Office Trailers

Contractor shall provide, at a minimum, two job site office trailers. One trailer shall be dedicated to the owner, with facilities for full time staff members to perform their necessary onsite duties. The second trailer shall be for the contractor, and any engineering or subcontractor staff that require such space on site.

The office trailers shall be a minimum of 8' x 20', and contain all of the necessary provisions to meet local codes and standards, for temporary structures. Each office space shall have access to telephone and high speed internet service, either via hard line or cellular connection.

10.4.2 Electric Power

Contractor shall determine the type and amount of power necessary and make arrangements for obtaining temporary electric service, metering, and shall bear the costs for electric power used during the construction period.

10.4.3 Lighting

Contractor shall provide temporary lighting during construction to meet applicable safety requirements.

10.4.4 Water

Contractor shall provide potable water for construction and drinking by construction personnel during construction.

10.4.5 Sanitary Facilities

Contractor shall provide and maintain sanitary facilities on Site during construction.

10.5 Phone, etc.

10.5.1 See Telecommunications Facilities requirements

10.5.2 Other necessary utilities for construction shall be provided by Contractor, as applicable.

10.6 Site Security and Access

10.6.1 Contractor shall ensure the Project Site is secured, limiting access to construction workers, Owner, and AHJ during construction. All personnel permitted to access the site shall receive the proper training, and bear the appropriate personal protective equipment, commensurate with their level of access and risk while on site. Personnel that are granted access to the site shall wear a security badge, containing either the word “Guest”, or if full time the employee’s company name and position. Security badges shall be worn visibly at all times, and only by the individual to which it has been issued.

10.7 As-Built Drawings

During construction, Contractor shall keep on file one set of current as-built drawings reflecting all field deviations from the design drawings. As a condition to Final Acceptance, Contractor shall submit to Owner a set of as-built drawings which have been fully conformed to the construction records as of the completion of the Work. Drawings shall be provided in AutoCAD DWG/DWF and Adobe PDF format

11. ELECTRICAL EQUIPMENT INSTALLATION

11.1.1 Installation Work shall include receiving, unloading, inventorying assemblies and all sub-system assemblies, storage, removal from storage, hauling, cleaning, installation on foundations, and other Work necessary to place all equipment into successful operation. Factory test reports shall be filed and stored on Site.

11.1.2 In addition, installation Work shall include complete assembly of equipment shipped unassembled; dismantling and reassembly of equipment to make adjustments and provisions of personnel, equipment, and assistance in testing and placing the equipment into operation.

11.1.3 Equipment shall be checked prior to its installation to ensure that it is in conformance with the purchase documents and manufacturer's drawings. Any discrepancies shall be reported to Owner.

11.2 Photovoltaic Modules

PV modules shall be provided with the following information:

11.2.1 The module manufacturer shall provide results from flash testing of modules being provided.

11.2.2 The flash test shall be conducted with an AM1.5G calibrated solar filter to approximate the sun's true spectral distribution following ASTM E927-97(1997) Class A and IEC-904-9 ANSI standards and be made available to Owner in electronic, CSV format.

11.2.3 The results of the flash test shall include, at a minimum, the following measured values: Isc, Voc, Impp, Vmpp, and Pmpp, solar irradiance and cell temperature.

11.2.4 The flash test data shall also include the PV module serial numbers and associated pallet numbers.

11.2.5 Modules shall be shipped and delivered in clearly identified bins that indicate the number of modules and nominal power per module with a manifest of each serial number contained within.

11.3 Module Mounting System

The module mounting system shall be installed in accordance with the following requirements:

11.3.1 The PV modules as installed and attached to the PV module mounting system shall not be exposed to a loading pressure in excess of the maximum loading pressure rating specified by the PV module manufacturer, when subjected to any wind and weather conditions over the entire range defined by the local building code.

11.4 Combiner Boxes

All combiner boxes shall be installed in accordance with the following requirements:

11.4.1 Adequate room for wiring slack shall be provided inside of each combiner box to allow for both module string wiring and PV output cable electrical voltage and current field measurements.

11.4.2 Contractor shall secure combiner boxes such that adequate access and working space per the NEC is provided. For ground based systems, the centerline shall be approximately 48 inches above grade, unless otherwise accepted by Owner. Furthermore, combiner boxes shall be mounted with a minimum of 12 inches of clearance above the established 100 year flood elevation, clear of drive isles, and in a position to not otherwise impede other equipment or cause shading of modules. If aluminum conductors are used, all electrical terminations shall be 18 inches above grade.

11.4.3 Combiner boxes shall be bounded by red-colored bollards, as appropriate, or located outside traffic areas.

11.4.4 Contractor shall install combiner boxes to be plum and level.

11.4.5 Contractor shall permanently secure combiner boxes on Unistrut, piperack, pile, steel pier, or any other suitable means of permanent attachment, subject to the approval of Owner.

11.5 Inverters

All inverters shall be installed in accordance with the following requirements:

11.5.1 Inverters shall be installed in accordance with the equipment manufacturer's installation instructions.

11.5.2 Contractor shall coordinate with inverter manufacturer to perform commissioning of the inverter when back-feed power is available.

11.6 Medium Voltage, Pad-Mounted Transformers

All medium voltage, pad-mounted transformers shall be installed in accordance with the following requirements:

11.6.1 Transformers shall be installed as specified on the drawings.

11.6.2 Transformers shall be installed in accordance with the equipment manufacturer's installation instructions.

11.6.3 Utility phase rotation shall be confirmed prior to installation to ensure proper connection.

11.6.4 Transformers shall be installed to maintain a minimum of 10-ft unobstructed access from the cabinet doors, perpendicular to the cabinet doors, and any adjacent cabinet containing operable electrical components (i.e. load-break switches).

11.6.5 Transformers shall be located near drive or road ways, to allow access by a 2-ton service vehicle with trailer.

11.6.6 Transformers installations shall include red-colored bollards.

11.7 Lightning Protection System

The lightning protection system shall be installed per the National Electrical Code, NFPA 70 using appropriately licensed and certified Lightning Protection Installation Subcontractors

11.8 Raceway

11.8.1 Conduits for ground-mounted systems shall be installed as follows: (all raceway and conductor installations shall be suitable to withstand the potential for rodent damage or intrusion)

- RGS only up to 8 feet above finished grade at ground level (for mechanical protection), EMT above 8 feet AFG and up to roof
- LFMC for short runs of less than 3 feet to combiner box
- PVC schedule 40 for underground, direct buried conduit or concrete-encased where subject to vehicles

11.8.2 Unless otherwise directed by Owner, underground duct banks subject to vehicular traffic shall be concrete-encased, 3000 psi minimum, with PVC schedule 40 conduits buried at the depth required for direct buried cables. Underground duct banks shall have electrical warning tape installed approximately 12 inches below finished grade in the backfill and a bare copper 4/0 AWG ground in the concrete nest serving as a counterpoise ground. Duct banks shall be designed to include spare capacity after completion of installation to allow for future growth and expansion.

11.8.3 Conduit shall be used to route lighting, telephone, and communication circuits where installed above grade.

11.9 Grounding

This section covers the furnishing and installation of the grounding system for the System.

11.9.1 All materials required for a complete grounding installation shall be furnished. Grounding components shall include ground rods, ground conductor, ground bus, above and below grade grounding connections, grounding lugs, and any other hardware required for a complete grounding system.

11.9.2 Grounding shall be compliant with NEC and local AHJ.

11.9.3 Suitable grounding facilities shall be furnished on electrical equipment not so equipped. The grounding facilities shall consist of compression type terminal connectors bolted to the equipment frame or enclosure.

11.9.4 The conduit system is not considered to be a grounding conductor. No equipment grounding conductor shall be smaller in size than 12 AWG, unless it is a part of an acceptable cable assembly.

11.9.5 If ground reference transformers are required by study, they shall conform to Owner design standards. This includes, but is not limited to:

- Zig-zag vectoring
- Current-carrying rating of 300A per phase conductor for 10-seconds
- Current-carrying ratting of 900A in the neutral-ground conductor for 10-seconds.

11.9.6 Ground Rods

Ground rods shall be copper clad, cold drawn carbon steel, manufactured in accordance with UL 467. The copper cladding shall be electrolytically bonded to the steel rod or bonded by a molten welding process. Individual ground rods shall be 5/8 inch minimum diameter and 10 feet long. Stainless steel ground rods shall be installed where soils conditions are considered to be corrosive or cathodic protection invoked for preservation of materials. Ground rods shall be Type ERITECH as manufactured by Erico, or an equivalent approved by Owner.

11.10 Conductors

11.10.1 Exothermic Connections

Exothermal connections shall be a standard duty copper molten weld conforming to the requirements of IEEE 80. Molds and powder cartridges used for making exothermal connections shall be furnished by the same manufacturer. Exothermal connections shall be similar to Type CADWELD as manufactured by Erico, or an equivalent approved by Owner.

11.10.2 Ground Lugs

Ground lugs shall be single hole or two-hole, compliant with NEC based on the application, and compliant with the commissioning criteria for dissimilar metals. Copper bars conforming to the requirements of IEEE 837 and UL 467. Ground lugs used with the exothermal weld process shall be similar to Type LA as manufactured by Erico, or a Owner acceptable equal. Ground lugs used with the compression process shall be similar to Type YGHA as manufactured by Burndy Electrical, or an Owner acceptable equal.

11.10.3 Grounding Installation

Grounding system components shall be installed as required by IEEE, NEC, NESC and applicable local codes.

11.10.4 Ground System Resistance Measurements

All ground resistance measurements shall be made with the Fall of Potential or slope methods as defined in IEEE 81.

After connection of ground rods to the ground system, Contractor shall obtain a ground resistance measurement from a selected location on the ground grid, using methods approved by Owner. This data shall be obtained, identified, and recorded.

The ground resistance measurement data may indicate that additional ground rods are required. Contractor shall furnish, install, and connect additional ground rods as necessary.

11.10.5 DC Cables (module to module or combiner box)

All insulated conductors, except supervisory and communication cable, rated less than 5000 volts shall be tested with a 1000 volt Megaohm-meter (“megger”) or an equivalent testing device. Insulation resistance measurements shall be made between each conductor and ground and between each conductor and all other conductors of the same circuit. Minimum acceptable resistance values shall be approximately 250 Megaohms.

11.10.6 DC Cables (combiner box to inverter)

All insulated conductors, except supervisory and communication cable, rated less than 5000 volts shall be tested with a 1000 volt Megaohm-meter (“megger”) or an equivalent testing device. Insulation resistance measurements shall be made between each conductor and ground and between each conductor and all other conductors of the same circuit. Minimum acceptable resistance values shall be approximately 250 Megaohms.

11.10.7 AC Power Cables (inverter output to step-up transformer, auxiliary power)

All insulated conductors, except supervisory and communication cable, rated less than 5000 volts shall be tested with a 1000 volt Megaohm-meter ("megger") or an equivalent testing device. Insulation resistance measurements shall be made between each conductor and ground and between each conductor and all other conductors of the same circuit. Minimum acceptable resistance values shall be approximately 250 Megaohms.

11.10.8 Medium Voltage AC Power Cable (AC collection system)

All insulated power cables rated 5000 volts and above shall be given an AC high potential test or partial discharge test. The test procedures shall be in accordance with IEEE 400.2 and the cable manufacturer's recommendations.

11.11 Cable Installation

Cable installation shall be in accordance with the following general rules:

11.11.1 Cables shall be installed in accordance with the cable manufacturers' recommendations, circuit lists, raceway lists, the drawings, and these Technical Specifications and Scope of Work. Each circuit shall be assigned a unique number.

11.11.2 All cable supports and securing devices shall be installed to provide adequate support without deformation of the cable jackets or insulation.

11.11.3 Oversized sunlight resistant nylon wire ties shall be utilized for bundling conductors for all exposed wiring. Wire ties shall be snug, but allow for thermal expansion.

11.11.4 Contractor shall identify both ends of the circuits with number and/or color-coding matching the drawings. Contractor shall also identify all circuits at manholes and handholes. Insulation of potentials should be color-coded and incorporated into a wire schedule.

11.11.5 All exposed wiring shall be neatly bundled so that exposed wiring is securely fastened. Exposed wiring running along metal surfaces shall be secured to prevent rubbing and damage from the metal surface or wire tie. Maximum spacing of 24 inches on center between fastening locations shall be such that secured wiring is not free to move due to wind, snow, or other environmental conditions. Use insulating foam spiral wrap, or other means to prevent contact with exposed bolt threads and sharp surfaces.

11.11.6 Phase tape shall be applied to each conductor at the terminations of all power and lighting circuits that are not already properly color coded.

11.11.7 Green shall be used for ground at every voltage level. Phase taping circuits shall not be required if cable with colored insulation is installed.

Table 11-1 Phase Tape Color Chart

Circuit	Taping
208Y/120 V Circuits	Black – Phase A Red – Phase B Blue – Phase C White – Neutral
480Y/277 V Circuits	Brown – Phase A Orange – Phase B Yellow – Phase C Gray/White – Neutral

Table 11-2 Multiconductor Shielded Control Cable Color Chart (per ICEA Table E2)

Conductor	K2 Color Code
1	Black
2	Red
3	Blue
4	Orange
5	Yellow
6	Brown
7	Red with Black Tracer
8	Blue with Black Tracer
9	Orange with Black Tracer
10	Yellow with Black Tracer
11	Brown with Black Tracer
12	Black with Red Tracer

11.11.8 Cable shall not be handled when the temperature is below the minimum temperature recommended by the manufacturer. If cable heating is required prior to placement, the cable shall be stored in a heated building in accordance with the manufacturer's recommendations for at least 24 hours. Cable shall be placed the same day it is removed from heated storage.

11.11.9 The pulling tension of any cable shall not exceed the maximum tension recommended by the cable manufacturer. Pulling mechanisms of both the manual and power types used by Contractor shall have the rated capacity in tons clearly marked on the mechanism. If any excessive strain develops, the pulling operation shall be stopped at once and the difficulty determined and corrected.

11.11.10 Cable shall not be pulled using trucks, forklifts, cranes, or other devices where the tension of the cable pull cannot be easily controlled.

11.11.11 Cable Grips: When pulling loops are used, the entire loop shall be cut off, discarded and recycled when the pull is completed.

11.11.12 Inspection: The outside of each cable reel shall be carefully inspected and protruding nails, fastenings, or other objects which might damage the cable shall be removed. A thorough visual inspection for flaws, breaks, or abrasions in the cable sheath shall be made as the cable leaves the reel, and the pulling speed shall be slow enough to permit this inspection. Damage to the sheath or finish of the cable shall be sufficient cause for rejecting the cable. Cable damaged in any way during installation shall be replaced.

