

October 25, 2022

VIA ELECTRONIC FILING

Public Utility Commission of Oregon
Attn: Filing Center
201 High Street SE, Suite 100
Salem, OR 97301-3398

Re: UM 2193— Informational Update to PacifiCorp’s 2022 All Source Request for Proposals

PacifiCorp dba Pacific Power & Light Company (PacifiCorp), subsequent to informal conversations with Public Utility Commission of Oregon (OPUC) Staff and at their request, submits the following enclosed updates to the 2022 all source request for proposal (2022AS RFP):

1. PacifiCorp is updating the following items in its RFP schedule. First, PacifiCorp will delay the benchmark bid deadline and receipt of benchmark bids from November 21, 2022, to December 6, 2022, in order to allow for more time to finalize modeling and evaluation assumptions prior to opening benchmark bids. Based on feedback from Utah’s independent evaluator, PacifiCorp will push the deadline for notice of intent to bid (NOI) submission from November 17, 2022, to December 16, 2022, and the Company will extend the last day for RFP questions from bidders to the independent evaluators from November 1, 2022, to January 13, 2023. Section 3.A of the Main RFP Document states the schedule is subject to changes and so the Company has updated the Main RFP Document and the RFP website to reflect the schedule changes.
2. PacifiCorp is updating Appendix A-1.4 (BTA) Solar Work Specifications and Appendix A-1.6 (BTA) Battery Energy Storage System Technical Specification to remove certain suppliers from the preferred vendor lists. These technical specifications are only applicable to Benchmark and BTA bids for resource ownership by PacifiCorp. The changes reflect certain companies for which PacifiCorp has cyber security and other government tariff-related concerns and have therefore been removed from preferred vendor lists by PacifiCorp for owned resources.

3. PacifiCorp is updating Appendix O PacifiCorp's Company Alternative (Benchmark Resource) following approval by the Utah commission as required as part of Docket No. 21-035-52. PacifiCorp has changed the list of resources it may consider for benchmark bids.
4. PacifiCorp is updating Appendix S Berkshire Hathaway Energy Cyber Security Requirements including Appendix S-1 Berkshire Hathaway Energy Cyber Security Attestation. The approved 2022AS RFP included a note stating that cyber security is an evolving issue with growing importance to the electric power industry and that PacifiCorp was developing security requirements for proforma contracts as well as an attestation form which would be requested of all bidders. PacifiCorp has finalized its Cyber Security requirements which it will request all bidders to review and either agree or list exceptions to upon notice of intent to bid and which will be reflected in any final contracts for generating and energy storage resources.
5. PacifiCorp has clarified on its 2022AS RFP website that a separate voluntary targeted demand-side RFP will not be required and interested demand-side bidders may participate via the 2022AS RFP. As indicated in its 2022AS RFP, PacifiCorp stated that it may pursue a voluntary targeted demand-side RFP in August 2022. PacifiCorp has not identified any specific needs that would require PacifiCorp to pursue such a voluntary targeted demand-side RFP in August 2022, and this is reflected in edits made to the RFP schedule posted to the 2022AS RFP. Interested demand-side bidders may submit a bid to the 2022AS RFP by following Appendix Q. All demand-side bids are due February 14, 2023, the market bid deadline.

PacifiCorp has updated its 2022AS RFP website to reflect the items above and intends to informally communicate the changes above via an email to the bidders on its 2022AS RFP distribution list, which includes developers, contractors, regulators, and other interested parties.

It is respectfully requested that all formal correspondence and Staff requests regarding this material be addressed to:

By email (preferred): datarequest@pacificorp.com

By regular mail: Data Request Response Center
PacifiCorp
825 NE Multnomah St Ste 2000
Portland OR 97232-2152

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Please direct any informal correspondence and questions regarding this filing to Cathie Allen
Regulatory Affairs Manager at (503) 813-5934.

Sincerely,

A handwritten signature in blue ink that reads "Shelley McCoy". The signature is written in a cursive style.

Shelley McCoy
Director, Regulation

Enclosures

UM 2193 PAC 2022AS RFP Main Document schedule Update 10-25-2022
UM 2193 PAC 2022AS RFP App A-1.4 Solar Work Specifications 10-25-2022
UM 2193 PAC 2022AS RFP App A-1.6 BESS Tech Specifications 10-25-2022
UM 2193 PAC 2022AS RFP App O PacifiCorp Benchmark Resources 10-25-2022
UM 2193 PAC 2022AS RFP App S Cyber Security Requirements Update 10-25-2022



2022 All-Source Request for Proposals

(2022AS RFP)

ISSUED: Friday April 29, 2022

DUE DATES:

Benchmark Bids: ~~Monday November 21~~

Friday December 9, 2022 5:00 PPT

Market Bids: Tuesday February 14, 2023 5:00 PM PPT

PacifiCorp
RFP 2022AS
Resource & Commercial Strategy
2022AS_RFP@PacifiCorp.com

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SECTION 1. OVERVIEW

A. PURPOSE AND SCOPE OF RFP

PacifiCorp established an action item out of PacifiCorp's 2021 Integrated Resource Plan (IRP) to conduct an all-source request for proposals (2022AS RFP) and acquire new resources. The 2021 IRP preferred portfolio includes the following incremental resources:¹

1. 1,345 megawatts (MW) of new proxy supply-side wind and solar generation resources and 600 MW of collocated energy storage resources with commercial operation date ("COD") by December 31, 2026.²
2. new proxy demand response resources.³

The 2022AS RFP will accept and evaluate all resource types,⁴ including small-scale and distributed resources, which meet the minimum criteria of this RFP listed in Section 3.I. Prior to the determination of the final shortlist bids in July 2023, the 2022AS RFP will incorporate the results of any separate, voluntary targeted demand response RFP. The two RFPs will dovetail and be evaluated at the same time using the IRP portfolio optimization models. Resource procurement to be pursued as part of the 2022AS RFP process timeline include:

1. This all-source RFP (2022AS RFP) released in April 2022 with market bids due February 14, 2023, and
2. In the event additional demand response resource need is identified through Company planning processes, a voluntary targeted demand-side resource RFP will be issued by August 31, 2022.

¹ [2021 IRP Volume I \(pacificorp.com\)](https://www.pacificorp.com/content/dam/pcorp/documents/en/pacificorp/energy/integrated-resource-plan/2021-irp/Volume%20I%20-%209.15.2021%20Final.pdf):

<https://www.pacificorp.com/content/dam/pcorp/documents/en/pacificorp/energy/integrated-resource-plan/2021-irp/Volume%20I%20-%209.15.2021%20Final.pdf>

² The figures for solar and wind exclude resource capacity added to meet assumed customer preference targets that are included in the 2021 IRP preferred portfolio.

³ 274 MW of proxy demand response resources were selected between 2022-2026 in the 2021 IRP. The Company is currently expanding its existing programs and contracting for new demand response resources identified in the 2021 demand response RFP, therefore total demand response resources needed may differ prior to the issuance of any further demand side RFP.

⁴ WAC 480-107-009 Required all-source RFPs and conditions for voluntary targeted RFPs. (1) All-source RFP requirements. All-source RFPs must allow bids from different types of resources that may fill all or part of the characteristics or attributes of the resource need. Such re-source types include, but are not limited to, unbundled renewable energy credits, conservation and efficiency resources, demand response or other distributed energy resources, energy storage, electricity from qualifying facilities, electricity from independent power producers, or other resources identified to contribute to an equitable distribution of energy and nonenergy benefits to vulnerable populations and highly impacted communities.

Demand response bidders may bid into one or both of the RFPs.⁵

Bidders bidding into the 2022AS RFP will be required to pay bid fee(s) and provide firm pricing at the time of bid and hold bids through November 21, 2023.

PacifiCorp will use the results of this 2022AS RFP as well as any voluntary targeted demand-response RFP to fulfil resource needs for system customers and state compliance obligations. The resource valuation and selection process will be based on PLEXOS, the portfolio optimization tool used for the IRP to ensure process consistency and fairness to the customers across PacifiCorp's six state territory.

After PacifiCorp selects the least cost, least risk resources on behalf of all system customers consistent with the resource need identified in the 2021 IRP,⁶ PacifiCorp may find it requires additional resources to comply with regulations in one or more of its six states.⁷ Following the selection of system resources for the final shortlist on behalf of PacifiCorp's six-state customers, PacifiCorp will consider additional compliance requirements for specific states with clean energy compliance obligations, and potentially add state-specific resources to ensure those compliance obligations are met. This secondary, discretionary process will not impact the outcome of the least-cost, least-risk resources chosen for system customers and state regulatory requirements. Any additional acquisitions, in order to meet Washington CETA compliance obligations for example, will be allocated to the state(s) where the obligation requires additional resources.

Following PacifiCorp's selection of resources for system customers and any additional resources required to meet specific state compliance obligations, PacifiCorp may conduct a secondary process to match renewable resource bids not chosen to the final shortlist with customers interested in voluntary renewable programs. This secondary, discretionary process will not impact the outcome of the least-cost, least-risk resources chosen for system customers and state regulatory requirements.

The 2022AS RFP will consider new and existing resources so long as they can achieve commercial operation and/or begin deliveries to PacifiCorp by December 31, 2027; however, PacifiCorp has a preference for bids which can come online by the end of 2025 or during 2026. PacifiCorp will also

⁵ The Company is currently in the process of contracting demand response resources from the 2021 DR RFP. The company also has significant DR resources on the system that can be expanded to meet certain resource needs. Thus, while the 2021 IRP identified additional demand response resource needs, the Company may or may not have an incremental need beyond existing programs and ongoing procurement efforts. In the event additional demand response resource need is identified, PacifiCorp will issue a voluntary targeted RFP by August 31, 2022 outlining the specific remaining incremental resource needs, including type, location and timing.

⁶ The estimated avoided cost will be based on the values determined through the IRP modeling process. Values can be found in Volume I, Chapter 8 (Modeling and Portfolio Evaluation Approach) and Chapter 9 (Modeling and Portfolio Selection). PacifiCorp provides a preliminary determination of accrual of energy and non-energy benefits within Volume II, Appendix O (Washington Clean Energy Action Plan).
<https://www.pacificorp.com/content/dam/pcorp/documents/en/pacificorp/energy/integrated-resource-plan/2021-irp/Volume%20I%20-%209.15.2021%20Final.pdf>

⁷ Washington CETA and Oregon HB2021

consider bids for long –lead-time resources,⁸ so long as commercial operation can be achieved by December 31, 2028. Bidders who may have questions about resource eligibility should submit a question to PacifiCorp for clarification along with documentation supporting their contention that the resource would qualify as a long-lead time resource. Resources bid into the 2022AS RFP must be capable of timely interconnecting with PacifiCorp’s transmission system (PACE or PACW) or, in the case of resources interconnecting to a third-party transmission system, delivering to PacifiCorp’s transmission system prior to the bidder’s proposed COD.

This document outlines the 2022AS RFP rules and processes. PacifiCorp is not bound to accept any bids and may cancel this solicitation at any time and at its own discretion.

B. INTERCONNECTION REQUIREMENTS AND EXISTING CONSTRAINTS

Resources bid into the 2022AS RFP must demonstrate their ability to interconnect with or, in the case of resources interconnecting to a third-party transmission system, deliver to PacifiCorp’s transmission system. Bids must include at least a completed interconnection study by the applicable interconnection provider (PacifiCorp Transmission or the applicable third-party transmission provider if the project is or will propose to be interconnected to a third-party system), which may include a i) completed fast track interconnection study,⁹ ii) completed PacifiCorp Transmission cluster study, or iii) signed interconnection agreement. In the case of proposed projects that have or propose to interconnect with a third-party transmission system, bids must further provide satisfactory evidence of firm point-to-point transmission rights sufficient to deliver the full output of the project to PacifiCorp’s transmission system on or before December 31, 2027, or December 31, 2028, for long-lead time resources and must detail all actual or estimated transmission costs.

The 2021 IRP included a schedule of potential transmission upgrades provided in **Appendix H-1 – 2021 PacifiCorp IRP Preferred Portfolio Transmission Upgrade Selections**,¹⁰ and the IRP preferred portfolio picked proxy resources in the locations enabled by associated transmission upgrades selected by the 2021 IRP preferred portfolio as summarized in **Appendix H-2 2021 PacifiCorp IRP Preferred Portfolio Proxy Resource Selections**.

Bidders are encouraged to research the publicly available information related to executed LGIAs, PacifiCorp Transmission’s Transition Cluster Study, and PacifiCorp Transmission’s Cluster Study I available on PacifiCorp’s Open Access Same-time Information System (OASIS). In **Appendix H-3 -**

⁸ Nuclear, geothermal or pumped storage hydro for example. Other long-lead resources approved on a case-by-case basis via request to the RFP inbox and in consultation with the IEs. Resources are considered long-lead time resources if they require a state or federal licensing process and a prolonged construction cycle outside the normal scope of wind/solar renewable development cycle projects. Such federal licensing requirement do not include pursuing federal (BLM) land rights.

⁹ Section 50 in the OATT (V. SMALL GENERATION INTERCONNECTION SERVICE)

¹⁰ August 27, 2021 IRP meeting, slide 8: [8.27.2021 PacifiCorp IRP PIM](#)

PacifiCorp Transmission: Summary of OASIS queue positions, PacifiCorp has provided a summary of the following OASIS reports at the time of RFP issuance:

1. Active Serial Queue Positions
2. Executed Interconnection Agreements – Not in Service
3. Transition Cluster Study
4. First Annual Cluster Study (Cluster Study 1)

The signed LGIAs are binding contractual agreements with PacifiCorp’s Transmission function, and therefore, reflect reserved interconnection capacity in certain locations on PacifiCorp’s transmission system. Such LGIAs may be updated from time-to-time subject to the Open Access Transmission Tariff (OATT) rules as requests may be withdrawn and consequently areas and individual resources may be restudied.

PacifiCorp will conduct a Workshop or Technical Conference for bidders regarding the interconnection process and transmission assessment shortly after issuance of the RFP on May 4, 2022. For more information and webinar/teleconference information, visit PacifiCorp’s 2022AS RFP website.¹¹

C. TRANSACTION TYPE

PacifiCorp is accepting qualified proposals for i) existing resources from bidders who currently own or have legally binding rights to operate existing resources, and ii) new resources from bidders with development rights to construct new resources. PacifiCorp will accept bids in the 2022AS RFP from existing operating facilities subject to the following conditions:

- Bidder cannot terminate an existing contract to bid into the 2022AS RFP;
- The existing contract must expire before the required on-line date as proposed in a bidder's bid but no later than December 31, 2027; and
- Bid must meet all other requirements in the 2022AS RFP.

Resources must be individually metered and remotely monitored. PacifiCorp has a preference for resources which can be dispatched but will also accept non-dispatchable resources.

PacifiCorp will consider proposals with the following transaction structures:

1. Benchmark transaction whereby the utility proposes to develop, construct, own and operate a bid project. Under this transaction structure, PacifiCorp will be responsible for all required development, design, equipment supply, construction, commissioning, and performance testing.
2. Build-transfer transaction whereby the bidder develops the project, assumes responsibility for construction and ultimately transfers the asset to PacifiCorp in accordance with the terms of a build-transfer agreement (BTA). Under this transaction

¹¹ <https://www.pacificorp.com/suppliers/rfps/2022-all-source-rfp.html>

structure, the bidder will be responsible for all development, design, equipment supply, construction, commissioning, and performance testing, and will be required to design and construct the resource in conformance with PacifiCorp's specifications. PacifiCorp will only be acquiring the bidder's assets under the BTA structure and will not consider BTA bids that involve the ultimate transfer of a project company to PacifiCorp. PacifiCorp provides a term sheet with this RFP that must guide any BTA bid. PacifiCorp will accept BTA offers for all resource types but only resources interconnecting directly to PacifiCorp's transmission system.

3. Power-purchase agreement (PPA) transaction with exclusive ownership by PacifiCorp of any and all energy, capacity, ancillary services and environmental attributes associated with the generation. PacifiCorp will consider PPA terms between 5 and 30 years.¹² PacifiCorp provides two forms of PPA: generation-only resources and generation resources collocated with a battery energy storage system (BESS) resource. With respect to collocated resources, the term length must be the same term for both the generation and the storage resource. PacifiCorp requires full dispatch control of the collocated or standalone battery (charge and discharge) as addressed in contractual terms in the applicable appendices to this 2022AS RFP.
4. Tolling Agreement, transaction whereby PacifiCorp controls the output of a standalone storage resource (BESS, Pumped storage hydro (PSH) or other). PacifiCorp will consider Tolling Agreement terms between 5 and 30 years, or for PSH bids up to the term of the operating license.
5. Professional Services Contract for demand-side bids included in **Appendix Q-1 – Professional Services Contract**.

D. BENCHMARK RESOURCES AND AFFILIATE TRANSACTIONS

PacifiCorp may submit one or more self-build ownership proposals (benchmark resources) which are further described in **Appendix O - PacifiCorp's Company Alternative (Benchmark Resource)**. Benchmark bids will be required to submit all of the same RFP requirements as third-party BTA bids, as listed in **Appendix F-1 BTA Instructions to Bidders** with the exception of Appendix D, Appendix E-2, Appendix F-2, Appendix G-1, Appendix J, Appendix K, and Appendix S-1. As discussed in more detail in Section 6.F below, any PacifiCorp benchmark resource bids will be reviewed and evaluated by PacifiCorp's evaluation team, and both PacifiCorp and the IE(s) will have filed their evaluations of such benchmark resource bids with the Commission(s) consistent with the rules in each state, prior to PacifiCorp commencing review and evaluation of the non-market bids.

In order to provide for a transparent and fair process, the RFP will be conducted under the oversight of three IEs as further described in Section 2.A. The IEs will have been involved in the development of the RFP and will ensure the RFP process is conducted in a fair and reasonable manner. Potential bidders are invited and encouraged to contact the Oregon, Utah or

¹² Longer terms matching a bidder's operational license will be accepted.

Washington IE with questions or concerns. More information concerning the role of the IE is provided in **Appendix M - Role of the Independent Evaluator**.

E. OPERATING CAPABILITIES OF THE RESOURCE

PacifiCorp has a preference for dispatchable, renewable energy resources, standalone energy storage and collocated BESS with renewable energy generating resources. With respect to bids including storage, PacifiCorp is requiring full dispatch control of the collocated or standalone battery (charge and discharge) as addressed in contractual terms in the applicable appendices to this 2022AS RFP. All collocated storage bids shall be AC-coupled. All PPAs should be bid as an augmented system capable of maintaining the original storage power capacity and duration rating for the contract term, or otherwise able to maintain original capability, as bid. BTAs should offer unaugmented storage bids; however the storage facility should be developed and designed to allow for future augmentation in accordance with the specifications in **Appendix A – Technical Specifications and Required Submittals**. Benchmark resources shall be bid consistent with **Appendix O - PacifiCorp’s Company Alternative (Benchmark Resource)**.

All bids should comply with technical and operating specifications for Automated Generation Control (AGC) for automated signal operation and Automatic Voltage Regulation functionality and **be capable of following a four second signal**. Bidders should review and understand the North America Electric Reliability Corporation (NERC) guidelines regarding technical requirements.¹³ A more detailed description of operating requirements and specifications is included in **Appendix A – Technical Specifications and Required Submittals** by resource type.

Bidders must provide a description of the plant communications and control plan as part of their **Appendix C-3 – Energy Performance Report** response. The plan shall include a description and diagrams (as applicable) that demonstrate how bidder will provide BESS systems data, including state of charge, power charge/discharge status, and asset health indicators (temperature, HVAC alerts, emergency status, etc.) as well as BESS system control, including limitation of charging only from renewable energy production, if applicable, charge/discharge scheduling, and station service load.¹⁴

All forms of storage systems (Lithium Ion, Flow Battery, Pumped Storage Hydro etc.) are eligible to bid into its 2022AS RFP. Standalone BESS BTA bids must conform to the BESS specifications in **Appendix A – Technical Specifications and Required Submittals** and BTA bids with collocated storage resources should conform to both the both the generating resource specifications and the BESS specifications in Appendix A. Bids should ensure the BESS specifications are consistent between **Appendix B-2 – Bid Proposal Instructions and Required Information, Appendix C-2 – Bid Summary and Pricing Input Sheet and Appendix C-3 – Energy Performance Report** responses.

¹³ Please refer to NERC, Improvements to Interconnection Requirements for BPS-Connected Inverter-Based Resources, September 2019.

¹⁴ All station service and auxiliary load must be metered and purchased via retail tariff with load serving utility. Standalone and collocated BESS systems may not use charging energy or stored energy for station service or auxiliary load.

Collocated storage bids must be AC-coupled with centralized storage designs. PPAs with collocated batteries should be bid with augmentation, whereas BTAs should offer unaugmented bids based on designs which allow for augmentation at PacifiCorp's election. Benchmark resources should be bid consistent with **Appendix O - PacifiCorp's Company Alternative (Benchmark Resource)**. Battery augmentation is the replacement or addition of new batteries to an existing battery resource to assure performance based on contractual requirements. For more guidance on PacifiCorp's storage need, bidders are encouraged to review **Appendix A-1.6 Battery Storage Specification** and also review resource selection in PacifiCorp's most recent 2021 IRP.

Generation and storage resources that are bid as a BTA must meet both the general technical specifications and the resource-specific technical specifications defined in **Appendix A – Technical Specifications and Required Submittals**.

Demand-side resources: Bidders must comply with technical specifications listed in **Appendix Q – 2021 Demand Response RFP - Requirements for Demand-side Bids**.

SECTION 2. PROCEDURAL ITEMS

PacifiCorp will evaluate proposals based on the following:

- Conformance with the RFP minimum eligibility requirements,
- Cost to customers, which is modeled by PacifiCorp as associated with the bid,
- The deliverability – or viability – of the resource including: ability to interconnect or otherwise deliver to PacifiCorp by the proposed COD, site control, development maturity (status of site studies (geotechnical/cultural/environmental/avian/wildlife/fish), permitting status, developer's experience, procurement and supply chain plan, and demonstration that the project's COD will be achieved by December 31, 2027, or in the case of long-lead time resources, the ability to reach commercial operation by 2028,
- Conformance with the 2022AS RFP requirements related to transmission and interconnection (see Section 5.D and 5.E),
- Technical design, feasibility, and compliance with **Appendix A – Technical Specifications and Required Submittals**.
- Ability to provide acceptable credit security as determined per **Appendix D – Bidder's Credit Information**.
- Ability to reach a mutually agreeable contract generally in conformance with the terms attached in **Appendix E-2 – PPA Documents, Appendix E-3 – Tolling Agreement Documents, or Appendix F-2 – BTA Documents, or Appendix Q-1 – Professional Services Contract** for Demand-side Bids.

- Resources allocated to the state of Washington will be further evaluated according to WAC 480-107-035, including risks and benefits to vulnerable populations¹⁵ and highly impacted communities (“equity” criteria).
- Resources located and delivered to PacifiCorp’s system in California will be further evaluated according to Rulemaking 18-07-003.
- Demand-side resources will be evaluated according to **Appendix Q – 2021 Demand Response RFP - Requirements for Demand-side Bids**. For the purposes of the all-source RFP, demand-side resources are asked to follow the same process and complete the similar documents as the 2021 demand response RFP.¹⁶

Bidder is responsible for all bidder fees and all costs and expenses of any response to PacifiCorp in connection with its proposal for the 2022AS RFP. Such expenses may include but are not limited to i) bidders cost of providing additional information, **ii) a required success fee if project is selected to the final shortlist**, and iii) bidder's own expenses in negotiating and reviewing any documentation. PacifiCorp will have no liability arising out of or relating to PacifiCorp's rejection of any proposal, or bidder’s reliance upon any communication received from PacifiCorp, for any reason.