11.11.13 Cable Bends: Tape shielded, flat tape armored, and wire armored cable shall not be bent to a radius of less than 12 times the overall cable diameter. All other cables shall not be bent to a radius of less than eight times the cable diameter.

11.11.14 Spare Conductors: All spare conductors of a multiconductor cable shall be left at their maximum lengths for possible replacement of any other conductors in the cable. Each spare conductor shall be neatly dressed for future use and marked as “spare.”

11.11.15 Lacing: UV rated ties shall be used to neatly lace together conductors entering switchboards and similar locations after the conductors have emerged from their supporting raceway and before they are attached to terminals.

11.11.16 Cable Identification

11.11.16.1 The ends of all circuits listed in the circuit list shall be identified with a circuit tag. Each marker shall bear the number of the circuit according to the Circuit List and drawings. At terminations, Contractor shall identify each circuit. Each phase of multiphase power circuits shall be individually identified. The circuit tag shall be so attached that it is readily visible for circuit identification.

11.11.16.2 Phase tape shall be applied to each conductor at the terminations of all power and lighting circuits. The phase taping for power conductors shall follow Owner Design Standards.

11.11.17 DC String Cable Placement in Free-Air Installations: DC string cables shall be secured with a cable tray, wireway, cable clips or equivalent. Cable ties are not allowed as the only means of securing dc cables. The cables shall be neatly bundled together with no/minimal strain exiting out of the PV module junction box and secured at 24 inches, on center, maximum. If wire harnesses are utilized to connect strings together, same guidelines still apply.

11.11.18 Except as otherwise specified or indicated on the drawings, cable shall be installed according to the following procedures, taking care to protect the cable and to avoid kinking the conductors, cutting or puncturing the jacket, contamination by oil or grease, or any other damage.

11.11.19 Stranded conductor cable shall be terminated by lugs or pressure type connectors. Wrapping stranded cables around screw type terminals is not acceptable.

11.11.20 Stranded conductor cable shall be spliced by crimp type connectors. Twist-on wire connectors may be used for splicing solid cable and for terminations at lighting fixtures.

11.11.21 Splices may be made only at readily accessible locations.

11.11.22 Cable terminations and splices shall be made as recommended by the cable manufacturer for the particular cable and service conditions. All shielded cable stress cone terminations shall be IEEE Class 1 molded rubber type. Shielded cable splices shall be tape or molded rubber type as required. Shielded cable splices and stress cone terminations shall be made by qualified splicers. Materials shall be by 3M Company, Plymouth/Bishop, or Raychem Electric Power Products.

11.11.23 Cable shall not be pulled tight against bushings nor pressed heavily against enclosures.

11.11.24 Cable-pulling lubricant shall be compatible with all cable jackets; shall not contain wax, grease, or silicone; and shall be Polywater "Type J."

11.11.25 Cables operating at more than 2000 volts shall be fireproofed in all cable vaults, manholes, and handholes. Fireproofing shall be applied with a half-lapped layer of 3M "Scotch 77 Arc-Proofing Tape," anchored at each end with a double wrap of 3M "Scotch 69 Glass Cloth Tape," or with equivalent tape by Anixter or Plymouth/Bishop.

11.11.26 Where necessary to prevent heavy loading on cable connections, in vertical risers, the cable shall be supported by Kellems, or equal, woven grips.

11.11.27 Spare cable ends shall be taped, coiled, and identified.

11.11.28 Cables shall not be bent to a radius less than the minimum recommended by the manufacturer. For cables rated higher than 600 volts, the minimum radius shall be 8 times diameter for non-shielded cable and 12 times diameters for shielded cable.

11.11.29 All cables in one conduit, over 1 foot long, or with any bends, shall be pulled in or out simultaneously.

11.11.30 Circuits to supply electric power and control to equipment and devices are indicated on the one-line diagrams. Conductors in designated numbers and sizes shall be installed in conduit of designated size. Contractor shall not field combine circuits to reduce conduit requirements unless approved by Engineer.

11.12 Connectors

This section of this Technical Specification defines methods of connecting cable between electrical systems and equipment. In this section, the term “connector” is applied to devices that join two or more conductors or are used to terminate conductors at equipment terminals for the purpose of providing a continuous electrical path. Connectors shall be installed as follows:

11.12.1 Connector material shall be compatible with the conductor material to avoid the occurrence of electrolytic action between metals.

11.12.2 All medium voltage and low voltage connectors shall be pressure type and secured by using a crimping tool. The tool shall produce a crimp without damage to the conductor, but shall ensure a firm metal-to-metal contact. The tool should be calibrated and approved by the manufacturer. Low voltage terminations shall be permitted to be screw-down lugs where only screw-down lugs are available, such as molded case circuit breakers.

11.12.3 Medium voltage cables require stress cones at the termination of the cables. Stress cones shall be of the preformed type suitable for the cable to which they are to be applied.

11.12.4 Cables shall not be spliced in trench unless authorized in writing by Owner, cable trays or conduits. Connections shall be made in conduit outlet fittings or junction boxes utilizing terminal blocks or an appropriate connector.

11.12.5 Splices, joints, and connections in cable other than cable terminations at equipment shall be made only in pull boxes or junction boxes unless otherwise indicated on the drawings and shall be made in accordance with the instructions of the cable manufacturer.

11.13 Grounding (medium voltage AC collection system)

Bare ground conductor 2/0 or 4/0 AWG and larger shall be soft drawn, stranded copper conforming to the requirements of ASTM B-8. Insulated ground conductor shall be soft drawn, stranded copper conforming to the requirements of UL 83. Insulated ground conductor shall be Type TW or THW having green colored PVC insulation.

11.14 Auxiliary Power Cables (lights, receptacles, computers, tracker motors and controllers, PLC, heating/ventilation)

All insulated conductors, except supervisory and communication cable, rated less than 5000 volts shall be tested with a 1000 volt Megaohm-meter (“megger”) or an equivalent testing device. Insulation resistance measurements shall be made between each conductor and ground and between each conductor and all other conductors of the same circuit. Minimum acceptable resistance values shall be approximately 250 Megaohms.

11.15 Control Cables (alarms, contacts, etc.)

All insulated conductors, except supervisory and communication cable, rated less than 5000 volts shall be tested with a 1000 volt Megaohm-meter (“megger”) or an equivalent testing device. Insulation resistance measurements shall be made between each conductor and ground and between each conductor and all other conductors of the same circuit. Minimum acceptable resistance values shall be approximately 250 Megaohms.

11.16 Analog Instrumentation (analog signals)

All insulated conductors, except supervisory and communication cable, rated less than 5000 volts shall be tested with a 1000 volt Megaohm-meter (“megger”) or an equivalent testing device. Insulation resistance measurements shall be made between each conductor and ground and between each conductor and all other conductors of the same circuit. Minimum acceptable resistance values shall be approximately 250 Megaohms.

11.17 Fiber Optic Cable (SCADA/DAS)

11.17.1 Contractor shall install fiber-optic cable and terminations as specified and in accordance with the cable and equipment manufacturer's recommendations. All fiber-optic accessories required for a complete installation shall be supplied and installed by Contractor. Examples of fiber-optic accessories include fan-out kits, end connections, dust caps, cleaving tools, polishing equipment, etc.

11.17.2 Fiber-optic cable furnished may be 62.5 micron multimode, 50 micron multimode, or 9 micron single-mode type. Fiber-optic cable shall be installed in inner duct with a minimum diameter of 1.25”.

11.17.3 Fiber-Optic Testing

11.17.3.1 As a minimum, all testing shall conform to the requirements of ANSI/TIA/EIA-568B, optical fiber link performance testing, and TIA/EIA-526-14A, end-to-end attenuation testing.

11.17.3.2 Contractor shall submit test documentation to Owner that includes the circuit number, type of test, date of test, test results, etc. In addition, Contractor shall submit installation, termination and as-built documentation to Owner as follows:

- Circuit installation documentation shall include circuit number; origin and destination; routing; cable type, size, length; date of installation, etc.
- Circuit termination documentation shall include circuit number; equipment termination locations; date(s) terminated; etc.
- Modifications to the fiber-optic routing, if any.
- Locations and details of any splice points not included in original Design Documentation, if any.

11.17.4 CAT6 Cable (communication and analog signals)

11.17.4.1 All insulated conductors of communication cable shall be tested for continuity.

11.17.4.2 High performance cable certification shall be performed for the permanent link configuration and documented for all CAT6 cables. Testing shall be accomplished with a Level III (CAT6) compliant test set with a minimum spectral frequency range of 1 to 250 MHz (CAT6). The test specifications for all installed cables must meet or exceed the specifications for CAT 6 cabling, respectively, that are documented within the TIA/EIA-568-B.2.

11.17.4.3 Cables not achieving a PASS rating shall be corrected and re-certified. Cables that cannot achieve a PASS rating shall be replaced and re-certified. A rating of *PASS (marginally pass) or *FAIL (marginally fail) is not acceptable.

11.18 Electrical Tests

Contractor shall provide field-testing of all wire, cable, electrical devices and equipment, and electrical systems delivered and installed on the Project. The following items shall be performed and procedures shall be followed:

11.18.1 Test protocol and forms shall conform to NETA Acceptance Testing Specifications. Contractor shall prepare and submit an electrical testing plan to Owner for review and

approval. Owner shall be informed in writing a minimum of three days in advance of all scheduled testing in order to witness any such electrical testing.

11.18.2 Written records of all electrical tests showing date of test, test equipment used, personnel making test, equipment or material tested, tests performed, and results, including any deficiencies found shall be created and maintained by Contractor and shall be submitted for review by Owner.

11.18.3 All test reports shall include nameplate data of equipment being tested. All tests on electrical equipment and systems shall be undertaken as directed by the manufacturer's field service representatives.

11.18.4 Contractor shall provide all necessary test equipment, labor, materials, and subcontracted testing services.

11.18.5 Contractor shall be responsible for any damage to equipment or material due to improper test procedures or test apparatus handling, and shall replace, or restore to original condition at Owner's discretion, any damaged equipment or material, at no additional cost to Owner.

11.18.6 Contractor shall provide and utilize safety devices during electrical testing including lock-out tag-out, rubber gloves and blankets, protective screens and barriers, barricade tape, danger signs, etc., to adequately protect and warn personnel in the vicinity in which tests are being undertaken.

11.18.7 After Placement

Preoperational tests shall be performed on insulated conductors after installation, as follows:

11.18.7.1 All cables, conductors, bus work, and control wire shall be tested according to OwnerSubstation standards.

11.18.7.2 Insulated conductors with insulation rated 5,000 volts and above shall be given an AC High potential test, according to IEEE 400.2, to confirm adequate dielectric strength of the conductor insulation.

11.18.7.3 All medium-voltage cables shall be separated from pad-mount transformers, inverters, or other like equipment before testing.

11.18.7.4 Low voltage cables shall be either insulation resistance tested before connecting to equipment or functionally tested (at equipment operation voltage) as part of the checkout of the equipment and/or system.

11.18.7.5 Insulated conductors shall be continuity tested for correct conductor identification.

11.18.7.6 All circuits, including lighting circuits, shall be tested with the circuit complete except for connections to equipment. All splices, stress cones on shielded cable, and terminal connector attachments shall be complete prior to testing. Splice technician shall have experience in cable splicing of given voltage class and shall provide certificate of qualifications.

11.18.7.7 In addition to the tests performed after cable placement is complete, continuity tests shall be performed on all supervisory and communication cable before and after each splice is made.

11.18.7.8 Any circuit failing to test satisfactorily shall be replaced or repaired and then retested, at no additional cost to Owner.

11.18.8 All equipment and labor required for testing shall be furnished by Contractor.

11.18.9 Continuity Tests

Continuity tests shall include all tests necessary to confirm that each conductor is continuous throughout its entire length.

11.18.10 Identification Tests

Identification tests shall include all tests necessary to confirm that the conductor being investigated originates and terminates at the locations designated in the Circuit List or indicated on the drawings, and is of the proper phase and/or rotation.

11.18.11 Insulation Tests

Resistance from ground provided by the insulation on all field-installed insulated power conductors shall be measured, excluding 120 VAC non-essential power circuits.

11.19 Experience

Contractor personnel performing fiber-optic Work shall be certified to perform termination for fiber-optic work, and shall use the connectors, tools, or other special equipment by the same Contractor as the equipment being installed. Contractor shall furnish all required special tools.

11.19.1 Dust caps shall be installed on any un-terminated connectors or bushings.

11.20 Redundancy

11.20.1 In general, all fibers shall be terminated. If a cable problem is detected during commissioning, the spare terminated fibers will be available for use without additional fiber-optic terminations.

11.20.2 Provide 100% active redundancy (i.e., one terminated spare for each utilize fiber; additional spare fibers may be coiled).

11.21 Splicing

11.21.1 Splicing of fiber-optic cable shall be avoided unless approved by Owner. Splicing shall be made using fusion techniques compatible with the fiber. Splices shall have a maximum attenuation of 0.15 dB, as determined by an optical time domain reflectometer (OTDR) trace or end-to-end attenuation test. Splices that exceed this attenuation shall be cut and redone until their attenuation is within compliance.

11.21.2 All control cable splicing shall be in a junction box according to Owner Substation Design Standards

11.22 Site Lighting

11.22.1 Site lighting fixtures shall be installed in accordance with the equipment manufacturer's installation instructions.

11.22.2 Lighting fixtures shall be installed plumb and level and aimed as specified on the drawings, as applicable.

11.23 Freeze Protection System

Freeze protection systems shall be installed in accordance with the equipment manufacturer's installation instructions.

11.24 Site Security System

Site security systems shall be installed in accordance with the equipment manufacturer's installation instructions.

11.25 Low Voltage Dry-Type Transformers

All low voltage dry-type transformers shall be installed in accordance with the following requirements:

11.25.1 Low voltage dry-type transformers shall be installed in accordance with the equipment manufacturer's installation instructions.

11.25.2 Mount transformers approximately where indicated on the drawings.

11.25.3 Load any vibration isolators external to the unit properly and provide complete isolation with no direct transformer unit metal in contact with the mounting surface.

11.25.4 Connect electrical circuits to transformers by means of moisture proof, flexible metallic conduit in a manner that prevents transformer vibrations from being transmitted to the building or other equipment.

11.25.5 Ground neutrals and enclosures of all transformers and all moisture proof flexible conduits in accordance with applicable codes and as otherwise may be indicated.

11.25.6 Connect voltage taps on all transformers to give as close as possible to rated output voltage under normal plant load conditions.

11.26 Low Voltage Panelboards

All low voltage panelboards shall be installed in accordance with the following requirements:

11.26.1 Low voltage panelboards shall be installed in accordance with the equipment manufacturer's installation instructions.

11.26.2 Mount panelboards securely where indicated, plumb, in-line, and square with walls.

11.26.3 Unless otherwise indicated, mount panelboard with top of its cabinet approximately 6-feet above the finished floor.

11.26.4 Provide a typewritten circuit directory under a metal-framed transparent plastic cover inside each panelboard.

11.27 Medium Voltage Switchgear

All medium voltage switchgear shall be installed in accordance with the following requirements:

11.27.1 Medium voltage switchgear shall be installed in accordance with the equipment manufacturer's installation

11.27.2 All equipment requiring anchor bolts shall be provided with the anchor materials, complete with bolts, nuts, and washers.

11.27.3 Sills and anchor materials shall be shipped ahead of the scheduled equipment delivery to permit installation before concrete is placed.

11.27.4 The anchor bolts shall be designed for continued operation following a seismic event.

11.27.5 Anchor bolt calculations shall be provided and be signed/sealed by a Structural Professional Engineer.

11.28 GFCI Receptacles

All ground fault circuit interrupt (GFCI) receptacles shall be installed in accordance with the following requirements:

11.28.1 GFCI receptacles shall be installed in accordance with the equipment manufacturer's installation instructions.

11.28.2 Mount receptacles with grounding slot down except where horizontal mounting is indicated, in which case mount with neutral slot up.

11.28.3 Ground receptacles to boxes with grounding wire, not by yoke or screw contact.

11.28.4 Mount weatherproof receptacles with the hinge for the protective cover above the receptacle opening.

11.29 Light Switches

All light switches shall be installed in accordance with the following requirements:

11.29.1 Light switches shall be installed in accordance with the equipment manufacturer's installation instructions.

11.29.2 Mount switches for switch operation in the vertical position.

11.30 Disconnect Switches

All disconnect switches shall be installed in accordance with the following requirements:

11.30.1 Disconnect switches shall be installed in accordance with the equipment manufacturer's installation instructions.

11.30.2 Mount switches for switch operation in the vertical position.

11.31 Junction Boxes

Not used.

11.32 Concrete Pull Boxes

11.32.1 Location Tolerances

Equipment shall be located within +/- 0.5 inch of the dimensional location indicated on the drawing unless otherwise permitted by Owner. Some equipment is indicated schematically without dimensions. Contractor shall coordinate the location of this equipment with all other equipment or materials to be installed.

11.32.2 Alignment

Rigid components such as bus, bus duct, throat connections, and enclosures shall be aligned and connected with special care to prevent excessive stress in joints, supports, and connections. Correct "spacing" hardware necessary for "turning" of field assemblies, usually tracker dampener shocks shall be used.

11.33 Bolted Electrical Connections

11.33.1 Where bolted electrical connections are made to aluminum, the aluminum surface shall be thoroughly cleaned with a wire brush, then coated with joint anti-oxidant compound and thoroughly brushed again through the compound. Additional compound shall then be added and the joint bolted together.

11.33.2 Where bolted connections are made between copper or brass surfaces, the metal surfaces shall be thoroughly cleaned and coated with a suitable anti-oxidizing compound.

11.33.3 It shall be Contractor's responsibility to certify that the torque of each bolt in all bolted electrical connections is in accordance with the manufacturer's recommendations. Factory bolt torques shall be verified as part of the equipment checkout and test procedures. Mark with torque scribe lines.

11.33.4 Bolted electrical connections shall be tightened with manual torque wrenches. Torque wrenches shall be constructed, so that they will visually or audibly indicate when the proper torque is reached. Mark with scribe lines.

11.33.5 The tightened bolts in electrical connections shall be checked at random; ten percent of the connections shall be reviewed and documented. Contractor shall be responsible for coordinating the checking of bolt tightness, so that minimum interference with equipment installation and connections will be experienced. If one percent of the ten percent samplings fail, all connections should be re-torqued and witnessed.

11.34 Equipment Finish

11.34.1 Surfaces of most electrical equipment, such as panels, switchgear, transformers, and circuit breakers are finished at the factory. Care shall be exercised to prevent damage to this original finish during equipment installation and during construction Work.

11.34.2 If factory finish is damaged during the course of construction, the damaged component shall be touched-up or refinished to the satisfaction of Owner, at no additional cost to Owner.

11.34.3 Refinishing paint, if furnished with the equipment, may be used; otherwise the paint shall be obtained from the equipment manufacture. Procedure for paint application should be in accordance with the manufacturers' recommendation.

12. COMMISSIONING, PERFORMANCE TESTING, AND PERFORMANCE GUARANTEE

Additional requirements regarding commissioning and performance testing are included in Exhibit A of this Technical Specification.

Additional requirements regarding the performance guarantee of the System are included in Exhibit B of this Technical Specification.

13. APPROVED SUPPLIERS

Below is a list of preferred and approved equipment suppliers for the System. Should Contractor's proposal include equipment suppliers which deviate from the parties below, Contractor will request approval for the use of such parties from Owner. Owner may request information related to the equipment suppliers experience in the industry, technical specifications of equipment or materials proposed, CVs, and/or other similar background and informational documentation.

13.1 Approved Major Equipment Vendors

13.1.1 Photovoltaic Modules

- JA Solar
- Trina Solar
- Solarworld
- Jinko
- Canadian Solar
- Yingli
- Hanwha Q-Cells
- First Solar
- Sunpower

13.1.2 Inverters

- SMA
- Power Electronics
- TMEIC
- Eaton
- General Electric
- ABB

13.1.3 Module Mounting Systems

- Fixed Tilt:
  - Applied Energy Technologies (AET)
  - RBI Solar
  - GameChange Solar

- Single Axis Tracking:
  - Array Technologies, Inc. (ATI)
  - NexTracker

13.1.4 Combiner Box

- SolarBOS
- Bentek
- Amtec Industries, Inc.
- Shoals Technologies Group

13.1.5 Collector System Cable

- Southwire
- Prysmian Power Cables and Systems
- General Cable
- Okonite

13.1.6 Substation Transformers

- Pauwels (Winnipeg, Manitoba, Canada shop)
- Smit (The Netherlands shop)
- ABB (St Louis, MO shop)
- Fortune Electric
- Siemens (Mexico shop)
- HICO
- Hyundai (Montgomery, AL shop)
- Delta Star
- Waukesha Electric

13.1.7 Protective Relays

- Schweitzer Engineering Laboratories (SEL)

13.1.8 GSU Padmount Transformers

- ABB
- CG Power Systems USA
- General Electric
- Cooper Power Systems
- Siemens

13.1.9 High Voltage Circuit Breakers

- Siemens
- ABB
- Mitsubishi
- Alstom

13.1.10 Instrument Transformers

- ABB

- Trench Ltd
- Alstom

13.1.11 Ground Reference Transformers

- ABB
- Cooper
- GE
- Virginia Transformer
- Pacific Crest Transformers

13.1.12 Transmission Tubular Steel Towers

- Valmont
- Sabre
- Trinity Meyer
- Dis-Tran

13.1.13 Substation Remote Terminal Unit

- Eaton Cooper Power System

13.1.14 Substation Human/Machine Interface

- Schneider Electric

13.1.15 Substation Ethernet Switches and Routers

- RuggedCom

13.1.16 SCADA Input/Output Devices

- Eaton Cooper Power Systems

Portland General Electric Company

SOLAR RESOURCE TECHNICAL SPECIFICATION**

Renewable Energy Resources

Exhibit A – Commissioning and Performance Testing

****NOTE: PGE's final issuance of the 2016 Request for Proposals (RFP) for Renewable Energy Resources is subject to Oregon Public Utility Commission approval of both the draft RFP and the Petition for Partial Waiver of the Competitive Bidding Guidelines, including the expedited RFP timeline.**

May 23, 2016

14. EXHIBIT A – COMMISSIONING AND PERFORMANCE TESTING

Table of Contents

Scope 144
1.0 Applicable Standards and Codes 144
1.1 Government and Jurisdictional Codes and Regulations 144
1.2 Industry Standards and Codes 144
2.0 General Requirements 145
2.1 Commissioning Test Manual 145
2.2 Test Requirements 146
2.3 Test Reports 146
2.4 Test REport Labeling 147
3.0 Commissioning Testing 147
3.2 General Inspections 148
3.3 System Grounding 149
3.4 Cable and Module Testing 149
3.5 Equipment Testing 153
3.6 Systems Testing 158
3.7 Minimum Reporting Requirements for Commissioning 159
4.0 Acceptance Testing 163
4.1 General 163
4.2 Operational Test 164
4.3 Capacity Test 165
4.4 Minimum Reporting Requirements for Acceptance Tests 169
5.0 Appendices 171
5.1 Appendix A: Defined Terms 171
5.2 Appendix B: Acronyms and Abbreviations 173

LIST OF TABLES

Table 1. Monthly Expected Capacity and Reporting Conditions 167

Scope

Unless otherwise stipulated by the Scope of Work, Contractor is responsible for conducting all Commissioning and Acceptance Tests outlined in this System Commissioning and Performance Tests (Protocol). In addition, Contractor shall perform any additional tests or measurements as required by applicable Standards, Codes or the requirements of the Authorities Having Jurisdiction (AHJ) or Local Electric Utility, and equipment manufacturers. All labor, materials, equipment, and tools used to complete Commissioning and Acceptance Testing shall be qualified and suitable for the assigned task.

The tests shall meet the requirements presented in this specification and all referenced industry standards. All tests shall be in accordance with any applicable manufacturer's instructions and/or protocols. Any discrepancy between this specification and the tests conducted in the field shall be reported to the Owner in writing.

1 Applicable Standards and Codes

The current editions of the following standards, codes and regulations (or their specific country, state, or province equivalent) that are applicable to the project at the time of contractual signing shall be complied with. All applicable state or local codes and requirements shall be in addition to the following list.

1.1 GOVERNMENT AND JURISDICTIONAL CODES AND REGULATIONS

1.1.1 Occupational Safety and Health Administration (OSHA) regulations

29CFR 1910: Occupational Safety and Health Standards

1.1.2 State and local codes

State and local codes and regulations enforced by agencies having jurisdiction (AHJ) where the project is located.

1.2 INDUSTRY STANDARDS AND CODES

1.2.1 American Society for Testing and Materials (ASTM)

ASTM E2848-13: Standard Test Method for Reporting Photovoltaic Non-Concentrator System Performance

ASTM E2939-13: Standard Practice for Determining Reporting Conditions and Expected Capacity for Photovoltaic Non-Concentrator Systems

1.2.2 American National Standards Institute (ANSI)

1.2.3 Institute of Electrical and Electronic Engineers (IEEE)

IEEE-81: Guide for Measuring Earth Resistivity, Ground Impedance and Earth Surface Potentials of a Grounding System

IEEE-400/-400.2: Guide for Making High-Direct-Voltage Tests on Power Cable Systems in the Field

1.2.4 International Electrical Testing Association (NETA)

ATS: Acceptance Testing Specifications

ETT: Standard for Certification of Electrical Testing Personnel

1.2.5 National Fire Protection Association (NFPA)

NFPA 70: National Electrical Code (NEC)

NFPA 70E: Standard for Electrical Safety in the Workplace

2 General Requirements

This section discusses the Commissioning and Acceptance Testing documents which are to be prepared by Contractor and submitted to Owner. These include:

Commissioning Test Manual

- General Inspection Plan
- System Grounding
- Cable and Module Testing
- Equipment Testing
- System Testing

Individual Test Reports

Final Commissioning Test Summary

Acceptance Test Report

2.1 COMMISSIONING TEST MANUAL

Contractor shall prepare and submit an initial draft of the Commissioning Test Manual for the Project to Owner for review no later than thirty (30) calendar days before the scheduled start of commissioning. The Commissioning Test Manual shall include all applicable tests set forth in this Protocol, including the General Inspection, and shall comply with all of the requirements set forth by this Protocol. Owner will return comments to Contractor and Contractor will amend and resubmit the Commissioning Test Manual to Owner no more than ten (10) business days after

comments were received. Contractor will be responsible for finalizing the Commissioning Test Manual with Owner.

The test procedures outlined in the Commissioning Test Manual shall include the following information as applicable to the Scope of Work:

Prerequisites to the tests

Make and model of equipment to be used for measuring data

List of the data that will be collected

Test procedures which shall be used

Successful acceptance criteria

Any differences between tests in the Manual and this Protocol

Test report templates

The Commissioning Test Manual shall include a testing schedule which is consistent with the overall project schedule and presents the following in detail:

Expected duration of each test, including start and end dates

Plans for submission of test data and final test report

2.2 TEST REQUIREMENTS

Contractor shall comply with the following test requirements:

Provide at least ten (10) business days notice to Owner prior to the commencement of any inspections and/or tests in this Protocol or the Commissioning Test Manual.

Provide documentation to Owner certifying that inspections or tests have been conducted in accordance with this Protocol.

All testing shall meet the pre-operational requirements set forth by the Local Electric Utility in addition to compliance with the agreed upon Commissioning Test Manual.

All testing equipment shall be calibrated in accordance with to the applicable manufacturer's requirements and industry standards and be conducted by a certified and recognized equipment testing authority.

Provide equipment calibration certificates for all installed instrumentation as part of submission of test documentation.

2.3 TEST REPORTS

Contractor shall submit Test Reports that document the results of each of the tests in the Commissioning Test Manual and this Protocol. Individual Test Reports shall include the following, at a minimum for each test:

Any mutually agreed upon deviations from the Commissioning Test Manual procedures

Instrument calibration sheets and certificates

Test data, including corrected test data

Field notes (weather conditions, observations, etc.)

Test calculations

Any deficiencies or issues identified during, or as a result, of testing

Any corrective actions taken shall be documented, and will include any subsequent retesting results, as applicable.

Conclusions

Signatures of Contractor and Commissioning Manager

A Final Commissioning Test Summary shall be prepared to document the results of all Commissioning Tests in a single document. The Final Commissioning Test Summary shall be submitted to Owner within five (5) business days following the completion of all Commissioning Tests.

An Acceptance Test Report shall be prepared and submitted for Owner review within five (5) business days following completion of the Acceptance Tests.

2.4 TEST REPORT LABELING

All test report files submitted to Owner shall be labeled in accordance with the Commissioning Test Manual or this Protocol.

For Example:

The Open-Circuit Voltage (V_{oc}) String Test found in Section 3.4.1 of this Protocol shall have a corresponding test report labeled "*3.4.1_VocStringTestReport.pdf*" and associated data files labeled "*3.4.1_VocStringTestData.csv"*.