A. INDEPENDENT EVALUATOR

PacifiCorp is conducting the 2022AS RFP under the oversight of three independent evaluators (IEs). An IE has been retained by PacifiCorp on behalf of the Public Utility Commission of Oregon (Oregon Commission) as required by Oregon Administrative Rules § 860-89-200.¹⁷ A second IE has been retained by PacifiCorp on behalf of Washington Utilities and Transportation Commission (UTC) as required by WAC 480-107-023. The Utah Public Service Commission (Utah Commission) has also retained their own IE consistent with Utah guidelines in Utah Admin. Code R746-420. The IEs will be involved in development of the RFP and provide oversight to ensure the RFP process is conducted in a fair and reasonable manner. Potential bidders are invited and encouraged to contact the Oregon IE, the Washington IE and/or the Utah IE with questions or concerns. More information concerning the role of the IE is provided in **Appendix M – Role of the Independent Evaluator** for each of the states.

Contact information for each IE is as follows:

Independent Evaluators:
<p>OREGON – PA Consulting Group, Inc. Charles Janecek 2022as_ie@paconsulting.com 303-250-5060</p>

¹⁵ As defined in WAC 480-100-605.

¹⁶ PacifiCorp conducted a demand response RFP in 2021 and intends to issue a demand-side RFP in Q3 2022. Please reference **Appendix Q - 2021 Demand Response RFP - Requirements for Demand-side Bids**.

¹⁷ Oregon’s competitive bidding rules were adopted in Public Utility Commission of Oregon Docket AR 600, *In the Matter of Rulemaking Regarding Allowances for Diverse Ownership of Renewable Energy Resources*, Order 18-324 (August 30, 2018).

Independent Evaluators:
WASHINGTON – Bates White, LLC Frank Mossburg frank.mossburg@bateswhite.com 202-652-2194
UTAH - Merrimack Energy Wayne Oliver MerrimackIE@merrimackenergy.com 781-856-0007

B. PACIFICORP RFP ORGANIZATION AND ROLES

The RFP organization and roles were established by PacifiCorp before issuance of this RFP. The RFP teams shall consist of i) an RFP evaluation team, ii) a project development (benchmark) team, and iii) other general support, shared resource teams such as but not limited to the IRP, engineering and customer solutions teams. Members of the evaluation and benchmark teams will work in separate physical locations to protect the integrity of the RFP process and will not be allowed to confer on items related to the 2022AS RFP, proposed benchmark resources, or other market bids. Prior to the benchmark bid deadline, benchmark bids shall be saved in drives that the evaluation team is not able to access. Following receipt of the benchmark bids, the RFP evaluation team will save all market bids, price and non-price scorecards and other evaluation documents to drives which the project development (benchmark) team does not have access to. Non-price scores and the results of initial PLEXOS analyses and pricing against proxy resources conducted by the RFP evaluation team in compliance with OAR 860-089-0350, including bid preparation models, will be submitted to the IEs for their retention prior to PLEXOS modeling.

Members of the RFP Evaluation Team, Project Development (Benchmark) Team, and Shared Resource teams will be allowed to communicate and collaborate on work unrelated to the selection of bids in the 2022AS RFP, such as, for example, engineering and technical support for ongoing contractual negotiations.

- RFP Evaluation Team – Valuation and Commercial Business (Origination and Structuring and Pricing)
 - Responsible to coordinate with the IE and all of the RFP Evaluation Team members and perform the evaluation of the non-price components of the bid analysis.
 - Responsible for evaluation of the benchmark and market resource bids.
 - Responsible for overseeing the modeling and preparation of bid inputs to the IRP models. Responsible for preparing bid inputs for the IRP modeling.
 - Responsible for evaluation of the applicable environmental, siting and facilities permits and other environmental studies for the project bid and coordination with the Environmental group as needed.
 - Responsible for overseeing the credit screening, evaluation and monitoring throughout RFP process.
 - Responsible for confirming compliance and legal review of submitted bid documents.

- Project Development (Benchmark) Team - PacifiCorp employees isolated from the RFP Evaluation Team in RFP bid review and selection
 - Responsible for development and submittal of any Benchmark Resource Bid(s)
- Shared Resources Teams:
 - Shared resource teams will perform specific portions of the benchmark and market bid evaluation with oversight by the RFP Evaluation team and ultimately the IEs. Members of the Shared Resources team will not share information to the Project Development (benchmark) Team related to market bids or bidders.
 - Engineering Team
 - PacifiCorp employees responsible for evaluating technical assumptions, including compliance with **Appendix A - Technical Specifications and Required Submittals** and validation of **Appendix C-3 Energy Performance Report** in conjunction with 3rd party consultant.
 - Customer Solutions Team
 - PacifiCorp employees responsible for evaluating demand-side resources including distributed energy and demand response bids and who may also be issuing voluntary targeted request for proposals in Q3 2022.
 - Credit
 - Responsible for assessing bidder organization and creditworthiness qualifications.
 - Compliance, Permitting and Safety
 - Responsible for evaluating bids with respect to siting, cultural, avian, wildlife, fish, environmental, permitting and safety criteria.
 - Legal
 - Responsible for general legal support, including supporting the RFP Evaluation Team in evaluating bidder comments and redlines to pro forma contract forms and term sheets.
 - Regulatory
 - Responsible for ensuring compliance with state procurement rules and other requirements such as Washington CETA, Oregon HB2021, etc.
 - PacifiCorp Transmission
 - Responsible for providing general subject matter expert support. PacifiCorp Transmission may also be consulted by the RFP Evaluation Team regarding interconnection and transmission information pertinent to a bid, subject to a bidder-signed and posted waiver on OASIS for bid specific discussions.
 - IRP Team
 - The IRP Team will be treated as a shared resource to perform work for the RFP Evaluation Team in running PLEXOS models. The IRP Team will not share any information it obtains from the RFP Evaluation Team with the Project Development (Benchmark) Team, and the IRP Team will not share with either the RFP Evaluation Team or Project Development (Benchmark) Team, any non-public transmission system information at any point in the process.

More information related to primary roles and responsibilities may be found in **Appendix N – PacifiCorp’s Organization for RFP Process**.

C. STANDARDS OF CONDUCT; SEPERATION OF FUNCTIONS

Each bidder responding to this RFP must conduct its communications and activities in recognition of PacifiCorp's obligation to comply with the Federal Energy Regulatory Commission (FERC)'s Standards of Conduct for Transmission Providers (see **Appendix I – Standards of Conduct; Separation of Functions**), which require the functional separation of PacifiCorp's transmission and merchant functions. Interconnection with or transmission service on PacifiCorp's system is arranged through PacifiCorp's transmission function, and not PacifiCorp's merchant function that administers this RFP. Similarly, with respect to any necessary interconnection and transmission arrangements on a third-party transmission system, the bidder must coordinate with and refer to the requirements of the third-party transmission provider. As part of a bid submittal, bidders will be requested to execute a customer consent form provided in **Appendix J – PacifiCorp Transmission Waiver** that enables PacifiCorp's merchant function to discuss the bidder's interconnection and/or transmission service application(s) with PacifiCorp's transmission function.

D. CONFIDENTIALITY

As described in Section 3.C. below, before bid submittal, bidders will be required to execute a confidentiality agreement in the form provided in **Appendix G-1 – Confidentiality Agreement**. As provided in the form of confidentiality agreement, PacifiCorp will attempt to maintain the confidentiality of all bids submitted, to the extent consistent with law or regulatory order. Washington state requires that within thirty days after the close of the bidding period, the utility must post on its public website a summary of each bid the utility has received. PacifiCorp will endeavor to post a generic but complete description and protect confidential data to the extent Washington procurement rules allow.¹⁸ It is the bidder's responsibility to clearly indicate in its proposal what information it deems to be confidential and subject to the terms of the executed confidentiality agreement. Bidders may not mark an entire proposal as confidential, but bidders must mark specific information on individual pages to be confidential to receive confidential treatment for that information under the terms of the executed confidentiality agreement.

All information supplied to PacifiCorp or generated internally by PacifiCorp is and will remain the property of PacifiCorp. To the extent bidder receives information from PacifiCorp, bidder must maintain the confidentiality of such information and such information may not be provided to any third-party before, during or after this RFP process unless required by law or regulatory order.

E. PACIFICORP'S RESERVATION OF RIGHTS AND DISCLAIMERS

PacifiCorp reserves the right, without limitation or qualification and in its sole discretion, to reject any or all bids, and to terminate or suspend this RFP in whole or in part at any time. Without limiting the foregoing, PacifiCorp reserves the right to reject as non-responsive any or all bid proposals received for failure to meet any requirement of this RFP. PacifiCorp further reserves the right without qualification and in its sole discretion to decline to enter into any agreement with any bidder for any reason, including, but not limited to, change in regulations or regulatory

¹⁸ WAC 480-107-035(5)

requirements that impact PacifiCorp, and any evidence of collusive bidding or other anticompetitive behavior or conduct of bidders.

Bidders who submit bid proposals do so without recourse against PacifiCorp, its parent company, its affiliates and its subsidiaries, against any director, officer, employee, agent or representative of any of them, or against the Independent Evaluators, for any modification or withdrawal of this RFP, rejection of any bid proposal, failure to enter into an agreement, or for any other reason relating to or arising out of this RFP.

SECTION 3. GENERAL INFORMATION AND LOGISTICS

A. SCHEDULE

The proposed 2022AS RFP schedule is shown below, subject to change.¹⁹

Milestone	Date
2022AS RFP Issued to market	04/29/2022
Interconnection and Transmission Workshop	05/04/2022
First Bidders Conference	05/06/2022
PacifiCorp OATT - Cluster Study Request Window closes (deadline)	05/15/2022
Demand-side Voluntary Targeted RFP Issued to Market, as necessary	08/31/2022
Demand-side RFP notice of intent to bid due	09/30/2022
Second Bidder Workshop	10/20/2022
Last day for RFP questions to IEs for Q&A	11/01/2022
Cluster study results posted to OASIS / bidders notified by PacifiCorp Transmission	11/12/2022
Notice of Intent to Bid due	11/17/2022
	11/21/2022
Benchmark bids due	12/09/2022
Notice of Intent to Bid due	12/16/2022
Demand-side Voluntary Targeted RFP bids due	11/30/2022
PacifiCorp completes non-price scoring, bid preparation models and initial price scoring of benchmark resources in accordance with OAR 860-089-0350 (1)	01/12/2023
Last day for RFP questions to IEs for Q&A	01/13/2023
IEs complete review of benchmark bid evaluations, including non-price scores, bid preparation models, and indicative pricing in comparison with proxy resources	02/13/2023

¹⁹ Any schedule changes will be posted to PacifiCorp’s 2022AS RFP website: <https://www.pacificorp.com/suppliers/rfps/2022-all-source-rfp.html>

PacifiCorp files benchmark bid evaluation in accordance with OAR 860-089-0350 (1)	02/13/2023
RFP bids due from market	02/14/2023
Capacity factor and BESS evaluation of bids started	02/16/2023
PacifiCorp completes bid eligibility screening	03/16/2023
IE completes review of bid eligibility screening	03/23/2023
PacifiCorp completes due diligence and non-price scoring of market bids	04/13/2023
IEs complete review of non-price scoring	04/27/2023
Capacity factor and BESS evaluation of bids completed	04/27/2023
PacifiCorp completes bid preparation models for supply-side and demand-side market bids and provides all inputs to portfolio optimization team for upload into PLEXOS alongside benchmark resources files previously provided and uploaded	04/27/2023
PLEXOS generates price score and preferred portfolio for each benchmark and market bid in consideration of all bids	06/26/2023
Final Shortlist (FSL) selected	06/26/2023
IEs' review of FSL completed	07/17/2023
Complete negotiation of T&Cs for resource agreements	11/10/2023
Execute agreements	11/21/2023
Bid validity date	11/21/2023
Winning bid guaranteed COD	12/31/2027

Bidders seeking an interconnection study via the 2022 PacifiCorp Transmission Cluster Study shall be responsible for working with PacifiCorp Transmission to ensure that all cluster study requirements included in the Open Access Transmission Tariff (OATT) have been met by May 15, 2022 when, according to the current OATT as of the date of this issuance, the Cluster Request Window closes.