3 Commissioning Testing

3.1.1 Use of Temporary or Remote Instrumentation

With the written permission of Owner, temporary or remote instrumentation may be used to perform the measurements required for Commissioning Testing.

3.1.2 Test Conditions

All Equipment required for the normal operation of the Facility will be operated in as close to normal, automatic, or manual modes, as practicable. During all tests, Contractor and its subcontractors will have free access to the Project and all operating data for purposes of monitoring and calculating performance.

3.1.3 Test Calculations

All calculations prescribed within this Protocol will be carried out by Contractor and submitted to Owner for approval.

3.2 GENERAL INSPECTIONS

A comprehensive General Inspection Plan shall be developed by Contractor and presented to the Owner as a part of the Commissioning Test Manual.

The General Inspection of components shall be performed prior to any Commissioning Tests on those components and include, at a minimum, a Visual & Mechanical inspection and a Grounding System inspection. The visual inspection shall include, but is not limited to, the inspection for possible issues and verification of the Project design. Any issues identified by the General Inspection shall be rectified immediately and reported to the Owner. The General Inspection shall be repeated until all issues are resolved.

3.2.1 Identification of General Issues

The General Inspection shall identify any issues and/or irregularities, including the following:

Physical damage. All readily accessible cables, modules, racking, inverters and other system components shall be visually inspected to be free of physical damage.

Poor wire management. All readily accessible wires and cables shall be visually inspected to ensure that they are installed in a clean and workmanlike manner with no loosely hanging wires.

Corrosion. All readily accessible system components shall be visually inspected to be free of corrosion or oxidation issues such as rusting.

Shading concerns. The Project site shall be visually inspected for unforeseen obstructions which may cause unexpected shading on modules.

Poor welds. All readily accessible welds performed in the field shall be visually inspected for issues.

Missing torque marks. Visual torque marks shall be visually inspected on a sampling of lug and bolt heads. Torque marks shall extend for the center of the bolt head continuously to the surface on which the bolt is secured.

3.2.2 Verification of Design

The General Inspection shall verify the correct installation of system components per the Project design and include a review of the following:

Markings and labels

Equipment ratings

Wire sizing

Module flash test review

Mounting or racking components

Tracker components (if applicable)

3.3 SYSTEM GROUNDING

Contractor shall ensure that all components are properly grounded according to design and specifications. Grounding connections shall be inspected by an AHJ or other independent quality control inspector to verify proper installation of all compression clamps, CAD welds, and mechanical connections. The DC and AC system groundings shall conform to all applicable codes and standards. Visual inspection of the grounding systems shall be documented in a report that includes, but is not limited to, the following verifications:

Racking posts grounded per specifications and connected to system grid

Module grounding components installed correctly (washers, clips, etc.)

All readily accessible connections visually verified

Mechanical attachment

Anti-oxidation coatings applied, as required

Lugs fully seated

Whip installed per manufacturer's requirements

Connections to grounding grid inspected

CAD welds

Compression clamps

Grounding Rods

Rods set to depth per drawings or otherwise verified to provide adequate ground connection as determined by the engineer.

Clamp fully engaged

Whip/cable fully engaged

3.4 CABLE AND MODULE TESTING

3.4.1 Open-Circuit Voltage (Voc) String Test

Open-circuit voltage (V_{oc}) string testing shall be conducted in order to assess overall module and string performance. The test shall be conducted and witnessed by at least two qualified technicians using best practices and the following procedure:

The test shall be conducted during periods of irradiance greater than POA 500 W/m^2 and between the hours of 10:00am and 2:00pm. Expanded hours and lower POA values may be authorized in writing by Owner and/or the engineer.

Inspect string fuses for appropriate use and correct sizing.

Measure and record the following for every string:

String number and combiner box location (or similar relevant string identification)

Time of test and weather conditions

Module back-sheet temperature at a location representative of the strings being tested. Measurements made every 5 minutes using an infrared thermometer or thermocouple affixed to the back side of the module

Plane-of-Array (POA) irradiance measurement for area of strings being tested

Open-circuit voltage (V_{oc}) measurement of every string within each combiner box. Measurement shall be made using a voltmeter with the suitable voltage rating and accuracy of at least 0.5%

Each measured string V_{oc} shall be within 5% from the expected V_{oc} ($V_{oc-expected}$) and within 5% of adjacent strings under identical temperature and irradiance conditions. The expected V_{oc} shall be calculated using the following equation:

$$V_{oc-expected} = \eta \cdot V_{oc-ref} \cdot \left[1 + \beta \cdot \left(T_{mod} - T_{mod-ref}\right)\right]$$

where:

$V_{oc-expected}$ = expected open-circuit voltage of the string

V_{oc-ref} = module open-circuit voltage at reference conditions

η = number of modules in series in tested string

β = module open-circuit temperature coefficient (°C^{-1})

T_{mod} = measured temperature at back of module (°C)

$T_{mod-ref}$ = back of module temperature at reference conditions

Comparisons between all measured and expected V_{oc} shall be analyzed in a spreadsheet which shall include the following PASS/FAIL tests for each string:

String $V_{oc-measured}$ is within 5% of $V_{oc-expected}$

String $V_{oc-measured}$ is within 5% of the $V_{oc-measured}$ of adjacent strings

Strings that fail either test shall be investigated for module defects, loose connections, disconnected modules, or other possible defects.

IV Curve Trace Testing as described in the following section may be used as source for (V_{oc}) upon written approval of Owner or the engineer.

3.4.2 IV Curve Trace Test

Contractor shall perform IV Curve Tracer tests for all strings of modules connected to combiner boxes at each combiner box location. The test shall be conducted and witnessed by at least two qualified technicians using best practices and the following procedure:

1. The test shall be conducted during periods when irradiance is greater than 500 W/m^2 and between the hours of 10:00am and 2:00pm. Expanded hours and lower POA values may be authorized in writing by Owner and/or the engineer.

Verify that the module and IV Curve Tracer are compatible.

Shut down the inverter associated with the string and combiner box being tested.

Disconnect the combiner box (or relevant DC disconnect switch) from the inverter and all other DC systems.

Measure, record and verify the following for every string:

String number and combiner box location (or similar relevant string identification)

Date and time

POA irradiance at precise time of test

Module backsheet temperature (use a string representative of all others being tested)

Ambient temperature

Wind speed

Weather conditions

Correct polarity shall be verified.

Using an IV Curve Tracer, perform the curve trace using the manufacturer's instructions. The Curve Tracer shall be configured to record at least 10 current-voltage data points and record the following values:

Maximum power (P_{max})

Voltage at maximum power (V_{mp})

Current at maximum power (I_{mp})

Open circuit voltage (V_{oc})

Short circuit voltage (I_{sc})

Fill Factor (FF)

Short-circuit current test: Each measured string short-circuit current shall be greater than the expected short-circuit current ($I_{sc-expected}$) derived using the following equation:

$$I_{sc-expected} = \kappa \cdot I_{sc-ref} \cdot \left(\frac{G}{G_{ref}}\right)$$

where:

$I_{sc-expected}$ = expected short-circuit current of the string

I_{sc-ref} = short-circuit current at Standard Test Conditions (STC) as shown on module datasheet

κ = 0.95 (uncertainty and soiling factor)

G = measured irradiance (W/m^2)

G_{ref} = 1000 W/m^2

3.4.3 Low Voltage Insulation Resistance ("Megger") Test

All low voltage (LV) direct current (DC) and alternating current (AC) cables shall be tested for insulation resistance in accordance with the NETA-ATS. Measured insulation resistance values shall be adjusted to a 20°C reference in order to determine acceptance with NETA-ATS Tables 100.1 and 100.14.

All insulation resistance acceptance criteria shall be proposed by Contractor and approved by Owner. Any test results that fail to be in accordance with the NETA-ATS, or do not meet the accepted criteria, shall be documented as a deficiency on the test report. Corrective action shall follow the identification of a failed test, followed by re-testing.

3.4.4 Cable Tests (Low and Medium Voltage)

3.4.4.1 Low Voltage Cables (up to 1000V)

All low voltage cables shall be inspected and tested in accordance with NETA-ATS, Section 7.3.2. Test Values shall be in accordance with NETA-ATS, Section 7.3.2.3.

Note: NETA-ATS states that Section 7.3.2 is for low-voltage cables up to a 600 Volt Maximum. This Section shall also be used for cables with voltages up to 1000 Volts.

Test voltages applied in the field shall not exceed the maximum test voltage of NETA-ATS Table 100.1.

Verify uniform resistance for all parallel conductors.

3.4.4.2 Medium Voltage Cables (2 kV – 35 kV)

Inspection and testing shall be performed after all splices and cable terminations have been installed.

All medium voltage cables shall be inspected and tested in accordance with NETA-ATS, Section 7.3.3. Test Values shall be in accordance with NETA-ATS, Section 7.3.3.3.

The preferred test method for Section 7.3.3.2.4 is by partial discharge analysis with Very Low Frequency (VLF) test devices. Test methods or devices other than those listed in NETA-ATS 7.3.3.2.4 may be used only with approval by Owner.

Test voltages applied in the field shall not exceed 80% of the factory test value, and shall not exceed the maximum test voltage shown in NETA-ATS Table 100.6.

Verify proper installation of faulted-cable indicators as shown in the project drawings, as applicable.

3.4.5 Phase Rotation Test (as applicable)

A test that verifies the proper AC phase rotation at the point of interconnection (Point of Common Connection – PCC) shall be completed and documented.

3.4.6 Polarity Test

Verify that all circuits have the correct polarity according to the design drawings. Verify proper termination of positive (+) and negative (-) cable connections.

3.4.7 Copper Communication line Testing

Test all circuits, with connectors in place, with the appropriate communication tester for the circuit, (CAT5, Coaxial, Paired, RJ45, etc.).

3.4.8 Fiber Optic Line Testing

All fiber optic network assemblies shall be tested per Fiber Optic Association (FOA) standards with appropriate Optical Loss Test Set (OLTS). Optical Time Domain Reflectometer (OTDR) testing may be required by the engineer.

3.5 EQUIPMENT TESTING

3.5.1 Circuit Breaker Tests (Low, Medium, and High Voltage)

3.5.1.1 Low-Voltage Insulated-Case/Molded-Case Air Circuit Breakers

Inspect and test each circuit breaker in accordance with NETA-ATS, Section 7.6.1.1.

Confirm that if a Breaker is being back-fed, it is rated accordingly.

Verify that the Test Values are in accordance with NETA-ATS, Section 7.6.1.1.3.

Proof and documentation of equivalent factory testing, if applicable, may be provided in place of Contractor performing the test described above at Owner discretion.

3.5.1.2 Low-Voltage Power Air Circuit Breakers

Inspect and test circuit breakers in accordance with NETA-ATS, Section 7.6.1.2.

Confirm that if a Breaker is being back-fed, it is rated accordingly.

Verify that Test Values are in accordance with NETA-ATS, Section 7.6.1.2.3.

3.5.1.3 Medium-Voltage Air Circuit Breakers (as applicable)

Inspect and test circuit breakers in accordance with NETA-ATS, Section 7.6.1.3.

Confirm that if a Breaker is being back-fed, it is rated accordingly.

Perform the optional power factor test on each pole and bushing (7.6.1.3.2.7-8)

Verify that the Test Values are in accordance with NETA-ATS, Section 7.6.1.3.3.

3.5.1.4 Medium and High Voltage Oil Circuit Breakers (as applicable)

Inspect and test circuit breakers in accordance with NETA-ATS, Section 7.6.2.

Confirm that if a Breaker is being back-fed, it is rated accordingly.

Verify that the Test Values are in accordance with NETA-ATS, Section 7.6.2.3.

3.5.1.5 Medium-Voltage Vacuum Breakers (as applicable)

Inspect and test each circuit breaker in accordance with NETA-ATS, Section 7.6.3.

Perform the optional power factor test on each pole and bushing (7.6.3.2.8-9).

Verify that the Test Values are in accordance with NETA-ATS, Section 7.6.3.3.

3.5.2 Switch Tests (Low, Medium and High Voltage)

3.5.2.1 DC and AC Switches (Low Voltage)

Inspect and test each low voltage switch in accordance with NETA-ATS, Section 7.5.1.1.

Confirm and document correct electrically-bonded equipment ground.

Confirm and document that metal-enclosed switches are clean and that any debris has been removed.

Verify that switches used in DC applications are rated and installed accordingly.

Verify that warning signs (where provided) are in accordance with the National Electrical Code (NEC), or equivalent electrical code that is applicable to the project.

Verify that Test Values are in accordance with NETA-ATS, Section 7.5.1.1.3.

3.5.2.2 Medium Voltage Switches (Metal-Enclosed) (as applicable)

Inspect and test each medium voltage (MV) metal-enclosed switch in accordance with NETA-ATS, Section 7.5.1.2.

If applicable, include testing of the motorized switch operator device, in accordance with NETA-ATS, Section 7.5.1.2.

Verify that Test Values are in accordance with NETA-ATS, Section 7.5.1.2.3.

3.5.2.3 Medium and High Voltage Air Break Switches (as applicable)

Inspect and test each medium and high voltage (HV) air break switch in accordance with NETA-ATS, Section 7.5.1.3.

If applicable, include testing of the motorized switch operator mechanism, in accordance with NETA-ATS, Section 7.5.1.3.

Verify that Test Values are in accordance with NETA-ATS, Section 7.5.1.3.3.

3.5.3 Switchgear and Switchboard Equipment Inspection (as applicable)

Contractor shall review factory test documentation to confirm that all MV and HV (as applicable) switchgear assemblies have passed all factory tests including, but not limited to:

Insulation Resistance

AC High Voltage Withstand

Main Contact Resistance (Ductor Tests)

Earth Switch Resistance (Ductor Tests)

Oil Dielectric Strength

Functional Tests

Type Tests

Contactor shall review factory test documentation to confirm that all LV switchgear has passed all factory tests including, but not limited to:

Insulation Resistance

Contact Resistance

Functional Tests

Type Tests

3.5.4 Transformer Tests (as applicable)

3.5.4.1 Liquid Filled Transformers

Inspect and test each Transformer in accordance with NETA-ATS, Section 7.2.2.

Inspect and test the sudden pressure relay when applicable.

Verify that Test Values are in accordance with NETA-ATS, Section 7.2.2.3.

If not required by the manufacturer, Contractor has the option to also perform the following tests (if applicable):

Core insulation resistance test (7.2.2.2.8).

Measure the percentage of oxygen in the nitrogen blanket (7.2.2.2.9).

Oil tests for water content, and power-factor (7.2.2.2.10.7-8).

Note: Proof and documentation of equivalent factory testing, if applicable, may be provided in place of Contractor performing the tests described above.