The schedule above is subject to change. Actual dates may vary for reasons that include, but are not limited to, negotiation time, availability of key personnel, due diligence, the evaluation or negotiation of any issues unique to any bid, bidder, or project. PacifiCorp is not responsible for any costs or damages to bidders alleged to be attributable to changes in the RFP schedule stated above. PacifiCorp is not obligated to develop a shortlist of bidders, to make a final selection, or to initiate or complete negotiations on any transaction.

Bidders should note the firm nature of the schedule and be available for calls and meetings with PacifiCorp and the IE regarding bid submittals and be responsive to questions in a timely manner.

BIDDERS WILL BE REQUIRED TO RESPOND TO BID QUESTIONS AND CURE ANY BID DOCUMENT DEFICIENCIES WITHIN TWO (2) BUSINESS DAYS OF BID REVIEW AND REQUESTS.

B. 2022AS RFP BIDDER CONFERENCE

Due to the extended timeframe between the RFP issuance and bidder deadlines, two bidder conferences will be scheduled, the first to be held on **May 6, 2022 and the second on October 20,**

2022. The bidder conference will be scheduled from 9:30 AM to 1:00 PM PT (10:30 AM to 2:00 PM MT) and will cover the 2022AS RFP structure, deliverables, schedule, requirements, energy performance analysis, required forms and interconnection requirements. The bidder conference will be scheduled as a Microsoft Teams meeting for remote attendance. Additional details on the bidder conference will be posted to the PacifiCorp website.

Day: Thursday
 Date: May 6, 2022 and October 20, 2022

Time and Agenda:

9:30 AM to 11:00 AM Pacific (10:30 AM to 12:00 PM Mountain)	General RFP Structure, deliverables, schedule, requirements and energy performance analysis
11:30 AM to 1:00 PM Pacific (12:30 PM to 2:00 PM Mountain)	RFP forms and bid preparation

Location: Teams Meeting (Details to be provided on PacifiCorp RFP webpage²⁰)

C. INTENT TO BID FORMS

Parties that intend to submit bids for consideration in this RFP process are requested to return the following completed documents²¹ in an electronic copy to the following PacifiCorp and IE’s email addresses, no later than **5:00 p.m. Pacific Prevailing Time on ~~December 16~~ November 17, 2022**, to be accepted as a bidder in the 2022AS RFP:

1. **Appendix B-1 – Notice of Intent to Bid**
2. **Appendix D – Bidder’s Credit Information**
3. **Appendix G-1 – Confidentiality Agreement**

Email: 2022AS_RFP@PacifiCorp.com
 frank.mossburg@bateswhite.com (Washington IE)
 2022as_ie@paconsulting.com (Oregon IE)
 MerrimackIE@merrimackenergy.com (Utah IE)

After PacifiCorp receives the Intent to Bid form, an acknowledgment of receipt and directions for bid submittal fees will be provided.

D. SUBMISSION OF QUESTIONS

Bidders may submit questions related to this solicitation, and PacifiCorp will respond in a timely fashion. While PacifiCorp will maintain the confidentiality of the party posing questions, all questions as well as PacifiCorp’s response to questions will be posted on the PacifiCorp website at <https://www.pacificorp.com/suppliers/rfps/all-source-rfp.html>. PacifiCorp requests that

²⁰ <https://www.pacificorp.com/suppliers/rfps/2022-all-source-rfp.html>

²¹ Documents not completed may be grounds for disqualification of a bid.

bidders copy the IEs on all questions to the RFP mailbox. Bidders may also submit questions confidentially through one or more of the IEs at the following email addresses:

Washington IE: frank.mossburg@bateswhite.com

Oregon IE: 2022as_ie@paconsulting.com

Utah IE: MerrimackIE@merrimackenergy.com

PacifiCorp: 2022AS_RFP@PacifiCorp.com

IE Website – Merrimack Energy, the Utah IE, will host a website dedicated to information exchange and archiving information, questions and answers between the bidder, IE, and PacifiCorp. The IE site, separate from PacifiCorp’s RFP website, will be used for bidder questions related to their bid or the RFP. Any question submitted through the IE will be blinded and provided to PacifiCorp for a response. The website link is shown below and will also be accessible as a link on PacifiCorp’s RFP website.

<https://www.merrimackenergy.com/pacificorp-2022as-rfp>

All questions submitted to either PacifiCorp or an individual IE will be shared with the IEs in each of the three states.

E. SUBMISSION OF BIDS

Proposals must be submitted with a cover letter that includes all signatures necessary to approve and submit bidder’s proposal by one or more representatives having necessary corporate or other organizational authority.²² Additionally, the cover letter must also include the following declaration, which may not be edited without the express approval of PacifiCorp:

“**[Insert legal name of Bidder]** (the “Bidder”) acknowledges receipt of PacifiCorp’s 2022AS All-Source Request for Proposals on or about April 26, 2022. Bidder makes the following representations to PacifiCorp:

1. All of the statements and representations, including bidder’s self-scored non-price scoring, made in this proposal are true to the best of Bidder’s knowledge and belief;
2. Bidder possesses a legally binding agreement(s) or option(s) to possess all necessary land rights for sufficient site control to undertake development of the project as set forth in the proposal, including ingress and egress to and from the site;
3. Bidder agrees to comply with Berkshire Hathaway Energy’s cyber security requirements.
4. Bidder possesses or will possess all necessary and appropriate water rights for construction and ongoing maintenance of the project through the term of the agreement;

²² If the proposal is being bid under a partnership, the partnership must be fully established, including a legally binding agreement among the partners (not a letter of intent), before submission of a proposal under this RFP. Each partner must be bound to comply with the terms of this RFP and the proposal. The signature of each partner must be included on the cover letter, along with their contact information (i.e., company name, phone number, email address, etc.). The proposal must include evidence documenting the legal and binding partnership.

5. Bidder i) possesses or intends to obtain all necessary eagle studies and agency coordination required to apply with the United States Fish & Wildlife Service for an eagle take permit, consistent with such regulatory requirements or agency guidance, and bidder possess or intends to obtain all necessary avian, wildlife and fish studies for construction and ongoing maintenance of the project throughout the term of the agreement, ii) agrees to apply for an Eagle Take Permit from the United States Fish & Wildlife Service for the construction, commissioning, and operations of a wind project and for other energy sources or associated infrastructure that may have eagle impacts, iii) agrees to identify and implement, voluntarily or as agreed upon with applicable agency, cut-in speed adjustment, curtailment strategy, and/or bat deterrent systems to address bat impacts at wind projects, iv) has included within its bid an appropriate deduction to its resource production estimates (which would be non-compensable curtailment in any contract executed with bidder in this RFP) to account for potential voluntary outages, cut-in speed adjustments and/or curtailment due to impacts to avian, wildlife and fish species, including eagles and bats; and v) agrees to utilize applicable wildlife siting guidance and meaningful coordination with state/federal wildlife agencies to avoid, minimize, and/or mitigate potential impacts to wildlife and their habitat from project development, construction, and operations.
6. Bidders for projects sited in Oregon understand the requirements in ORS 757.306²³ and will provide required attestations or Project Labor Agreements under HB2021 within 30 days of when the date for construction begins.
7. Bidders agrees to report diversity representation by contractors.
8. Bidder has obtained, or can demonstrate how it will obtain, all necessary authorizations and approvals that will enable Bidder to commit to the terms provided in this proposal;
9. Bidder has reviewed the entirety of this RFP including all relevant appendices, acknowledges its terms, and agrees to comply with the processes stated within
10. BTA bid conforms with **Appendix A - Technical Specifications and Required Submittals**, or else all exceptions are clearly stated and listed as an addendum to this letter.
11. Bid pricing is based on the terms of the transaction documents in **Appendix E-2 – PPA Documents, Appendix E-3 – Tolling Agreement Documents, or Appendix F-2 – BTA Documents or Appendix Q-1 Professional Services Contract**,²⁴ as reviewed and, if applicable, revised by bidder; and
12. This proposal is a firm and binding offer through November 21, 2023.

²³ A person who constructs or repowers a large-scale project sited in Oregon shall, at the time of contract finalization for development of the project or execution of a contract for delivery of energy from the project, provide a signed attestation or declaration stating to the best of their knowledge and belief, subject to penalty of perjury as described in ORS 162.065, that during all periods of construction all contractors and subcontractors working on the construction or repowering project will have done certain things related to apprenticeship programs, diversity hiring outreach, anti-employee harassment policies, and other required measures as required by ORS 757.306.

²⁴ Bidder to select appropriate reference appendix for its submitted bid.

PACIFICORP IS ACCEPTING ONLY ELECTRONIC COPIES OF A BID AND WILL NOT ACCEPT HARD COPIES.

A single form of bid submittal is required; an electronic copy via email.

The electronic copy via email should be sent to:

PacifiCorp at:	2022AS_RFP@PacifiCorp.com
Washington IE at:	frank.mossburg@bateswhite.com
Oregon IE at:	2022as_ie@paconsulting.com
Utah IE at:	MerrimackIE@merrimackenergy.com

Bidders should be aware of file size when delivering the electronic copy of their bid. PacifiCorp suggests limiting the size of each email with attached files to no more than 20 MB to ensure acceptance. Bidders are allowed to submit multiple emails for their bid and should label them accordingly (i.e. "1 of 3...", "2 of 3...", "3 of 3...").

PacifiCorp will respond with receipt email(s).

Benchmark bids will be due 5:00 p.m. Pacific Prevailing Time on ~~Friday December 9-Monday, November 21~~, 2022.

All other market bids will be accepted until 5:00 p.m. Pacific Prevailing Time on Tuesday, February 14, 2023. PacifiCorp will not accept any late proposals. Any bids received after this time will be returned to the bidder unopened.

All bid proposals shall have a bid validity date through 5:00 pm PPT, November 21, 2023.

Bidders must submit complete proposals that include the following items:

1. Via email, one (1) electronic copy of the bid,²⁵ sent to the RFP email addresses²⁶ provided, which should include any required forms in PDF format and Microsoft Excel format, as required, including all appendices and exhibit sheets.
2. Each bid submission should include all of the requirements listed in Section 4 of this RFP document and **Appendix B-2 – Bid Proposal Instructions and Required Information**, including:²⁷
 - a. Technical submittal requirements from **Appendix A – Technical Specifications and Required Submittals**
 - b. The main bid document (proposal) as organized in **Appendix B-2 – Bid Proposal Instructions and Required Information**,
 - c. An excel version and also PDF print outs of the required tabs from **Appendix C-2 – Bid Summary and Pricing Input Sheet**,

²⁵ Large bid submittals may require being sent in multiple emails due to 25 MB size limitation of email transmittals.

²⁶ The IEs should be copied on emailed bid submissions.

²⁷ Demand-side resource bids shall include the requirements listed in **Appendix Q – 2021 Demand Response RFP - Requirements for Demand-side Bids** including the redline to PacifiCorp's General Services Agreement if applicable.

- d. Redlines or comments to the contract documents reflecting the resource type and structure contained in the bid:
 - i. **Appendix E-2 – PPA Documents**
 - ii. **Appendix E-3 – Tolling Agreement Documents**
 - iii. **Appendix F-2 – BTA Documents**
 - iv. **Appendix Q-1 – Professional Services Contract**
- e. **Appendix Q - 2021 Demand Response RFP – Requirements for Demand-side Bids** as required for Demand-side bids

F. PACIFICORP’S POSTING OF SECURITY

PacifiCorp will not post security to support its obligations under any definitive agreement. Bidders who will require such security from PacifiCorp should not submit a proposal under this RFP.

G. BID EVALUATION FEES

All bidders proposing resources greater than 5 MW, including Benchmark bids, must pay a \$15,000 bid fee for each base bid proposal. All bidders proposing resources less than or equal to 5 MW must pay a bid fee of \$1,000 per MW for each base bid proposal. A proposal (“Bid”) is made up of a combination of “Bid Attributes,” defined by the Bid Attributes table below. For each base bid proposal, and corresponding bid fee, **a bidder may submit one base bid and up to three bid alternatives**. All base bids and bid alternatives must be submitted via a separate Appendix C-2 along with supporting documentation consistent with appendices and submittal requirements.

Bid alternatives fall into three categories. Two bid alternatives may be submitted under either category 1 (“Free alternatives”) or category 2 (“Reduced price bid alternatives”) below at the bidder’s discretion. A third bid alternative may be submitted consistent with category 3 (“Free diversity strategy alternative”) below:

- 1) Free alternatives. Up to two free bid alternatives are available for bidders electing to offer variations to the contract term (end date) or price structure. Bidders are encouraged to consider PacifiCorp’s cost of capital provided in the Company’s IRP filing when considering offering free bid alternatives. Bidder’s offering one free bid alternative from this Category 1 will only be eligible to offer one reduced price bid alternative from Category 2 below. Likewise, bidders offering two free bid alternatives from this Category 1 will be ineligible for reduced price bid Category 2 alternatives.
- 2) Reduced price bid alternatives. Up to two reduced price bid alternatives are available for bidders electing to offer bid variations to the proposed start date (COD), storage facility power/energy capacity, or storage duration. Bidders electing to offer Category 2 bid alternatives will be required to pay \$5,000 per reduced price bid alternatives up to two alternatives. Changes to location, technology, nameplate (generation) capacity, and transaction structure (PPA/BTA) are not eligible bid attributes for Category 2. Consistent with above, bidder’s offering one reduced price bid alternative from this Category 2 will only be eligible to offer one free price bid alternative from Category 1 above. Likewise, bidders offering two reduced price bid alternatives from Category 2 will be ineligible for free bid Category 1 alternatives.
- 3) Free diversity strategy alternative. In addition to the two bid alternatives available via Categories 1 and 2, each bidder may submit a third free bid alternative for a different diversity strategy related to alternative supplier, contractor and/or hiring strategies.

Please note that changes to project site, technology, transaction structure (PPA/BTA) are not available as bid alternatives via the categories 1-3 above; however, bidders may pay an additional \$15,000 bid fee along with a complete RFP bid package if they wish to propose alternatives to those bid attributes. Similarly, bidders who wish to offer any additional Bid Attribute alternatives may do so subject to an additional \$15,000 fee for each additional alternative. For more information, please see the Bid Attribute table below and the bid calculator worksheet in **Appendix B-1.2 Bid Fee Calculator Worksheet.**

Bid Attribute	Bid Limitations	Bid Alternative Treatment
Project Site	Multiple project sites may be bid as individual Bids or as a combined Bid; however, 1) a base bid fee is required for each Bid variation; 2) contingent Bids are not allowed, 3) the COD and term length for all sites in any single Bid must be the same, and 4) the bid package and bid documents for each Bid (including nameplate capacity size, layouts, resource estimates, Appendix C-2s, interconnection studies etc.) must be consistent with the Bid and clearly articulated. Confusing and ambiguous Bids will be given two (2) days to cure and then deemed ineligible.	Base bid only. Not eligible for bid alternative. Bidders who submit multiple base bids must submit complete bid proposals including all required bid submittals.
Technology	A Bid may include multiple collocated technologies; however, the bid package and bid documents for each Bid (including capacity size, layouts, resource estimates, Appendix C-2s, interconnection studies etc.) must be consistent with the Bid and clearly articulated. Confusing and ambiguous Bids will be given two (2) days to cure and then deemed ineligible. Contingent Bids are not allowed. A base bid fee is required for each technology type variation. If a generating resource is collocated with BESS, 1) the BESS must be AC-coupled and 2) the COD and term of the generating resource and BESS must be the same.	Base bid only. Not eligible for bid alternative. Bidders who submit multiple base bids must submit complete bid proposals including all required bid submittals.
Nameplate (MW)	The nameplate capacity size of a Bid(s) must be consistent with and supported by the proposal layouts, interconnection agreement(s), other Appendix A submittals, Appendix C-2 generation profiles, Appendix C-3 Energy Performance Reports and other bid submittals. Bidders with multiple executed LGIAs and/or completed interconnection studies may combine multiple LGIAs and/or	Base bid only. Not eligible for bid alternative. Bidders who submit multiple base bids must

	interconnection studies; however, contingent bids are not allowed, and all required bid documents including layouts, resource estimates, Appendix C-2s, interconnection studies etc. must be clearly articulated and delineated. Confusing and ambiguous Bids will be given two (2) business days to cure and then deemed ineligible.	submit complete bid proposals including all required bid submittals.
BESS Duration	Bidders may bid any storage duration.	Eligible for Reduced Price Bid Fee.
Commercial Operation (COD) / Start Date	Bids may be for term lengths between 5-30 years. ²⁸ Multiple Bids may also bid for the same resource with different COD/ start dates subject to bid fee requirements.	Eligible for Reduced Price Bid Fee.
Contract Term / End Date	Pricing shall include the cost of the security included in the Appendix E-2, E-3 and F-2 pro forma agreements.	Eligible for Free Bid Alternative.
Price Structure	PPAs may be bid as fixed price or variable (escalating) price structures. Multiple Bids may also bid for the same resource with different price structures. PPA bids offering collocated generating resource plus BESS will assume battery augmentation in their offered price (no decline in capacity over contract term) and maintain the Storage Power Capacity Rating. BTA pricing shall be for resources which are developed and designed for future augmentation at PacifiCorp's option.	Eligible for Free Bid Alternative.
Transaction Structure	Generating resource-only Bids may be bid as a PPA or a BTA contractual agreement. PPAs shall be bid with a \$/MWh price structure. Bids offering collocated generating resource plus BESS may be offered either as a PPA with BESS or a BTA contractual agreement. For a PPA with BESS, the generating resource will be priced on a \$/MWh basis and the BESS will be priced as a \$/MW-month toll payment. Bids offering standalone storage proposals may be bid as a Tolling (contractual) Agreement or a BTA. Standalone storage pricing will be bid on a \$/MW-month toll payment.	Base bid only. Not eligible for bid alternative. Bidders who submit multiple base bids must submit complete bid proposals including all

²⁸ Longer terms matching a bidder's operational license will be accepted.

	<p>BTA bids shall include a proposed milestone payment schedule showing the timing and amount of all payments from PacifiCorp.</p> <p>A Bid may also include a combined transaction structure, for example a 50% PPA and 50% BTA Bid; however, 1) the Bids must be offered as a single combined Bid and not separately as multiple “contingent” Bids, and 2) all required bid documents including layouts, resource estimates, Appendix C-2s, interconnection studies etc. must support the transaction structure and be clearly articulated and delineated with respect to the PPA resource vis-à-vis the BTA resource. Confusing and ambiguous Bids will be given 2 days to cure and then deemed ineligible.</p>	required bid submittals.
Labor Standard and/or Workforce Approach	An alternative Bid may be submitted via a separate Appendix C-2 showing alternative pricing based on different subcontracting and hiring strategy consistent with certain state practices as described below.	Eligible for one free bid alternative.

The Bid Fees will be used to cover the costs incurred by PacifiCorp in analyzing the proposals, including the costs of the Washington, Oregon and Utah IEs, the technical consultants, and legal advisors.

As mentioned above in the Bid Attribute section, Bidders will be allowed an additional free alternative Bid to provide alternative pricing for a different supplier, contractor/subcontractor strategy, labor standards or workforce and apprenticeship approaches consistent with one or more of the following, as applicable: California’s Rulemaking 18-07-003, Oregon’s HB2021, Washington’s RCW 82.08.962 and 82.12.962, and PacifiCorp’s Supplier Diversity goals.²⁹ Note that the State of Washington Clean Energy Transformation Act (CETA) includes certain tax incentives related to diversity hiring, and Oregon’s HB2021 requires a person who constructs or repowers a large-scale project sited in Oregon to provide a signed attestation of certain labor standards or project labor agreement at the time of contract finalization for development or construction of the project. Bidders may offer a second price for i) an alternative percentage of employees or labor during construction and ongoing operations, and/or ii) an alternative percentage of suppliers, contractors, subcontractors and that are veteran-owned and women-owned, minority-owned and LGBT-owned business enterprises.

In addition to the Bid Fees, a success fee may be charged to successful Bid(s) selected for the final shortlist. Success fees will only be required in the event Bid Fees are not sufficient to cover the incremental costs of the IE and other external consultants and service providers required in the contract development process. In no event may the success fee exceed the lesser of \$5,000

²⁹ Supplier Diversity (pacificorp.com): <https://www.pacificorp.com/suppliers/supplier-diversity.html>

dollars per megawatt for each successful Bid or a capped at \$300,000 per Bid. The success fee applies to both benchmark and market bids. In the event success fees are required, documentation of the calculation of the success fee will be computed in cooperation with the IEs and provided to the bidder at the time the bid is selected to the final shortlist.

Payment of Bid Fees. Bid Fees must be paid by wire transfer to PacifiCorp. PacifiCorp will email wire transfer instructions to all bidders who have submitted a notice of intent to bid. Instructions will be emailed at least five (5) business days before the bid deadline. No cashier's checks will be accepted. As a bid requirement, when the bid is submitted, Bidder ***must provide documentation*** of submitted Bid Fees, such as a pdf receipt of the wire transfer or wire transfer confirmation number. **The bid fee is non-refundable. After submission of bidder's Bid, the bid fee will only be refunded if i) the Bid is withdrawn before the submittal due date, ii) the Bid does not meet the minimum eligibility requirements and the deficiency cannot be cured, or iii) the Bid is rejected for any other non-conformance before commencement of the evaluation and selection process.**

H. BID NUMBERING AND FILE NAMING CONVENTION

Bid numbers will be self-assigned by bidder in accordance with the directives below and consistent with **Appendix B-1.2 Bid Fee Calculator Worksheet**. There is no limit to the number of Bids that may be submitted, subject to having paid the applicable Bid Fee(s) in accordance with Section 3.G.

Different resources must be expressed as a whole number followed by one decimal place, beginning with the number 1.00. Each subsequent resource proposal will have a separate sequential bid number (i.e., 2.00, 3.00, etc.). Each resource may have one base bid and multiple bid alternatives as described in the bid fee section above and consistent with Appendix B-1.2. Each base bid and bid alternative will have a corresponding bid number which must be used to identify a corresponding **Appendix C-2 – Bid Summary and Pricing Input Sheet**. For example, the initial resource Bid will be identified as "1.00" and the second Bid variation would be "1.01, 1.02, 1.03 etc." Subsequent resources should be identified as "2.00" for the initial Bid and "2.01, 2.02, 2.03, etc" for corresponding bid variations.