3.5.4.2 Dry-Type Transformers (small and large)

Inspect and test each Transformer in accordance with NETA-ATS, Section 7.2.1.1 or 7.2.1.2 (small or large transformers).

Verify that Test Values are in accordance with NETA-ATS, Section 7.2.1.1.3 or 7.2.1.2.3.

Note: Proof and documentation of equivalent factory testing, if applicable, may be provided in place of Contractor performing the tests described above.

3.5.5 Inverter Commissioning

Inverters shall be commissioned by the inverter manufacturer, or an authorized representative of the manufacturer, using the manufacturer's specified procedures. Commissioning reports shall be in a format provided by the manufacturer.

At a minimum, inverter commissioning shall meet the following requirements:

Inverters shall be fully operational after commissioning completion

All shipping and packing materials shall be removed from inverter cabinets

Fuses and air filters shall be checked, verified as correct and in place

Torque wrench marks shall be recorded

Software updates and data acquisition (DAQ) communication shall be tested and functional

3.5.6 Meteorological (MET) Station Equipment

Meteorological (MET) station equipment shall be commissioned, calibrated and tested using the manufacturer's specified procedures with accuracy being compared to the manufacturer's specifications. Calibration certificates for each installed instrument shall be confirmed. Test reports shall be in a manufacturer provided format if available.

The following instrumentation, if it is part of the metrology equipment specified by Owner, shall be tested, at a minimum:

Solar irradiance measurement device, as applicable, e.g.:

Global horizontal irradiance (GHI)

Plane of array (POA) irradiance

Anemometer (wind speed), as applicable

Module temperature, as applicable

Ambient temperature, as applicable

Rainfall gauge, as applicable

Data-logger and communications equipment, as applicable

3.5.7 Protective Relay Equipment (as applicable)

Protective relay equipment shall be inspected and tested in accordance with NETA-ATS, Section 7.9. Each equipment device shall be programmed with the specified relay settings provided by, or approved by, the local electrical utility. The following shall be performed and documented in a report, at a minimum:

Verify that all grounding pins have been removed from all shorting-type terminal blocks in non-spare current transformer circuits.

Verify that all spare current transformers are properly shorted.

Perform functional testing of each control scheme, including breaker trip tests, close inhibit tests, lockout relays, alarm functions, and breaker-failure schemes.

3.5.8 Surge Arrestors (as applicable)

Surge arrestors shall be inspected and tested in accordance with NETA-ATS, Sections 7.19.1 and 7.19.2. Test Values shall be in accordance with NETA-ATS, Section 7.19.2.3.

3.5.9 Thermographic Survey (Infrared Scans)

Perform a thermographic (infrared) survey in accordance with NETA-ATS, Section 9. All thermo graphic images will be provided to Owner and the survey shall meet the following requirements:

The survey shall be performed after all other commissioning tests are complete and while the Project is operational.

An infrared (IR) camera shall be used to detect areas of non-uniform temperature.

The test shall be conducted during a minimum POA irradiance of 500 W/m^2.

The survey shall include the following equipment:

All combiner and re-combiner boxes

All AC power distribution equipment

All inverters (if infrared test window is available)

All transformers (if infrared test window is available)

Five (5) percent of all PV modules from the front

Five (5) percent of all PV modules from the rear

Any covers, shields, or doors on equipment shall be opened, moved or removed during testing of equipment to ensure the survey is free of obstructions to a clear IR image.

Investigate and comment on the results of the thermographic survey in a report that states either no issues were identified or comments on temperature differences greater than:

Three degrees Celsius (3°C) between similar components in the same enclosure

Fifteen degrees Celsius (15°C) between components and ambient air

3.6 SYSTEMS TESTING

3.6.1 Grounding System Tests

The Grounding System shall be inspected and tested in accordance with NETA-ATS, Section 7.13. Test Values shall be in accordance with NETA-ATS, Section 7.3.2.3. Ground resistance testing shall be by the fall-of-potential method, in accordance with IEEE-81.

3.6.2 SCADA/DAS and Monitoring System Verification

The Supervisory Control and Data Acquisition (SCADA) or Data Acquisition System (DAS) equipment shall be commissioned and tested using the manufacturer's specified procedures. Tests shall verify the correct operation of the SCADA/DAS system, meters, sensors, weather station instruments, and all inverters, while verifying the correct data input logging from trackers, breakers, and other components monitored by the system.

All data points collected by the SCADA shall be verified for consistency from the field device to the SCADA/DAS master device and, if applicable, on the remote monitoring service. This test shall verify that the data collected is correctly received by the SCADA system and can be used to produce any required performance or operation reports.

3.6.3 Security System Testing

Security system equipment shall be commissioned, tested and calibrated by a certified installer of the equipment manufacturer using the manufacturer’s specified procedures. Security system testing shall include testing of all operating modes and alarm conditions. If applicable, camera coverage shall demonstrate the ability to observe any location within the Project area.

If available, security system commissioning reports shall use a reporting format or forms provided by the security system provider.

3.6.4 Mounting System Testing

Mounting systems; fixed or trackers shall be inspected and tested by the manufacturer or authorized manufacturer representative. Trackers shall be operational prior to Acceptance Testing. All aspects of the mounting system shall be inspected and documented including, but not limited to, foundations, verifying tilt angle, fastener torques, module mounting methods, motors, software, global positioning system (GPS), and limits and rotation. All software shall be

updated to the most recent version. Tracker back-tracking, rotation and stow function shall be such that maximizes annual power production. Back-tracking and stow functions to be demonstrated using grid and auxiliary power when applicable.

3.7 MINIMUM REPORTING REQUIREMENTS FOR COMMISSIONING

The following summarizes the minimum data and results that are required to be included in individual commissioning report documentation provided to Owner.

3.7.1 General Requirements

The Commissioning Report shall include:

Test period, test conditions and Contractor's personnel responsible for test

A statement of whether each of the Commissioning inspections and/or tests either passed or failed

If one or more inspections and/or tests failed, a detailed explanation shall be submitted to Owner for review

A signed statement from Contractor that the Project complies with all of the Commissioning requirements set forth in this Specification

3.7.2 Open-Circuit Voltage (Voc) Test for each String

String number and combiner box location(s)

Date and time of test and weather conditions

Module temperature [^{o}C]

POA Irradiance [W/m^2], ≥500 W/m^2], at time of test

Measured open-circuit voltage ($V_{oc-measured}$) [V], for each string

Expected Voc calculation ($V_{oc-expected}$) [V], for each string

Percent difference between $V_{oc-expected}$ and $V_{oc-measured}$

3.7.3 IV Curve Trace Test

String number and combiner box location

Date and time of test and weather conditions

Module temperature [^{o}C]

Module temperature [^{o}C]

POA Irradiance [W/m^2], ≥500 W/m^2], at time of test

Wind speed [^{o}C]

Verification of correct polarity

Measured short-circuit current ($I_{sc-measured}$) [A], for each string tested

Expected short-circuit current calculation ($I_{sc-expected}$) [A], for each string tested

Verification that $I_{sc-measured}$ is larger than $I_{sc-expected}$

3.7.4 Low Voltage Insulation Resistance Test

Measured insulation resistance for each low voltage cable (in Megohms)

Verification that measured resistance exceeds recommended minimum insulation resistances presented in NETA-ATS

Identification of cables that fail the insulation test

3.7.5 Cable Tests (Low Voltage)

Visual and mechanical inspections in accordance with NETA-ATS, Section 7.3.2

Electrical tests in accordance with NETA-ATS, Section 7.3.2

3.7.6 Cable Tests (Medium Voltage)

Visual and mechanical inspections in accordance with NETA-ATS, Section 7.3.3

Electrical tests in accordance with NETA-ATS, Section 7.3.3

3.7.7 Phase Rotation Test

Verification the proper AC phase rotation at the point of interconnection

3.7.8 Polarity Test

Verification that all circuits have the correct polarity according to the design drawings

3.7.9 Copper Communication line Testing

Test report certifying that all circuits were tested and their corresponding plan identification.

Test report shall identify any circuits requiring repair or that were repaired during testing.

Test report shall include a description of test equipment and method.

3.7.10 Fiber Optic Line Testing

- Test report showing the calculated Expected Optical Loss and Actual Optical Loss per FOA standards for each circuit identified on the plans.

3.7.11 Test report shall include a description of the test equipment and method. Circuit Breaker Tests

All reported inspections and tests shall be in accordance with NETA-ATS, Section 7.6

3.7.12 Switch Tests

All reported inspections and tests shall be in accordance with NETA-ATS, Section 7.5.1

3.7.13 Switchgear and Switchboard Equipment Inspections

Verification and documentation confirming passes factory tests of the following for low, medium, and high voltage switchgear assemblies (if applicable):

Insulation resistance

AC High Voltage Withstand

Main Contact Resistance

Earth Switch Resistance

Oil Dielectric Strength

Functional Tests

Type Tests

3.7.14 Transformer Tests

All reported inspections and tests shall be in accordance with NETA-ATS, Section 7.2.2 for liquid filled transformers or Section 7.2.1 for dry-type transformers

3.7.15 Inverter Commissioning

Inverter commissioning report shall be from the manufacturer or authorized manufacturer representative

Commissioning reports shall verify the following:

Inverters are fully functional

Fuses and air filters have been checked and verified as correctly installed

Torque wrench marks have been recorded and mechanically verified

Software is up-to-date and functional

3.7.16 Meteorological (Met) Station Instrumentation

Provision of calibration certificates for all Met station instruments

Verification that all Met station equipment has been tested and verified as functional

3.7.17 Protective Relay Equipment

All reported inspections and tests shall be in accordance with NETA-ATS, Section 7.9

Verification of the following items:

Grounding pins have been removed

Spare current transformers are properly shorted

Functional test verification

3.7.18 Surge Arrestors (as applicable)

All reported inspections and tests shall be in accordance with NETA-ATS, Section 7.19.1 and 7.19.2, and test values be in accordance with Section 7.19.2.3

3.7.19 Thermographic Survey (Infrared Scans)

Submission of infrared scans for:

All combiner boxes

All re-combiner boxes

All AC power distribution equipment

All inverters and transformers (if infrared test window is available)

Five percent (5%) of all PV modules (both front and back scan)

Report shall comment of the results of the thermographic survey and identify any issues identified

3.7.20 Grounding Systems Test

All reported inspections and tests shall be in accordance with NETA-ATS, Section 7.13, and test values be verified to be in accordance with Section 7.3.2.3

3.7.21 SCADA/DAS and Monitoring System Verification

Test report shall verify that data collected by the SCADA system is correctly received by the monitoring system and is sufficient to being used for required performance and operation reports

3.7.22 Security system testing (if Applicable)

Security system installer shall provide verification of the completed commissioning, testing and calibration of the security system

Test reporting shall show that all operating modes and alarm conditions have been tested

3.7.23 Tracker System Testing (If applicable)

Reporting on tracker system commissioning shall be from the manufacturer and verify, at a minimum, that motors, software, limits, rotation, and global positioning systems are operating and functional so that the system maximizes annual power production. Data collected during foundation installation (driving times or torques information) to be reviewed and compared to foundation design.

4 Acceptance Testing

4.1 GENERAL

4.1.1 Acceptance Test Director

Contractor will designate an Acceptance Test Director (ATD) who will have the responsibility for test coordination. The ATD will maintain authority to start and stop the test as required. The ATD will maintain the authority to consider and accept any required deviations from the test procedure as mutually agreed with the Owner or Owner's representative.

4.1.2 Use Temporary or Remote Instrumentation

With the written permission of Owner, temporary or remote instrumentation may be used to perform the measurements required for Acceptance Testing.

4.1.3 Test Conditions

All Equipment required for normal operation of the Facility will be operated in normal, automatic, or manual modes, as applicable. During all tests, Contractor and its subcontractors will have free access to the Project and all operating data for purposes of monitoring and calculating performance.

4.1.4 Test Calculations

All calculations prescribed within this Protocol will be carried out by Contractor and submitted to Owner for approval.

4.1.5 Acceptance Test Data Requirements

Contractor shall provide sufficient data for the Owner to verify the successful completion of Acceptance Testing in addition to Acceptance Test reports. The following data shall be provided by Contractor to the Owner for the Project.

4.1.5.1 Data required for entire Project:

5 minute interval measurements in CSV[1] format for each project:

Energy from revenue meter (at point of grid interconnection)

Ambient Temperature (for each sensor)

Plane-of-Array (POA) Irradiance (for each solar irradiance measurement device)

Wind speed

[1] CSV stands for Comma Separated Value, which is a common file format for data.

DAS/SCADA system access

Energy report taken directly from revenue meter (kWh units, at least 24 hours)

Proof from Operator that an imposed performance alert was acknowledged, e.g. screen shot of monitoring UI, ticket or email creation.

Proof from Operator that DAS/SCADA is integrated with other business systems, i.e. energy invoice consistent with energy metered.

4.1.5.2 Data Required per Inverter:

5 minute interval measurements in CSV format for each inverter:

Real and Reactive Power output at inverter

Any available status indication of reduced real power generation due to reactive power generation (if applicable)

Times when inverter AC and DC disconnect are imposed.

4.2 OPERATIONAL TEST

A two (2) day long Functional Test, as defined below in its entirety, that demonstrates the continuous and uninterrupted operation of the Facility shall document the following:

Inverters. All inverters shall start at wake-up voltage in the morning, operate continuously during periods of sufficient solar irradiance and enter stand-by mode at dusk (sufficient solar irradiance is the amount of solar irradiance necessary for the inverter to operate before entering stand-by mode). Inverter operation shall be autonomous at all times. Inverters shall react properly to remote or automatic AC and DC disconnections. The inverter disconnection mechanism of the grid interconnection shall be functional during grid interconnection faults or failure unless otherwise required by the grid operator. All inverters shall include a communications interface with standard communications protocol to integrate to an external SCADA. Owner reserves the right to observe the inverter display at site to confirm that the Maximum Power Point Tracking (MPPT) is fully functional.

SCADA/DAS and Revenue Meter Verification. The reporting interface shall be functional and shall update with new data within expected time period. The accuracy of energy and power values in the reporting interface shall be validated using energy production data obtained directly from the revenue meter. Performance alerts shall be functional and acknowledged by operations staff. Remote monitoring shall be available at the point of telecommunication connection at the plant.

Trackers (if applicable). All trackers shall operate autonomously at all times. Tracking accuracy shall be verified to comply with manufacturer's specifications. Every tracker shall have an inclinometer installed for each of its tracking axis of movement. Each inclinometer shall be monitored by the SCADA System.

The inclinometer data shall be recorded by the SCADA system at the same rate as the rate of rotation of the axis or more frequently.