File names should be kept short by using abbreviations wherever possible. All required documents must use the following naming convention:

[Abbreviated Bidder name]_[Bid number]_[Abbreviated_File_Description]

I. MINIMUM ELIGIBILITY REQUIREMENTS FOR BIDDERS

Bidders may be disqualified for failure to comply with the RFP if any of the requirements outlined in this RFP are not met to the satisfaction of PacifiCorp, as determined in its sole discretion. If Bids do not comply with these requirements, PacifiCorp has the option to deem the Bid non-conforming and eliminate it from further evaluation. Reasons for rejection of a bidder or its Bid include, but are not limited to:

1. Receipt of any Bid after the bid submittal deadline.
2. Failure to submit the required Bid Fee when due.

3. Failure to meet the requirements described in this RFP and provide all information requested in **Appendix C-2 – Bid Summary and Pricing Input Sheet** of this RFP.
4. Failure to adequately demonstrate the viability of a COD on or before December 31, 2027, with the exception of long-lead resources as described in Section 1.A.
5. Failure to execute **Appendix G-1 – Confidentiality Agreement** and permit disclosure of information contained in the proposal to PacifiCorp’s agents, contractors, regulators, or non-bidding parties to regulatory proceedings consistent with terms of executed confidentiality agreement.
6. Any attempt to influence PacifiCorp in the evaluation of the proposals outside the solicitation process.
7. Failure to provide a firm offer through the bid validity date outlined in Section 3.E of this RFP.
8. Failure to disclose a commitment of any portion of the proposed resource to another entity.
9. Failure to disclose the real parties of interest in any submitted proposal.
10. Failure to clearly specify all pricing terms for each proposal.
11. Failure to offer product delivered to a point of interconnection or point of delivery on Company’s transmission system in either its PACE and PACW balancing areas.
12. For any bid that is proposing to interconnect to a third-party transmission system and secure transmission service to deliver the output of the resource to PacifiCorp at PACE or PACW, failure to provide a system impact study by the third-party transmission provider as well as satisfactory evidence³⁰ that firm point-to-point transmission rights are already secured in bidder or project owner’s name or readily obtainable by bidder to deliver the full output of the resource to PacifiCorp on or before December 31, 2027, detailing all actual or estimated transmission costs.
13. Failure to materially comply with technical specification requirements in **Appendix A – Technical Specifications and Required Submittals** for BTA proposals involving potential PacifiCorp ownership or operational control.
14. Failure to demonstrate a process to adequately acquire or purchase major equipment (i.e., wind turbines, solar photovoltaic panels, inverters, tracking

³⁰ Transmission service documentation to PacifiCorp’s system is two-fold: first, firm capacity is available on third-party transmission provider and second, bidder has made a request to the third-party transmission provider to acquire firm point-to-point transmission service to PacifiCorp’s system. Documentation should include copies of direct, dated correspondence from transmission service provider to bidder, showing evidence a request for transmission service was in fact made, and transmission provider is indicating to bidder that firm, uninterruptible transmission service will be available for bidder to procure, for a specified OATT service, and identified MW capacity, POR, POD, and term. Dated correspondence should be at least within six (6) months of bid submittal.

system, generator step-up transformers, batteries) and other critical long-lead time equipment.

15. Failure to demonstrate or represent compliance with PacifiCorp's prohibited vendors list.
16. Failure to demonstrate that it can meet the credit security requirements for the resource and commercial online date proposed.
17. Failure to submit information required by PacifiCorp to evaluate the price and non-price factors described herein.
18. Failure or inability to abide by the applicable safety standards.
19. Failure to submit an acceptable contract structure.
20. A determination by PacifiCorp that collusive bidding or any other anticompetitive behavior has occurred.
21. Bidder or proposed project being bid is involved in bankruptcy proceedings.
22. Failure of the bidder's authorized officer to sign the proposal cover letter as required in this document and without edits.
23. Misrepresentation or failure to abide by Federal Trade Commission Green guidelines for renewable projects, if applicable.
24. Any change in law or regulatory requirements that make the bidder's proposal non-conforming.
25. Any matter impairing the bidder, the specified resource, or the generation of power or, if applicable, environmental attributes from the specified resource.
26. Failure to provide the minimum resource performance estimate information as described in Section 5.B. of the RFP.
27. Failure to provide a performance report and model output including hourly output values as identified in **Appendix C-3 – Energy Performance Report**.
28. Failure to provide **Appendix D – Bidder's Credit Information**.
29. Any bid that includes a requirement that PacifiCorp provide credit assurances.
30. In the case of a BTA bid, failure to submit an operations and maintenance proposal materially compliant with the applicable form included in **Appendix K – Operations and Maintenance Services**.
31. Failure to satisfy the requirements as set forth in Section 3.E.4, related to eagle and wildlife studies, agency coordination, eagle take permit(s), bat impacts/curtailment, deduction to resource production estimates, and/or general avoidance, minimization, and mitigation for wildlife impacts.

32. Failure to provide documentation of binding, exclusive site control for the project including the facility but excluding right-of-way or easements for interconnection, transmission or roads.³¹
33. Failure of the project description in the bid to be consistent with project description in existing interconnection studies and/or executed LGIAs. In the event changes have been made to the proposed project bid as compared to what is described in the current interconnection documentation, bidder will need to provide documentation from PacifiCorp Transmission, or the applicable interconnection provider, that a material modification or interconnection re-study is not required that could materially impact the project costs or estimated in-service date.
34. In the case of a demand-side bid, failure to meet the requirements of PacifiCorp's 2021 Demand Response RFP included in **Appendix Q – 2021 Demand Response RFP - Requirements for Demand-side Bids**.
35. Failure of an Oregon-sited resource bidder to agree to provide attestations or Project Labor Agreements as specified by HB2021 and provisions in the pro forma contract agreements.
36. Failure to report, disclose and comply with OFAC Sanctions Lists and Government-Owned Enterprises, as set forth in the applicable provisions in the attached pro forma contract agreements.
37. Failure to agree to track and report to PacifiCorp bidder's use of diverse businesses including, but not limited to, women-, minority-, disabled-, and veteran-owned businesses, and for resources in Washington state, failure to track and report to the utility the firm's application of the labor standards in RCW 82.08.962 and 82.12.962.³²
38. Bidders agree to comply with Berkshire Hathaway Energy's Cyber Security Requirements, which may include prohibited vendors and compliance with enterprise security requirements as may evolve over the life of the proposed bid term.

SECTION 4. RFP CONTENT AND SUBMITTAL INSTRUCTIONS

A. ALL PROPOSALS

This section outlines the content and format requirements for all proposal structures. Bids that do not include the information requested as described in this section may be deemed ineligible for further evaluation if the bidder does not provide information within two (2) business days of a request by PacifiCorp in its sole discretion. PacifiCorp may deem information not relevant as

³¹ Site control for the 2022AS RFP requires a definitive, exclusive and binding lease or purchase agreement or option agreement.

³² WAC 480-107-075(3)

determined by PacifiCorp in its sole discretion. All sections must be complete and in compliance with the RFP for the bid to be accepted.

B. GENERAL ORGANIZATION OF THE BID SUBMITTAL

All generation and storage resource bids must contain the following information and, to facilitate timely evaluation, must be organized as indicated below. The sections of each bid proposal must be as follows and are further described in this Section 4 and **Appendix B-2 – Bid Proposal Instructions and Required Information**:

- Section 1 - Executive Summary of Proposal
- Section 2 - Resource Description
- Section 3 - Bidder's Qualifications
- Section 4 - Financial Information
- Section 5 - Pricing Proposal and Project Financing strategy, including tax credit strategy
- Section 6 - Interconnection & Transmission Service
- Section 7 - Environmental and Siting
- Section 8 - Contract Terms
- Section 9 - O&M Services Contract Terms (BTA Bid Only)
- Section 10 - Equity Summary

Demand-side bids must contain the information required in PacifiCorp's 2021 Demand Response RFP included in **Appendix Q – 2021 Demand Response RFP - Requirements for Demand-side Bids**.

C. PPA AND TOLLING AGREEMENTS PROPOSALS

For new or existing generating and storage resources, PacifiCorp will consider transaction structures whereby the bidder develops the resource, assumes responsibility for construction and sells the power (and non-power attributes) to PacifiCorp on a long-term basis, pursuant to the terms of a PPA and/or a Tolling Agreement, which will include certain performance guarantees. The bidder will be responsible for all aspects of the development and construction of the facility, including, but not limited to, permitting, engineering, procurement, construction, interconnection and long-term asset management and operational costs. Without limiting the foregoing, the bidder will be responsible for obtaining all permits, rights and resources required to construct and operate the generation resource consistent with the bidder's proposal.

For existing resources, PacifiCorp will consider PPA transactions whereby the bidder sells the power (and non-power attributes) to PacifiCorp on a long-term basis, pursuant to the terms of a PPA, which will include certain performance guarantees. The bidder will be responsible for all aspects of the project's interconnection and the long-term asset management and operational costs. Without limiting the foregoing, the bidder will be responsible for obtaining all permits, rights and resources required to operate the generation resource consistent with the bidder's proposal.

If a proposed resource intends to interconnect to a third-party transmission system, the bidder will be responsible under the PPA to arrange and maintain firm point-to-point transmission service to deliver the full output of the PPA to a designated point of delivery on PacifiCorp's transmission system. Bidders must clearly articulate the point of delivery in their bid and include wheeling costs in their PPA price (see Section 3.I.12 of Minimum Eligibility Requirements FOR Bidders).

Tolling Agreements for standalone storage resources interconnecting with third-party systems will not be accepted.

Bidders interconnecting to PacifiCorp's transmission system shall demonstrate the facility's interconnection studies and interconnection agreement are consistent with the proposed renewable resource equipment, capacity, and configuration and will not require a material modification³³ or interconnection re-study such as, for example, a proposal to add a BESS to a project for which the existing interconnection materials do not contemplate incorporation of such a system.

Specific bid instructions are included in the RFP Appendices. In addition to the bid narrative and bid organization instructions in **Appendix B-2 – Bid Proposal Instructions and Required Information**, PPA and Toll bidders should reference the submittal checklist in **Appendix E-1 – PPA and Tolling Agreement Instructions to Bidders**.

The bidder's proposal must contain their redline to the applicable pro forma documents based on the specific bid: **Appendix E-2 – PPA Documents or Appendix E-3 Tolling Agreement Documents**. Note that the pro forma agreements are tailored for new resources and specific technologies; conforming changes may be required for existing resources or other types of resources. The redline should contain all of Bidder's exceptions to the terms and conditions of the pro forma document. Bidders objecting to terms should provide alternate language and context to the objections for PacifiCorp to evaluate the alternate language. Bidders should submit comments to the pro forma agreement on issues that they have concerns with and identify alternatives to address the issues.

All bidders in this category must complete the information requested in **Appendix C-2 – Bid Summary and Pricing Input Sheet** (PPA tabs listed in Appendix C-1).

PacifiCorp will accept transactions with generating and storage resources for 5 to 30 years. Pumped storage hydro and nuclear bids may submit a contract term longer than 30 years to match the bidder's operational license.

PacifiCorp reserves the right to request a bid's cash flow projection, if necessary, in order to evaluate the bid for capital lease accounting for tax purposes. Similarly, Bidder shall agree to providing certain financial and accounting information as stated in the pro forma documents included in **Appendix E-2 – PPA Documents** and **Appendix E-3 – Tolling Agreement Documents**.

D. BUILD TRANSFER AGREEMENT (BTA) PROPOSALS

PacifiCorp will consider build-transfer transactions whereby the bidder develops the resource, assumes responsibility for the development, construction and then ultimately transfers the project to PacifiCorp, pursuant to the terms of a BTA. The bidder will be responsible for all aspects of the development and construction of the facility, including, but not limited to, permitting, engineering, procurement, construction, interconnection and all related costs up to achieving commercial operation.

³³ As defined in PacifiCorp Transmission's OATT.

BTA bids will only be accepted for proposed resources that directly interconnect to PacifiCorp's system. BTA bids interconnecting with third-party systems will not be accepted. A bidder's interconnection study, or LGIA, if already executed, shall be consistent with the proposed renewable resource equipment and configuration, or else bidder shall provide documentation from PacifiCorp Transmission that a material modification will not be required.

Specific instructions are included in the **RFP Appendices**. In addition to the bid narrative and bid organization instructions in **Appendix B-2 – Bid Proposal Instructions and Required Information**, BTA bidders should reference the submittal checklist in **Appendix F-1 – BTA Instructions to Bidders**.

The bidder's proposal must contain their redline or other substantive comments to the BTA term sheet provided in **Appendix F-2 – BTA Documents**. Conforming changes may be required in **Appendix F-2 – BTA Documents** to reflect specific resource types. Bidders objecting to terms should provide alternate language and context to the objections for PacifiCorp to evaluate the alternate language. For the purpose of non-price scoring, PacifiCorp will consider the completeness of the BTA term sheet comments and redline, and more substantive comments will be addressed after selection to a final shortlist.

All bidders in this category must complete the information requested in **Appendix C-2 – Bid Summary and Pricing Input Sheet** (BTA tabs listed in in Appendix C-1).

BTA bidders will be required to provide an attestation letter signed by an officer representing and warranting certain bid assumptions. For example, BTA bidders must provide sufficient information, representations, and warranties sufficient to assure PacifiCorp that any proposed project will successfully complete construction and achieve full commercial operation by the required deadline. BTA projects must provide documentation that the proposed resource will be eligible to claim any applicable federal or state tax credits or other benefits³⁴ as interpreted by applicable guidelines and rules of the federal Internal Revenue Service or applicable state revenue authority.