The inclinometer data shall be compared to time of the day to ensure that the tracker's movement meets manufacturer's specifications.

Functionality: The test shall demonstrate that the Facility is functioning and capable of operating free of inverter error throughout the specified test period.

Compliance. Contractor shall provide verification that the Facility has the ability to comply with all material safety, system reliability, environmental, and other applicable Laws, Governmental Approvals, the EPC Agreement, the Power Purchase Agreement, and the Interconnection Agreement.

4.3 CAPACITY TEST

4.3.1 Purpose

The purpose of the Capacity Test is to determine the measured AC capacity (Measured Capacity) of the Project system and to compare the Measured Capacity to an Expected Capacity. Both the Measured Capacity and the Expected Capacity will be derived at identical Reporting Conditions (RC). Note: The Operational Test must be passed prior to starting the Capacity Test

4.3.2 Measurement Requirements

The measured data required for the calculation of Measured Capacity for this test include: plane of array (POA) solar irradiance, ambient temperature, wind speed, and AC power.

Ambient Air Temperature: Air temperature measurement equipment shall have a resolution of 0.1 °C or smaller and be accurate to within ±1 °C. The instrument shall include a radiation shield compliant with ASTM D6176. The instrument shall be placed close to the array without interfering with the array's thermal boundary layer.

Irradiance: Irradiance shall be measured with a minimum of two ISO 9060 Secondary Standard heated and ventilated pyranometers installed in the plane of array of the modules. The pyranometers should be located in different areas of the PV array to sample irradiance in multiple locations. The sensors shall be compared and time periods with differences greater than 10% shall be filtered from use to limit test to stable sky conditions.

Wind Speed: The uncertainty of the wind measuring instrument shall be no more than ±0.5 m/s. The instrument shall be placed close the array but away from any wind flow interference caused by the solar PV array or other obstacles. The sensors shall be compared and time periods with differences greater than 5 m/s shall be filtered from use to limit test to stable wind conditions.

Soiling: Soiling shall be assumed to be negligible during the test, modules to be washed prior to testing.

AC Power Output: The AC power output of the system shall be measured at the grid interconnection point using a meter which meets or exceeds the accuracy standards per ANSI C12.1.

Averaging Interval: The averaging interval shall be 5 minute periods. All measured data shall be recorded as the average over the five minute period.

4.3.3 Determine Reporting Conditions (RC)

Use ASTM E2939-13 to create RC based on Owner approved reference energy production model and Owner approved historical meteorological dataset

4.3.3.1 Filtered Measured Data and Minimum Dataset Requirements

Contractor shall filter meteorological data and modeled power output data per ASTM E2939-13 and ASTM E-2848-13, Section 9.1, omitting the filter described in ASTM E2848-13 section 9.1.6 (irradiance outside of range) For clarity, section 9.1.8, "inverter not peak power tracking, shall be considered to occur when any individual inverter is operating above 98% of its AC maximum nameplate or when the entire plant is above 98% of its AC nameplate. In addition, any point when the inverter is limited in its real power generation in order to provide reactive power shall be filtered from the dataset.

Filtered data shall provide a dataset that covers at least 5 days of operation.

4.3.3.2 Calculating the Reporting Conditions

The Reporting Conditions (RC) will be determined for each month by following the procedure outlined below in accordance with the test method outlined in ASTM E2848-13. The Reporting Conditions will be averages of the POA Irradiance, Ambient Temperature, and Wind Speed using the filtered datasets.

Calculate the reference POA Irradiance for each month ($Irr_{RC,j}$)

- $Irr_{RC,j}$ shall be selected from the filtered data for each month and shall be the highest of the following values that contains an equal number of data points in the range 0.8 x reference condition –reference condition and reference condition - 1.2 x reference condition : 500, 600, 700, …1000

Implement the filter described in 9.1.6 of ASTM E-2848-13 on the already filtered dataset based on the reference irradiation chosen in the above bullet

Calculate reference ambient air temperature for each month ($T_{amb,RC,j}$)

- $T_{amb,RC,j}$ shall be the average ambient temperature of the filtered data for the relevant time period.

Calculate reference wind speed each month ($WS_{RC,j}$)

$WS_{RC,j}$ shall be the average wind speed of the filtered data for each month.

4.3.3.3 Reporting Conditions Table

Table 1 shall be filled in prior to Contract signing. The Reporting Conditions presented in Table 1 shall be used to calculate Expected Capacity in Section **Error! Reference source not found.** of this Protocol.

4.3.4 Determine Expected Capacity

Expected Capacity shall be calculated for each month over a complete calendar year (12 months) at the corresponding Reporting Conditions, as determined in Section 4.3.3.2 of this Protocol.

4.3.4.1 Calculate "From Historical" Regression Coefficients and Expected Capacities

Use the filtered modeled power output, filtered plane of array irradiance (Irr_H), filtered ambient temperature ($T_{amb,H}$), and filtered wind speed data (WS_H) to fit the four (4) "from historical" regression coefficients $\{A_H, B_H, C_H, and\ D_H\}$ defined in ASTM E2848-13, and E2939-13 and compute the resulting target capacities for the selected monthly reference conditions

4.3.4.2 Expected Capacity Table

Table 1, below shall be filled in prior to Contract signing. The Expected Capacity recorded in Table 1 shall be used in comparison with the Measured Capacity, as determined per Section 4.3.5 of this Protocol.

Table 1. Monthly Expected Capacity and Reporting Conditions

MONTH (J)	EXPECTED CAPACITY $(C_{exp,j})$ (KW)	REPORTING POA IRRADIANCE $(Irr_{RC,j})$ (W/M^2)	REPORTING AMBIENT TEMPERATURE $(T_{amb,RC,j})$ (°C)	REPORTING WIND SPEED $(WS_{RC,j})$ (M/S)
January				
February				
March				
April				
May				
June				
July				
August				

September				
October				
November				
December				

Note: in the event that the Measurement Test Period (MTP) for the Measured Capacity spans across the boundary between two months, the Reporting Conditions (RC) corresponding to the MTP will be calculated as a weighted average of the RCs from each of the two months, where the weighting coefficients are based on the percentage of filtered measured data that falls within each month.

4.3.5 Measured Capacity

Measured Capacity shall be determined using ASTM E2848-13, Section 4 using data collected over the Measurement Test Period (MTP). Measured Capacity shall be compared to the Expected Capacity for the Test Month in which the test period occurred and meet the test requirements set forth in Section 1.1.1 of this Protocol.

4.3.5.1 Filtered Measured Data

Filter the measured energy production data, measured plane of array irradiance, measured ambient temperature, and measured wind speed in accordance with ASTM E2848, Section 9.1. For clarity, section 9.1.8, inverter not peak power tracking, shall be considered to occur when any individual inverter is operating above 98% of its AC maximum nameplate or when the entire plant is above 98% of its AC nameplate. In addition, any point when the inverter is limited in its real power generation in order to provide reactive power shall be filtered from the dataset.

In addition, data shall be filtered to limit the maximum wind speed to less than 10 m/sec.

4.3.5.2 Minimum Requirements for Filtered Dataset

Post-filtered data shall represent a dataset covering at least 750 minutes of operation.

Therefore, because the test is specified using five (5) minute intervals, a minimum of 150 data points is required.

4.3.5.3 Calculate Measured Capacity

Calculate measured regression coefficients and measured capacity values following the procedure outlined in ASTM E2848-13

1.1.1 Minimum Requirement for Measured Capacity

The Measured Capacity of the Project shall be greater than or equal to ninety-seven percent (97%) of the Expected Capacity for the Reporting Period for an acceptable test result.

4.4 MINIMUM REPORTING REQUIREMENTS FOR ACCEPTANCE TESTS

4.4.1 Operational Test Report

4.4.1.1 General Requirements

The Operational Test Report shall include:

- Test period, test conditions and Contractor's personnel responsible for test
- A statement of whether each of the Operational Test either passed or failed
  - If one or more Operational Tests failed, a detailed explanation shall be submitted to Owner for review
- A signed statement from Contractor that the Project complies with all of the Operational Test requirements set forth in this Specification

4.4.1.2 Required Reporting Data for the Entire Project

The following data for the entire Project, throughout the Operational Test period, shall be included in the Operational Test Report:

- Verification of proper Met Station functionality, for each averaging interval, including:
  - POA Irradiance [W/m2], for each solar irradiance measurement device
  - Ambient Temperature [^{o}C], for each temperature sensor
  - Wind Speed [m/s], for each wind speed sensor
- Verification of proper Tracker functionality
- Verification of proper SCADA/DAS functionality
  - Verification of proper communications functionality
  - Verification that an imposed performance alert was acknowledged
- Verification of proper Revenue Meter functionality

4.4.1.3 Required Reporting Data for each Inverter

The following data for each inverter, throughout the Functional Test period, shall be included in the Functional Test Report:

Verification of proper Inverter functionality

Real and Reactive Power output [kWac and kVar] from each inverter, for each averaging interval

Any time(s) during when either the AC and/or DC disconnect are imposed

Any times(s) during when curtailment was imposed by the utility

Any times(s) during when the plant was effectively curtailed due to adverse grid conditions

4.4.2 Capacity Test Report

The following data and calculations shall be provided to Owner in the Capacity Test Report and associated documents.

4.4.2.1 General Requirements

The Capacity Test Report shall include:

Measurement Test period, test conditions and Contractor's personnel responsible for test

A statement of whether the Capacity Test either passed or failed

If the Capacity Test failed, a detailed explanation shall be submitted to Owner for review

A signed statement from Contractor that the Project complies with all of the Capacity Test requirements set forth in this Specification

4.4.2.2 Data required for entire Project

Mutually agreed upon Historical Meteorological Dataset, including for each hour of a calendar year (8760 hours/year):

POA Irradiance [W/m^2]

Ambient Temperature [^oC]

Wind Speed [m/s]

Mutually agreed upon Reference Energy Production Model

One calendar year of modeling results at hourly resolution (8760 hours/year) from using the Owner-Approved Historical Meteorological Dataset as input into the Owner-Approved Reference Energy Production Model, including:

Energy [kWh]

Calculations and results used to determine the "From Historical" fitting coefficients, for each month: $\{A_H, B_H, C_H, and\ D_H\}$

Calculations and results used to determine the Reporting Conditions, for each month: $\{Irr_{RC,j}, T_{amb,RC,j}, WS_{RC,j}\}$

Calculations and results used to determine the Expected Capacity, for each month: $Expected\ Capacity_j$

A completed version of Table 1, above

Unfiltered measurements for the entire project, for each averaging interval:

Energy [kWh] from revenue meter

POA Irradiance [W/m^2], for each solar irradiance measurement device

Ambient Temperature [^{o}C], for each temperature sensor

Wind Speed [m/s], for each wind speed sensor

Real and Reactive Power output [kWac and kVAr] from each inverter, for each averaging interval

Any time(s) during when either the AC and/or DC disconnect are imposed

Any times(s) during when curtailment was imposed by the utility

Any times(s) during when the plant was effectively curtailed due to adverse grid conditions

Filtered measurements for the entire project, for each averaging interval:

Energy [kWh] from revenue meter

POA Irradiance [W/m^2], for each solar irradiance measurement device

Ambient Temperature [^{o}C], for each temperature sensor

Wind Speed [m/s], for each wind speed sensor

Calculations used to determine the "From-Measured" regression coefficients: $\{A_M, B_M, C_M, and\ D_M\}$

Calculations used to determine the Measured Capacity: $Measured\ Capacity$

Calculations and results used to compare Measured Capacity to Expected Capacity

5 Appendices

5.1 APPENDIX A: DEFINED TERMS

Table 2. Defined Terms

Note: "The defined terms, acronyms and abbreviations contained in this appendix are limited in application to this section/exhibit of the Agreement"

TERM	DEFINITION

TERM	DEFINITION
Acceptance Tests	The Acceptance Tests are tests specified to determine the functionality and performance of the Facility prior to Substantial Completion (SC). These tests must pass the test requirements prior to declaration of SC.
Array	A collection of solar PV modules wired together to enable the collection of DC power for conversion into AC power by an inverter. An array may consist of several sub-arrays (also known as blocks) that make up the larger solar array.
CAD Weld	An exothermic weld that melts a metal around a joint to electrically connect two electrical components such as a ground wire to a ground rod.
Capacity Test	A test that determines the measured AC capacity of a system and compares it to the expected AC capacity using measured data and the Reference Energy Production Model.
Commissioning	Inspections and tests designed to assess the proper function and correct installation of system components prior to system interconnection.
Reference Energy Production Model	A model used to calculate the expected annual energy production by a specific system design. Typically, the Reference Energy Production Model is the same model that was used to estimate the performance of the Project for the project pro forma (financial model).
Expected Capacity	The expected power output (kW) for a facility, calculated using measured conditions and the Reference Energy Production Model.
Facility	The entire system, system related components, and associated land, roof, or structure on which the system is installed.
Functional Test	A test that determines whether the Facility is capable of operating without error or disconnection for a required duration of days.
Grounding System	A system that consists of all wires, rods, plates or lugs used to safely ground system components such as modules, combiner boxes, inverters, transformers and racking.
Inclinometer	An instrument (also known as a clinometer) used for measuring tilt angles of modules in a tracking system.
IV Curve	Plot of current (I) versus voltage (V) for solar cells, modules, or strings. IV curves are used to determine the performance of modules or strings in relation to the module manufacturer's nameplate values.
Measured Capacity	Measured Capacity is the measured power output in kilowatts (kW) of the Facility, which is corrected using measured data and regression coefficients derived from following the ASTM E2848 standard.
Measured Power Output	The Measured Power Output is the power output in kilowatts (kW) of the Facility as reported by the revenue-grade meter on the DAS.

TERM	DEFINITION
Met Station	A meteorological measurement station that consists of all weather and solar irradiance measurement instrumentation such as pyranometers, anemometers, ambient temperature sensor, and module temperature sensors; and the communication interface thereto.
Modeled Power Output	The power output of the Facility as determined by the Reference Energy Production Model, and used in the regression analysis in the Capacity Test to determine the Expected Capacity.
Regression Coefficient(s)	Values derived by a regression tool in Microsoft Excel and represent the weighting and relationship of the explanatory variables (POA irradiance, ambient temperature, and wind speed) to the dependent variable (power output).
Revenue Meter	A revenue meter is a revenue-grade meter that measures the energy [kWh] production of the Project. Revenue-grade meters must have at least a ±2% accuracy per the American National Standards Institute (ANSI) rule C12.1-2008.
Thermographic	Thermographic cameras can detect radiation in the infrared range of the electromagnetic spectrum and help identify loose wire connections, overheating, and other issues at solar facilities that cause comparatively high temperatures.