BTA bidders will be responsible for submitting an operation and maintenance (O&M) service proposal as part of the overall BTA bid submittal consistent with the applicable terms included in **Appendix K – Operation and Maintenance Services**. Any BTA proposal that does not include an O&M proposal that contains pricing, scope and other key terms will be rejected as a nonconforming proposal.

Bidders should note that any proposal submitted in this BTA category must comply with the applicable technical and construction specifications contained in **Appendix A – Technical Specifications and Required Submittals**³⁵ and must use the services of a single primary contractor.

³⁴ Bidders should provide specific details of claims for tax credits including legal opinions, equipment supply agreements, and documentation of ability to meet tax credit guidelines and rules.

³⁵ PacifiCorp has included technical specifications and resource specifications for wind, solar, and BESS for BTA proposals. For other renewable resources, PacifiCorp will work through the resource specifications on an as needed basis.

To the extent the bidder uses a contractor or a separate legal entity other than the bidder itself, this entity must be experienced with the type of facility being proposed and meet credit criteria which may include a requirement for a parental guarantee, all as deemed acceptable to PacifiCorp in its sole discretion.

E. DEMAND-SIDE RESOURCE PROPOSALS

PacifiCorp recently conducted a demand response RFP in 2021 and is working to contract and stand up significant demand response resources from that solicitation. In the event additional demand response resource need is identified, the Company may issue a voluntary targeted demand-side RFP in Q3 2022. For the purposes of the all-source RFP, demand-response resources are asked to follow the same process and complete the same documents as required by the 2021 demand response RFP in **Appendix Q – 2021 Demand Response RFP - Requirements for Demand-side Bids**. The non-price score and minimum criteria used to evaluate demand-response resources bid into the 2022AS RFP are the same as that used for the 2021 demand response RFP, which is anticipated to be the same as that which would be used for the voluntary targeted demand response RFP.

Prior to issuing the voluntary targeted demand-side RFP, PacifiCorp will update and refine its requirements and description of resource need stemming from the 2021 IRP and incorporate learnings from the 2021 demand response RFP. PacifiCorp does not plan to re-procure resources that were contracted from the 2021 demand response RFP. Demand response resources that bid into any voluntary targeted RFP would only be evaluated based on what is incremental to the Company's existing demand side resources. The Company will identify resources that are of particular interest to the Company at the time of issuance of any voluntary targeted RFP in Q3 2022 and provide guidance to bidders. PacifiCorp anticipates that the voluntary targeted RFP would include many of the same general requirements as the All-Source RFP, though, it may contain some additional requirements specific to customer located resources and evolving state-specific requirements. In the event incremental demand response resource need is identified in Washington state, PacifiCorp, in coordination with the IE, will update the all-source RFP Appendix Q to be consistent with the subsequently issued voluntary targeted RFP.

As part of the evaluation process, both the supply-side RFP and any demand response RFP bids will be input into PLEXOS and included in the final IRP portfolio analysis to determine a final shortlist.

SECTION 5. RESOURCE INFORMATION

A. BID INFORMATION AND PRICING INPUTS

Appendix C-2 – Bid Summary and Pricing Input Sheet is an Excel-based worksheet that covers bid summary information, energy production profile, and pricing requirements for various bid types. Bidders should reference the instructions in **Appendix C-1 – Bid Summary and Pricing Input Sheet Instructions** which provides detailed directions on each tab. Bidders are required to complete and submit **Appendix C-2 – Bid Summary and Pricing Input Sheet**.

B. TECHNICAL SPECIFICATIONS

BTA Bidders are required to comply with technical specifications provided in **Appendix A – Technical Specification and Required Submittals** for BTAs.

C. RESOURCE PERFORMANCE ESTIMATE INFORMATION

Bidders are required to provide a resource performance estimate prepared by a third-party expert. PacifiCorp may accept in-house energy performance report contingent upon PacifiCorp being able to replicate the results.

Appendix C-3 – Energy Performance Report provides detailed directions for resource performance information by resource type.

D. DIRECT INTERCONNECTION TO PACIFICORP'S SYSTEM (ON SYSTEM BIDS)

All bidders are required to have completed an interconnection study. PacifiCorp requires that bidders submit all available interconnection studies and agreements, and any other required supporting documentation such as confirmations related to material modifications received from PacifiCorp Transmission. Off-system bidder requirements for interconnections are discussed in section 5.E below. PacifiCorp will review the bidder's interconnection documentation to confirm it aligns with the bidder's bid.

On-system bidders shall document in their bid and otherwise provide all estimated interconnection costs identified in their interconnection studies and agreements, including direct assigned and network upgrade costs. Bid prices shall include any estimated direct-assigned interconnection costs but shall exclude the estimated network upgrades costs. Although the network upgrade costs are not to be included in the bid price, the network upgrade costs will be provided to PacifiCorp and included in the utility's valuation models.

E. TRANSMISSION SERVICE FOR DELIVERY TO PACIFICORP'S SYSTEM (OFF SYSTEM BIDS)

PacifiCorp will not accept BTA bids for off-system bids. For off-system bid locations, PacifiCorp will only accept PPA or Tolling Agreement bids. PacifiCorp will consider new and existing resources, capable of interconnecting with a third-party transmission system and using firm point-to-point transmission service to deliver to PacifiCorp's transmission system at the bid's identified point of delivery. The minimum eligibility requirements for off-system bidders include an unredacted interconnection system impact study with the third-party transmission provider and documentation³⁶ of the availability of, and request for, long-term, firm point-to-point transmission service from the resource's point of interconnection with the third-party's transmission system to the bidder's designated point of delivery on PacifiCorp's system. Such

³⁶ Transmission service documentation to PacifiCorp's system is two-fold: first, firm capacity is available on third-party transmission provider and second, bidder has made a request to the third-party transmission provider to acquire firm point-to-point transmission service to PacifiCorp's system. Documentation should include copies of direct, dated correspondence from transmission service provider to bidder, showing evidence a request for transmission service was in fact made, and transmission provider is indicating to bidder that firm, uninterruptible transmission service will be available for bidder to procure, for a specified OATT service, and identified MW capacity, POR, POD, and term. Dated correspondence should be at least within six (6) months of bid submittal.

identified arrangements must reasonably demonstrate that the full proposed output of the resource, as identified in the bid, can be delivered by December 31, 2027, or December 31, 2028, for long-lead time resources.

Bidders choosing the third-party interconnection and third-party transmission option are responsible for any current or future third-party tariff requirements or tariff changes related to, but not limited to, any of the following: interconnection, variable energy resource, electric losses, reserves, transmission, integration, imbalance, scheduling, and ancillary service arrangements required to deliver to the bidder's selected point of delivery on PacifiCorp's system. These costs will not be included in the evaluation of PPA proposals as they are assumed to be the responsibility of the bidder.

Bid pricing for off-system bids on third-party transmission: Off-system bidders shall submit bid prices including all interconnection costs from the third-party interconnection provider, whether from a study or a signed interconnection agreement. Off-system bidders must also include in their bid price their estimated cost for wheeling energy to the proposed point of delivery on PacifiCorp's transmission system.

In the event an off-system resource is awarded a PPA or Tolling Agreement, the contract will include appropriate provisions reflecting the Seller's obligation to timely arrange and maintain the necessary firm point-to-point transmission service facilitating delivery of the full output of the resource to the identified point of delivery, including associated events of default for failure to comply with such requirements.

F. NETWORK TRANSMISSION SERVICE ON PACIFICORP'S SYSTEM

Proposed resources must be able to be designated by PacifiCorp's merchant function as a network resource and eligible for inclusion in PacifiCorp ESM's network integration transmission service agreement with PacifiCorp's transmission function (www.oasis.pacificorp.com). The terms and conditions specific to PacifiCorp's network transmission service request are further discussed in the pro forma PPA in **Appendix E-2 – PPA Documents**, the pro forma Tolling Agreement Term Sheet in **Appendix E-3 – Tolling Agreement Documents**, and the BTA term sheet in **Appendix F-2 – BTA Documents**.

G. TAX CREDITS AND/OR PROJECT INCENTIVES

Bidders bear all risks, financial and otherwise, associated with their - or their facility's - eligibility to receive any state or federal energy tax credits, sales tax waivers or exemptions, payment in lieu of tax (PILOT), or any other identified tax- or accounting-related, incentive, or benefit. The obligations of a bidder to perform under any executed agreement resulting from this solicitation remain effective and binding regardless of whether a bidder or facility is eligible for or receives tax credits or other tax- or accounting-related incentives or benefits.

For build-transfer (BTA) transactions, PacifiCorp will require written attestation by an officer of the bidding entity including documentation of the amount, timing and control of any and all available tax credits/incentives that the bidder's facility is eligible for, has applied for, and/or has received. Such documentation must include but not be limited to i) ownership rights to the credit,

grant or incentive, and ii) timing including expiration dates and milestones to achieve the credit, grant, or incentive.

H. ACCOUNTING

All contracts proposed to be entered into as a result of this RFP will be assessed by PacifiCorp for appropriate accounting and tax treatment. Bidders are required to supply, upon request by PacifiCorp, any and all information that PacifiCorp reasonably requires in order to make these assessments if the bid is selected to the final shortlist. Specifically, given the term length of the PPA or Tolling Agreement, or the useful life of the asset to be acquired under an asset acquisition, accounting and tax rules may require either: (i) a contract be accounted for by PacifiCorp as a financial lease or operating lease³⁷ for book purposes pursuant to ASC 842, (ii) a contract be accounted for by PacifiCorp as a capital lease for tax purposes,³⁸ or (iii) assets owned by the seller, as a result of an applicable contract, be consolidated as a variable interest entity (VIE).³⁹ Potential accounting or tax treatment impacts may be incorporated into the bid evaluation and selection process. For instance, if PacifiCorp determines that a long term PPA or Tolling Agreement offering would be treated as a capital lease for tax purposes, PacifiCorp would be treated as the tax owner for the proposed facility. In the event PacifiCorp is required to consolidate the entity, PacifiCorp would contractually require sufficient financial information to be provided to do so.

I. COST ASSOCIATED WITH DIRECT OR INFERRED DEBT

PacifiCorp will not take into account potential costs to PacifiCorp associated with direct or inferred debt (described below) as part of its economic analysis in the final shortlist evaluation. However, after completing the final shortlist and before the final resource selections are made, PacifiCorp may take direct or inferred debt into consideration. In so doing, PacifiCorp may obtain a written advisory opinion from a rating agency to substantiate PacifiCorp's analysis and final decision regarding direct or inferred debt.

Direct debt results when a contract is deemed to be a lease pursuant to ASC 842.

Inferred debt results when credit rating agencies infer an amount of debt associated with a power supply contract and, as a result, take the added debt into account when reviewing PacifiCorp's credit standing.

SECTION 6. BID EVALUATION AND SELECTION

³⁷ The terms "Financial Lease" and "Operating Lease" have the meaning assigned to such terms in the Accounting Standards Codification (ASC) 842 as issued and amended from time to time by the Financial Accounting Standards Board (FASB).

³⁸ See IRS Code Section 7701(e) describing the test for capital lease for tax purposes.

³⁹ The term "Variable Interest Entity" or "VIE" - has the meaning assigned to such term in ASC 810 as issued and amended from time to time by the FASB.

OVERVIEW OF THE EVALUATION PROCESS

PacifiCorp’s bid evaluation and selection process is designed to identify the combination and amount of new resources that will maximize customer benefits through the selection of bids that will satisfy projected capacity and energy needs while maintaining reliability. The method for evaluating benchmark resources will be transparent, fair, and consistent with how market bids are evaluated with additional oversight by the IEs.