5.2APPENDIX B: ACRONYMS AND ABBREVIATIONS

Table 3. Acronyms and Abbreviations

ACRONYM	WRITTEN OUT
AHJ	Authority(ies) Having Jurisdiction
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
ATD	Acceptance Test Director
ATS	NETA Acceptance Testing Specifications
CSV	Comma Separated Value (a common data file format)
CD	Commissioning Director
DAQ	Data Acquisition
DAS	Data Acquisition System
ETT	NETA Standard for Certification of Electrical Testing Personnel
FF	Fill Factor

ACRONYM	WRITTEN OUT
GHI	Global Horizontal Irradiance
HV	High Voltage
IEEE	Institute of Electrical and Electronic Engineers
Imp	Current at Maximum Power
IR	Infrared
Isc	Short Circuit Current
ISO	International Standards Organization
LV	Low Voltage
MV	Medium Voltage
NEC	National Electric Code
NETA	International Electrical Testing Association
NFPA	National Fire Prevention Association
OSHA	Occupational Safety and Health Administration
PCC	Point of Common Connection
Pmax	Maximum Power
POA	Plane of Array
RC	Reporting Conditions
SCADA	Supervisory Control and Data Acquisition
Vmp	Voltage at Maximum Power
Voc	Open Circuit Voltage

Portland General Electric Company

SOLAR RESOURCE TECHNICAL SPECIFICATION**

Renewable Energy Resources

Exhibit B – Performance Guarantee

****NOTE: PGE's final issuance of the 2016 Request for Proposals (RFP) for Renewable Energy Resources is subject to Oregon Public Utility Commission approval of both the draft RFP and the Petition for Partial Waiver of the Competitive Bidding Guidelines, including the expedited RFP timeline.**

May 23, 2016

15. EXHIBIT B – PERFORMANCE GUARANTEE

6 Table of Contents

Table of Contents 176

PERFORMANCE GUARANTEE 177

- Actual Performance Ratio 177
- Acceptance Criteria 178
- Underperformance Calculation for Performance Liquidated Damages 178
- Performance Liquidated Damages 178
- Buydown Liquidated Damages 179
- General Performance Conditions 180
- Data Collection 180
- Force Majeure 180
- Financial Security 180
- Test Report 180

7 PERFORMANCE GUARANTEE

Commencing on the Project Substantial Completion Certificate Date, Contractor guarantees an annual performance ratio (Guaranteed Performance Ratio) during the Warranty Period based on the Agreement PVsyst report. Specifically, the Guaranteed Performance Ratio is [GUARANTEED PERCENTAGE]. For avoidance of doubt, the Warranty Period shall be deemed to commence at 12:00 a.m. on the date following the Project Substantial Completion Date, and each year of the Warranty Period shall end on the anniversary of the Project Substantial Completion Date and be comprised of 8760 hours of data. The successful achievement of the Guaranteed Performance Ratio will be verified annually after each anniversary of the Project Substantial Completion Date according to the procedure defined herein.

8 Actual Performance Ratio

The Actual Performance Ratio (APR) will be calculated annually as follows:

$$APR_{Year} = \frac{Actual\ Energy_{Year}}{\frac{POA_{Year}}{G_{STC}} \times Power_{DC} \times (1 - d) \times T_{CORR}}$$

Where:

APR_{Year} (%) is the Actual Performance Ratio for the specific year.

$Actual\ Energy_{Year}$ (kWh) is the actual accumulated energy measured during the annual period considered[2] at the billing meter.

POA_{Year} (kWh/m2) is the accumulated plane of array irradiation for the corresponding year, measured at the weather station installed at the System[3].

G_{STC} (kW/m2) is the irradiance in Standard Test Conditions with a value of 1kW/m^2.

$Power_{DC}$ (kW) is the aggregated DC power of the System according to the flash tests provided by the module manufacturer.

d (%) is the degradation factor with a value of 0.7% per year.

T_{CORR} (°C) = 1 + T_C x (T_{AVG} - T)

[2] From one Substantial Completion anniversary to the following Substantial Completion anniversary.

[3] The pyranometer to be used will be the one that recorded the higher annual plane of array irradiation for the corresponding year.

T_C (%/°C) is the voltage temperature correction factor for the module, from the module manufacturer's spec sheet.

T_{AVG} (°C) is the weighted average of the measured back of module temperature for each month of the year.

T (°C) is the weighted average of the predicted ambient temperature, from the PVSYST model, as it relates to the POA Irradiance.

9 Acceptance Criteria

The Guaranteed Performance Ratio will be successfully achieved if:

$$APR_{Year} \geq GPR$$

Where:

APR_{Year} (%) is the Actual Performance Ratio for the specific year.

GPR (%) is the Guaranteed Performance Ratio and its value is based on the Agreement PVsyst report. ([GUARANTEED PERCENTAGE]).

10 Underperformance Calculation for Performance Liquidated Damages

In the event that the Guaranteed Performance Ratio is not achieved for a given year, the Underperformance for that year or U_{Year} will be calculated as follows:

$$U_{Year} = GPR - APR_{Year}$$

Where:

U_{Year} (%) is the underperformance for the corresponding year.

APR_{Year} (%) is the Actual Performance Ratio for the specific year.

GPR (%) is the Guaranteed Performance Ratio and its value is based on the applicable PVsyst report included below ([GUARANTEED PERCENTAGE]).

11 Performance Liquidated Damages

If Actual Production is less than the Expected Production for a given year, annual Performance Liquidated Damages will be paid by Contractor to Owner based on such year's shortfall at the end of each year. Contractor shall pay Owner annual performance liquidated damages in the amount corresponding to the following formula:

$$PLD_{Year} = \frac{POA_{Year}}{G_{STC}} \times Power_{DC} \times (1 - d) \times U_{Year} \times PPA_{Year}$$

Where:

PLD_{Year} (USD) are the Performance Liquidated Damages for the specific year.

POA_{Year} (kWh/m2) is the accumulated plane of array irradiation for the corresponding year, measured at the weather station installed at the System[4].

G_{STC} (kW/m2) is the irradiance in Standard Test Conditions with a value of 1kW/m^2.

$Power_{DC}$ (kW) is the aggregated DC power of the System according to the flash tests provided by the module manufacturer.

U_{Year} (%) is the underperformance for the corresponding year, calculated applying the method defined above.

d (%) is the degradation factor with a value of [0.7%] per year.

PPA_{Year} (USD/kWh) is the price per kWh generated by the System for the corresponding year, with a value of [$0.18]/kWh and considering applicable escalation rates.

12 Buydown Liquidated Damages

After the end of year 2, if Contractor fails to achieve 100% or greater of the last year of Expected Production, Buydown Liquidated Damages will be paid by Contractor to Owner according to the following formula:

$$BLD = \sum_{n=1}^{N} \frac{Power_{DC} \times \frac{POA_{TMY}}{G_{STC}} \times (1-d) \times U \times PPA_{Year}}{(1+i)^n}$$

Where:

BLD(USD) are the Buydown Liquidated Damages.

N (years) is the remaining lifetime of the System, considering that the total lifetime of the System is 25 years.

n (dimensionless) from 1 to N.

$Power_{DC}$ (kW) is the aggregated DC power of the System according to the flash tests provided by the module manufacturer.

POA_{TMY} (kWh/m2) is the accumulated plane of array irradiation for the typical meteorological year, which is [ANNUAL IRRADIATION] kWh/m^2.

G_{STC} (kW/m2) is the irradiance in Standard Test Conditions with a value of 1kW/m^2.

[4] The pyranometer to be used will be the one that recorded the higher annual plane of array irradiation for the corresponding year.

U (%) is the underperformance for the last year Guaranteed Performance Ratio, calculated applying the method defined above.

d (%) is the degradation factor with a value of [0.7%] per year.

PPA_{Year} (USD/kWh) is the price per kWh generated by the System for the corresponding year, with a value of [$0.18/kWh] and considering applicable escalation rates.

i (%) is the discount rate which value is [6%.]

Buydown Liquidated Damages are applicable to the total lifetime of the System which is 25 years.

13 General Performance Conditions

Equipment required for normal operation of the System will be operated in automatic or manual modes, as applicable. Pyranometer domes are to be routinely cleaned to maintain accurate plane of array irradiance measurements. During the Warranty Period, Contractor and its Subcontractors will have access to operating data for purposes of monitoring and calculating performance.

14 Data Collection

Performance data may be logged by the System data acquisition system or by the control systems supplied with the equipment. All performance data will be maintained for future analysis. The following data is required to be recorded and maintained for each project:

1. 5 min interval measurements in *.csv format for each project:
    a. Energy from billing meter (at point of grid interconnection)
    b. Plane of array irradiance (for each pyranometer)
2. Records logged in the Data Acquisition System including operation data and event logs.
3. Billing meter invoices and reports.
4. Proof that Data Acquisition System is integrated with other business systems, e.g., billing invoices are consistent with energy metered.

15 Force Majeure

In the event of a Force Majeure Event as defined in the Agreement, the Actual Performance Ratio will be modified by removing the affected hours from the accumulated plane of array irradiation for the corresponding year.

16 Financial Security

Contractor shall post financial security for the Performance Guarantee in the form of a letter of credit.

17 Test Report

A written test report will document performance guarantee data, calculations, and results. The report will include the following items:

- Date and time of performance period start and finish

- Description of the operating conditions
- Weather station instrument calibration data
- Raw performance data from the data acquisition system
- Performance calculations
- Performance guarantee results
- Conclusions

21. Appendix K – Confidentiality and Non-Disclosure Agreement

CONFIDENTIALITY
AND NON-DISCLOSURE AGREEMENT

THIS CONFIDENTIALITY AND NON-DISCLOSURE AGREEMENT ("Agreement") is made effective as of the ___day of _____ 2016 by and between PORTLAND GENERAL ELECTRIC COMPANY ("PGE"), having its principal office at 121 SW Salmon Street, Portland, Oregon 97204 and _____("Counterparty"), having its principal office at

_____.

Throughout this Agreement PGE and Counterparty may sometimes be individually referred to as a "Party" and collectively as the "Parties."

WHEREAS, PGE is in the process of acquiring electricity resources to fulfill certain electricity resource needs; and

WHEREAS, PGE will issue a Request For Proposals ("RFP") to fulfill those resource needs; and

WHEREAS, the Parties desire to investigate the possibility of executing a transaction (the "Transaction") to meet some of those resource needs; and

WHEREAS, in order to pursue that possibility, PGE and Counterparty will provide to each other certain information which the providing Party considers to be proprietary and confidential.

NOW THEREFORE, the Parties agree as follows:

The disclosure of confidential information pursuant to this Agreement is subject to the following conditions and limitations:

1. As used herein, "Confidential Information" means all oral or written non-public, confidential or proprietary information given or otherwise delivered by one Party (hereinafter the "Disclosing Party") to the other Party (hereinafter the "Receiving Party"), designated in writing or stamped as "confidential" at the time of delivery to the Receiving Party or its directors, officers, employees, representatives, advisors, contractors or agents (collectively, "Representatives"), by the Disclosing Party or its Representatives, together with analyses, compilations, studies, notes or other documents prepared by the Receiving Party or its Representatives which contain or reflect Confidential Information. Confidential Information does not include information which (a) is, or becomes, publicly available, other than through the wrongful act of the Receiving Party; (b) was in the possession of the Receiving Party prior to receipt from the Disclosing Party, (c) is independently developed by the Receiving Party, provided that it was not derived from any Confidential Information received from the Disclosing Party, or (d) information that

was obtained by the Receiving Party from a third party who, insofar as is known to the Receiving Party, is not prohibited from transmitting the information by a contractual, legal or fiduciary obligation.

2. The term "person" as used in this Agreement, shall be interpreted broadly to include, without limitation, any corporation, company, entity, partnership, group, regulatory agency, or other governmental entity, or individual.

3. Except as otherwise required by law, rules or regulations, the Receiving Party agrees that it will, in the same manner as it protects its own confidential information, hold in trust and confidence and not disclose any Confidential Information to any person not authorized by this Agreement.

4. The Receiving Party will restrict access to Confidential Information to such of its Representatives who have a need to know as is reasonably necessary for the purposes described herein. Each such recipient of Confidential Information shall be informed by the Receiving Party of its confidential nature, and shall be directed to treat such information confidentially and shall agree to abide by the provisions of this Agreement. In any event, the Receiving Party shall be responsible for any breach of this Agreement by any person to whom it discloses Confidential Information, other than disclosures pursuant to paragraph 5 of this Agreement. PGE shall not be required to return any bids or exhibits supplied to PGE during the RFP process.

5. In the event that the Receiving Party is required by subpoena, oral deposition, interrogatories, request for production of documents, administrative order, process or otherwise, to disclose any Confidential Information, the Receiving Party shall give the Disclosing Party notice of same as soon as reasonably practicable so that the Disclosing Party may seek an appropriate protective order or waive compliance with the terms of this Agreement. If, in the absence of a protective order or waiver, the Receiving Party is compelled to disclose any Confidential Information, the Receiving Party may make such disclosure without any liability under this Agreement, and to the extent permissible, will give the Disclosing Party prior notice of such disclosure. Notwithstanding the foregoing, PGE may disclose Confidential Information pursuant to the following Protective Order (or other Protective Order(s) that may be issued by the OPUC in connection with the RFP or related proceedings): Order No. _____ dated _____ (as such Orders may be modified by the OPUC) under this paragraph 5. In addition, PGE may disclose Confidential Information to the Independent Evaluator retained by PGE for the RFP.

6. Counterparty agrees that PGE Confidential Information may not be used for any purpose other than in connection with the Transaction or as otherwise permitted by this Agreement. Counterparty acknowledges and agrees that PGE may, subject to the confidentiality provisions contained in this Agreement and the terms of any RFP documentation delivered by PGE to Counterparty, use its Confidential Information generally in the RFP process or related proceedings and in connection with the Transaction.

7. Receiving Party will maintain and comply with administrative, technical and physical safeguards that are designed to protect the security and integrity of the Confidential Information, including in connection with any transfer, communication, remote access or storage of the Confidential Information as permitted or required under this Agreement. Receiving Party will immediately notify the Disclosing Party of any unauthorized disclosure or use of the Disclosing Party's Confidential Information.

8. Neither Party is obligated by this Agreement to enter into any negotiations or any transaction. Each Party will bear its own costs and expenses, including legal fees and fees of any advisors and the costs incurred by it in the development of appropriate documentation with respect thereto. The Parties agree that no joint venture, partnership or other fiduciary relationship shall be deemed to exist or arise between them as a result of this Agreement.

9. Neither the Disclosing Party nor any of its Representatives make any representation or warranty, expressed or implied, as to the accuracy or completeness of the Confidential Information disclosed to the Receiving Party.

10. The Receiving Party understands and agrees that money damages would not be a sufficient remedy for any breach of this Agreement and that the Disclosing Party shall be entitled to injunctive relief as well as reimbursement by the Receiving Party for legal and other expenses as a remedy for any such breach, including expenses for any appeal therefrom or review thereof so long as the Disclosing Party prevails. Such remedy shall not be deemed to be the exclusive remedy for the breach of this Agreement but shall be in addition to all other remedies provided for hereunder.

11. **IN NO EVENT SHALL EITHER PARTY'S LIABILITY UNDER THIS AGREEMENT EXCEED ONE HUNDRED THOUSAND DOLLARS ($100,000), AND NEITHER PARTY SHALL BE LIABLE FOR UNDER THIS AGREEMENT FOR ANY SPECIAL, INCIDENTAL, INDIRECT OR CONSEQUENTIAL DAMAGES.**

12. In the event that any party institutes any legal suit, action or proceeding, including arbitration, against the other party to enforce the covenants contained in this Agreement, the prevailing party in the suit, action or proceeding shall be entitled to receive in addition to all other damages to which it may be entitled, the costs incurred by such party in conducting the suit, action or proceeding, including reasonable and actual attorneys' fees and expenses and court costs.

13. It is understood and agreed that no failure or delay in exercising any right, power or privilege hereunder shall operate as a waiver thereof, nor shall any single or partial exercise thereof preclude any other or further exercise thereof or the exercise of any right, power or privilege hereunder.

14. This Agreement constitutes the entire agreement of the Parties with respect to the matters contained herein, and supersedes all prior understandings or agreements, written

or oral, on these matters. No waiver or amendment of this Agreement shall be effective unless it is in writing and signed by both Parties.

15. The confidentiality obligations of this Agreement shall remain in effect for two (2) years from the date hereof.

16. This Agreement shall be governed by and construed under the laws of the State of Oregon without regard to its conflicts-of-laws or principles. With respect to any suit, action or proceedings relating to this Agreement (the "Proceedings"), each Party irrevocably submits to the exclusive jurisdiction of the courts of the State of Oregon and the United States District Court located in Multnomah County, Oregon and irrevocably waives any objection which it may have at any time to the laying of venue of any Proceedings brought in any such court, waives any claim that such Proceedings have been brought in an inconvenient forum and further waives the right to object, with respect to such Proceedings, that such court does not have jurisdiction over such Party. Nothing in this Agreement precludes either Party from enforcing in any jurisdiction any judgment, order or award obtained in any such court.

17. PGE AND COUNTERPARTY WAIVE ANY RIGHT TO TRIAL BY JURY OR TO HAVE A JURY PARTICIPATE IN RESOLVING ANY DISPUTE, WHETHER SOUNDING IN CONTRACT, TORT, OR OTHERWISE, BETWEEN PGE AND COUNTERPARTY ARISING OUT OF THIS AGREEMENT OR OTHER INSTRUMENT, DOCUMENT, OR AGREEMENT EXECUTED OR DELIVERED IN CONNECTION HEREWITH.

IN WITNESS WHEREOF, the Parties have executed this Agreement by and through their duly authorized representatives, effective as of the day first above written.

PORTLAND GENERAL ELECTRIC COMPANY	(COUNTERPARTY)
By:_____	By:_____
Name:_____	Name:_____
Title:_____	Title:_____

22. Appendix L – Credit Guidance

A Bidder must provide reasonable assurance to PGE that PGE will be able to readily recover its actual damages in the event of any default by the Bidder. PGE's customers should not be at risk for the cost of replacement power as a result of counterparty default during the life of the contract.

All transactions are contingent upon the Bidder meeting and maintaining the credit requirements established by PGE's Credit Risk Management Department:

- Bidder's or Bidder's credit support provider's (if any) long-term, senior unsecured debt, that is not supported by third-party credit enhancement, must be rated by one or more of the following agencies as follows: BBB- or higher by Standard & Poor's and Fitch, BBB (low) by DBRS, or Baa3 or higher by Moody's Investor Services, Inc. If the Bidder or Bidder's credit support provider is rated by more than one agency, PGE will consider the lowest rating.
- All Bidders will be subject to review under PGE's internal guidelines by PGE's Credit Risk Management Department for qualification.

In addition the Bidder must provide performance assurance in a form and amount acceptable to PGE based on PGE's assessment of the Bidder's and/or Guarantor's credit profile and the amount of expected financial exposure related to the bid. Power purchase agreement (PPA) options also include credit requirements.

Performance Assurance

The performance assurance will be held throughout the term of the contract. The performance assurance will take the form of one or more of the following:

a) Cash;

b) an irrevocable, transferable, standby letter of credit issued by a Qualified Institution in a form and substance acceptable to PGE;

c) payment and performance bond in a penal sum equal to 100% of the contract price issued by a Qualified Institution in a form and substance acceptable to PGE; and/or

d) a guaranty of the Bidder's payment and performance obligations from an entity with a credit rating on long-term, senior unsecured debt by one or more of the following agencies: BBB- or higher by Standard & Poor's and Fitch, BBB (low) by DBRS, or Baa3 or higher by Moody's Investor Services, Inc.

PGE may consider alternative forms of performance assurance if requested.

Any entity acting as a guarantor for the Bidder will be required to provide PGE with audited financial statements for the previous three years as well as its credit ratings. "Qualified Institution" means a major U.S. commercial bank or a U.S. branch office of a major foreign commercial bank which is acceptable to PGE, a trust company (which is not an affiliate of the Bidder) organized under the laws of the United States (or any state or political subdivision thereof) with such bank having shareholders' equity of at least $10 billion (U.S. Dollars) and a Credit Rating of at least A- by S&P or A1 by Moody's, or an insurance company with assets of $2 billion or greater, an A.M. Best financial strength rating of an A or greater and authorized to issue surety bonds in the state in which the project resides.

In the event the Bidder or its guarantor experiences a material adverse change (i.e., is no longer creditworthy as defined above or as defined in the negotiated contract) during the life of the contract, Bidder may be required to provide additional eligible performance assurance as defined above.

In the event the Bidder or its credit support provider is no longer creditworthy at any time prior to execution of a contract, a new credit support provider will be required to provide a replacement commitment as defined above.

Credit Requirements for Power Purchase Agreements

For long-term Power Purchase Agreements (PPA), PGE will require pre-COD (for facilities not yet constructed) and post-COD performance assurance to provide adequate protection if a default occurs after execution of the PPA, but prior to COD or after COD, during the PPA term. PGE requests that Bidders include the cost of adequate, acceptable performance assurance as part of their bid proposal as shown below and any departures from this credit amount need to be explicitly stated in the PPA term sheet at minimum with a mark-up of the Form PPA also strongly encouraged.

Timing	Performance Assurance
Pre-COD Amount	$25 / kW*
Post-COD Amount	18 months of estimated Facility revenue**

* The kW amount referred to is based on Expected Capacity.

**The estimated Facility revenue will be based on the Expected Facility Output and the Contract Price.

In the event of an alternate structure for long-term sale of energy and Renewable Energy Credits (RECs), PGE may consider implementing fluctuating performance assurance that represents an estimate of its exposure to rising energy prices and feasibly to the market cost of compliant RECs. This would be calculated by taking the difference of the current market forward price for power and RECs versus the contract price for both for the prompt three years, and multiplying this difference by the forecasted or firm megawatt hours for delivery over the same prompt three year period. The performance assurance requirement may be reduced by any credit threshold (see below) granted to Bidder by PGE. PGE calculates these exposures at least once a week. Below are three examples of calculated exposures showing just a forward price rise on an energy contract (RECs not shown; assuming 16 hours per day):

Annual MWa	Contract Days/Year	Contract Price $MWh	Market Forward Price $MWh	Performance Assurance Required (PAR)
PAR = MWa X Contract Days/Year X 16 hrs X (Mkt Price - Contract Price) X 3				
100	365	$ 29.40	$ 29.40	$ -
100	365	$ 29.40	$ 33.60	$ 7,358,400
100	365	$ 29.40	$ 37.80	$ 14,716,800

Potential Credit Threshold Provided by PGE

For some energy and REC sale structures (as mentioned above), Bidders may be eligible for a credit threshold amount. A Bidder that has a credit rating on long-term, senior unsecured debt by one or more of the following agencies: BBB- or higher by Standard & Poor's and Fitch, BBB (low) by DBRS, or Baa3 or higher by Moody's Investor Services, Inc. may be eligible for a credit threshold to be applied against the performance assurance. The table below provides a range of potential thresholds for which a Bidder may be eligible. These amounts may be increased or decreased by PGE Credit Risk Management based on other factors such as financial analyses, bid type and overall risk assessment.

	Credit Threshold (Estimated) Matrix			
	Range of Moody's Credit Rating			
Tangible Net Worth	**Aaa - A1**	**A2 - A3**	**Baa1 - Baa2**	**Baa3**
Up to $250M	1,000,000	500,000	250,000	125,000
$251M to $500M	1,650,000	825,000	412,500	206,250
$501M to $750M	2,500,000	1,250,000	625,000	312,500
$750M to $1B	7,500,000	3,750,000	1,875,000	937,500
$1B to $25B	10,000,000	5,000,000	2,500,000	1,250,000
$25 to $50B	15,000,000	7,500,000	3,750,000	1,875,000
Over $50B	20,000,000	10,000,000	5,000,000	2,500,000

If the Bidder or guarantor is an established counterparty of PGE, then the combined amounts of existing thresholds and the additional threshold will not exceed the above amounts, after any adjustments made by PGE Credit Risk Management.

Credit Threshold Provided to PGE

Any determination of credit threshold will consider (but is not limited to) factors such as company size, credit rating, bid type, and payment history.

Attachment 1

GUARANTY COMMITMENT LETTER

(Must be on letterhead of Bidder's credit support provider)

Portland General Electric Company
121 SW Salmon Street
3 World Trade Center - 0306
Portland, Oregon 97204
Attn: Credit Dept.

Dear Sirs:

_____, ("Bidder") (insert Bidder name) plans to submit a bid in response to the Portland General Electric Company's 2016 Renewable Resources Request For Proposals ("RFP"). Bidder is the _____ (insert nature of relationship, e.g., wholly owned subsidiary, affiliate, etc.) of the undersigned. The undersigned will directly benefit from the bid submitted by Bidder into the RFP. And the undersigned and Bidder have their own, separate legally enforceable arrangement with respect to the undersigned's promise set forth in this letter.

The undersigned promises and agrees that, should you enter into a transaction with Bidder arising out of any bid submitted by Bidder in the RFP, with terms and conditions mutually acceptable to you and Bidder, 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, plus expenses of enforcing the guaranty.

We understand that said guaranty is a required element in evaluating the Bidder's bid and that the execution and delivery of the guaranty is a condition precedent to you entering into an agreement with Bidder. We also understand that you are under no obligation to enter into any agreement with Bidder, under the RFP or otherwise.

Yours truly,

(Name of guarantor)
(Name of authorized officer)
Attachment 2

LETTER OF CREDIT COMMITMENT LETTER

(Must be on letterhead of Bidder's letter of credit issuer)

Portland General Electric Company
121 SW Salmon Street
3 World Trade Center - 0306
Portland, Oregon 97204
Attn: Credit Dept.

Dear Sirs:

_____, ("Bidder") (insert Bidder name) plans to submit a bid in response to the Portland General Electric Company's 2016 Renewable Resources Request For Proposals ("RFP"). The undersigned promises 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 said letter of credit is a required element in evaluating the Bidder's bid and that the execution and delivery of the letter of credit is a condition precedent to you entering into an agreement with Bidder. We also understand that you are under no obligation to enter into any agreement with Bidder, under the RFP or otherwise.

Yours truly,
(Name of letter of credit issuer)

23. Appendix M – Detailed Scoring Criteria

Bid Scoring Categories:	Max Score	% of Total Score	Description	Individual Categories	Maximum Scoring	
1. Price Score	600	60%	Includes fixed and variable bid costs compared to a market price. Will include integration service based on PGE wind integration study for those who do not provide integration services	The price score will be calculated as the ratio of the bid's projected total cost per MWh to forecast market prices using real-levelized or annuity methods (per Guideline 9a. of the Competitive Bidding Guidelines). See also 'Price Factor' in PGE's 2016 Request for Proposals - Renewable Energy Resources	600	
2. Project Development Criteria	150	15%	Includes development team experience, permitting	Project already in service	150	Projects in Service
				Permitting status (emissions, makeup water, waste discharge, land use, zoning, aviation, telecommunication)	50	Projects in Development
				Experience of Project Team	35	
				Project Financing	15	
				Site Control: Including all rights required for project including access to the project site, easements and resources rights appropriate for the project	50	
				Federal Tax Credit Eligibility & Capture Risk	-50	
3. Project Characteristics	120	12%	Interconnection, Transmission rights, Diversity	Resource Location	4	
				Interconnection Rights	30	
				Transmission Rights: Long Term Firm Transmission to PGE Load	30	
				Projects Subject to Curtailment and Dispatch Limitation	-10	
				Capacity Value of Project	20	
				Project and Geographic Diversity	-10	
				Value of extension (PPA/equity)	15	
				O&M Reliability Characteristics	12	For Biomass and Biogas
				Project Fuel Supply	9	
				O&M Reliability Characteristics	12	For Wind Geothermal Hydroelec
				Resource Risk (quality and amount of data for proposed project)	9	
4. Power Product Characteristics	80	8%	Quality of power, guarantees, length of contract	Quality of Power	10	
				Performance Guarantee / Liquidated Damages	15	
				Length of contract commitment	25	
				Contract/Resource start Date	15	
				Amount (in MWa) of contract commitment	15	
				Variability of Bid Cost	-30	
				Technological Maturity	-100	
5. Credit Evaluation (PPA)	50	5%	Collateral requirement, credit threshold, cross default	PGE proprietary financial scoring based on liquidity ratios, profitability ratios, leverage ratios and financial statement audit quality. The scores and weight given to each of the input will be consistent with PGE Credit Risk Management internal procedures.	50	Credit Evaluation will be based on proposed structure
6. Credit Evaluation (Equity)			This is only used for equity bids for projects still in construction. Score is based on counterparty's ratio and debt rating (mutually exclusive with 5. Credit Evaluation (PPA))	PGE ratio analysis score	17.5	
				Bond Rating	17.5	
				Net Tangible Worth	10	
				Liquidity	2.5	
				Corporate Structure	2.5	
Total Score	1,000	100%			1,000	

Note: Score weights for score deductions are shown at the maximum negative amount possible.