The 2021 IRP selected individual resources and optimized a preferred portfolio from a list of generic “proxy” resources to reliably meet PacifiCorp’s energy and capacity needs across its six-state service territory. The PLEXOS portfolio optimization model that PacifiCorp will use to evaluate the 2022AS RFP bids and select the best combination and amount of bids is the same model that was used to evaluate proxy resources in PacifiCorp’s 2021 IRP with limited updates for market conditions conducted with IE oversight. PacifiCorp uses PLEXOS to serve as a decision support tool that can be used to guide prudent resource acquisition paths that maintain system reliability at a reasonable cost.

At a high level, the 2022AS RFP evaluation process involves multiple phases:

1. Minimum criteria and bid eligibility.
2. Due diligence and non-price scoring.
3. Bid preparation for input into PLEXOS, including resource shaping.
4. PLEXOS modeling, including bid selection, portfolio optimization, reliability testing, price-policy scenario analysis, stochastic risk analysis and price scoring.
5. Combination of price and non-price scoring and ranking of preferred resources.
6. Sensitivities may be run as part of the state regulatory approval process.
7. Finally, state-specific resource analyses to comply with evolving regulations. Specific examples include: i) resources allocated to Washington will be measured by certain non-energy benefits and community benefit indicators in compliance with CETA, and ii) small-scale renewables (under 20 MW) will be considered for purposes of satisfying AR 622 Small Scale Renewable Standard in Oregon.

The final shortlist will be selected following a series of PLEXOS model analyses based on a combination of price and non-price factors as weighted in Table 2.

Table 2. Scoring to Determine the Final Shortlist

	Maximum Score
1. Price	75 points
2. Non-price score	25 points

Price scores are determined using PLEXOS model outcomes in accordance with **Appendix R - Bid Scoring and Modeling**. Non-price scores are determined using a non-proprietary, self-scoring matrix. Developers will be asked to grade themselves as part of their bid package, which PacifiCorp will audit before determining a final non-price score for each bid.

The 2022AS RFP evaluation process is shown in Figure 1 and Figure 2. More detail on the price and non-price score methodology is provided below.

Figure 1. Bid Evaluation and Selection Process – Generation and Storage Resources

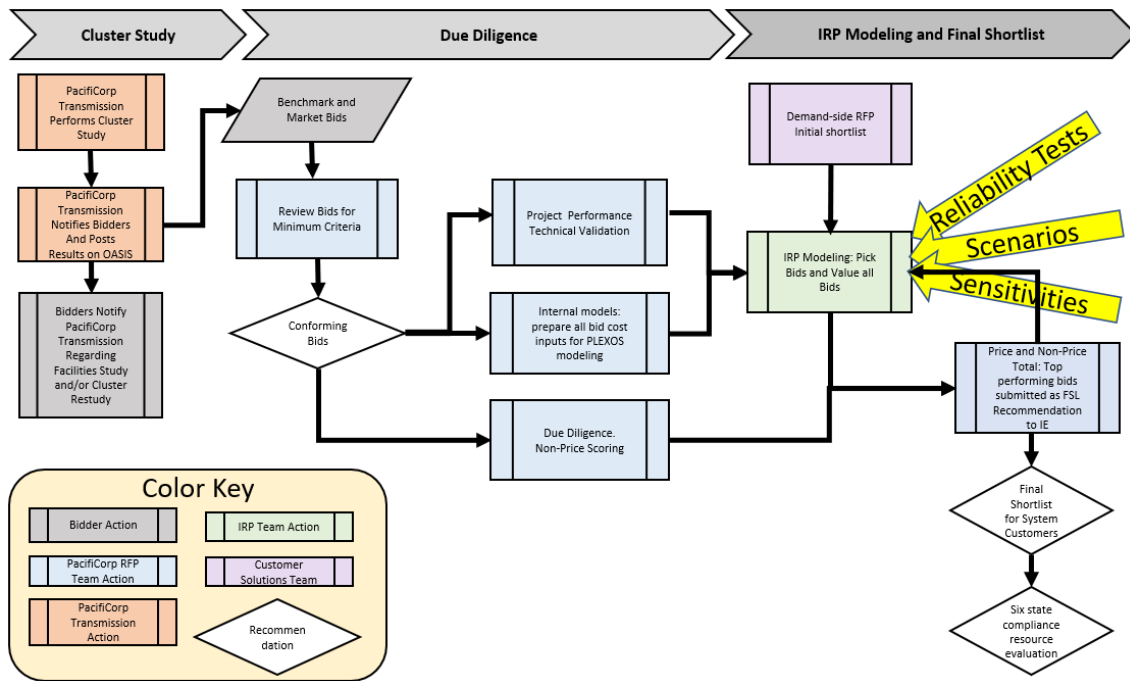
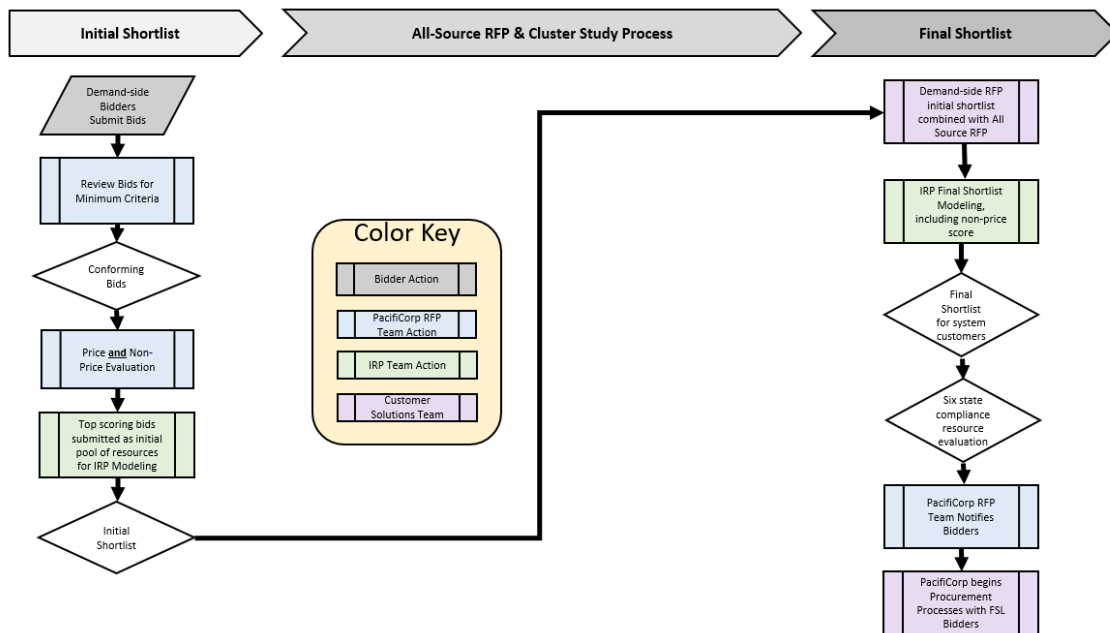


Figure 2. Bid Evaluation and Selection Process – Demand-side Resources



A. BID ELIGIBILITY: CONFORMANCE TO MINIMUM REQUIREMENTS

Benchmark and market bids will initially be screened after receipt against minimum requirements to determine RFP conformance and eligibility. After IE review and consultation, non-conforming bids will be notified to correct their bid within two (2) business days or be removed from the RFP.

Consistent with OR 860-089-0400 (2), non-price score criteria that seek to identify minimum thresholds for a successful bid have been converted into minimum bidder requirements.

B. DUE DILIGENCE AND NON-PRICE SCORING

After PacifiCorp has screened for eligibility, conforming bids will be evaluated according to the non-price criteria in Table 3. PacifiCorp’s review will focus on i) identifying bid attributes that would prevent PacifiCorp from reaching a contract with Bidder and ii) identifying bid deficiencies that would prevent the resources from coming online by the required deadline.

Table 3. Non-Price Factor Weighting

Non-Price Factors	Maximum Non-Price Factor Points
1. Bid Submittal Completeness	5 points
2. Contracting Progress and Viability	5 points
3. Project Readiness and Deliverability	15 points
TOTAL NON-PRICE SCORE	25 points

As part of their bid response, bidders will have self-scored their bids using the non-price scorecard, which will be audited and verified by PacifiCorp prior to giving each bid a non-price score. PacifiCorp reserves the right to contact a bidder to seek clarification and support for the bidder’s self-score. Bidders will have two business days to provide information requested by PacifiCorp to verify the self-scores.

A maximum of 25 points will be allocated for non-price score.⁴⁰ The non-price evaluation rubric is included in **Appendix L – Non-Price Scoring Matrix**.⁴¹ For each non-price factor, proposals will be assigned a one or a zero. PacifiCorp’s non-price scoring model evaluates whether bids are thorough and comprehensive, whether the proposed resource is viable, and whether the bidder is likely to achieve commercial operation by December 31, 2027 (or December 31, 2028, for long-lead time resources), or the proposed COD. The non-price rubric is designed to be objective, intuitive, and self-scoring. As a bid requirement, bidders are required to score themselves based on the completeness of RFP bid requirements, the ability to contract with the resource, and the maturity of the project and ability of the bidder to deliver the resource by the commercial operation deadline.

The first section of non-price scoring model is similar to a check list and grades bids based on completion of bid requirements such as providing complete, thorough and consistent responses. The second section grades bidders based on the ability to contract the resource bid. The third section of the non-price scoring model assesses each bid’s development status and viability. Points are earned based on degree of site control, permits attained, completed equipment sourcing strategy and other development and operational characteristics such as dispatchability and having a reasonable construction schedule.

⁴⁰ The same weighting for price and non-price scoring will be used for demand-and supply-side bids.

⁴¹ OAR 860-089-400-2(b).

PacifiCorp confirms that the non-price scoring is compliant with OAR 860-089-0400(2), non-price factors. Non-price scores primarily relate to resource characteristics identified in the Company's most recent acknowledged IRP Action Plan and reflect standard form contracts. Non-price scoring criteria is objective and reasonably subject to self-scoring analysis by bidders. Non-price score criteria that seek to identify minimum thresholds for a successful bid have been converted into minimum bidder requirements.

PacifiCorp requests that all resources complete the equity questionnaire in **Appendix P – Equity Questionnaire tabs 1 and 2**. Bids located in PacifiCorp's California, Washington and Oregon service territory will earn points in the non-price scorecard consistent with the following state policies:

- For resources located in California, PacifiCorp has a preference for renewable energy projects that provide environmental and economic benefits to communities afflicted with poverty or high unemployment, or that suffer from high emission levels of toxic air contaminants, criteria air pollutants, and greenhouse gases when ranking projects. As described in Section 3.G of the RFP, bids located in PacifiCorp's California service territory may provide a free bid alternative meeting a supplier diversity target for women-owned, minority-owned, disabled veteran-owned and LGBTQ-owned business enterprises and we encourage the bidder to register with California's supplier clearing house.
- Resources in Oregon will be required to provide attestations consistent with HB2021 in order to demonstrate their intent to meet the requirements of HB2021, including but not limited to apprenticeship and workforce requirements.
- Small-scale and distributed supply-side renewable resources under 20 MW which contribute to Washington's CETA goals and PacifiCorp's requirement under the AR 622 Small Scale Renewable Standard.
- When considering resources allocated to Washington customers, PacifiCorp has a preference for projects that provide environmental and economic benefits to highly impacted communities and vulnerable populations. When considering resources to be allocated to Washington customers, **Appendix P – Equity Questionnaire** responses will be used in the final phase of the evaluation process to measure Washington customer benefit indicators as part of Washington's CETA. As resource allocations are not yet known, PacifiCorp requests that all bidders complete Tab 2 of Appendix P- Equity Questionnaire to the best of their knowledge and ability.

C. BID PREPARATION INTO PLEXOS AND RESOURCE SHAPING

Both supply-side and demand-side resources will be prepared and uploaded into PLEXOS. PacifiCorp uses its proprietary excel models to process bid costs for input to PLEXOS modeling with oversight by the IEs. PacifiCorp's proprietary excel file will be used to prepare supply side bids by creating leveled costs for each eligible bid to be included in PLEXOS.

Consistent with the treatment of capital revenue requirement in PacifiCorp's IRP modeling, PacifiCorp will convert any calculated revenue requirement associated with capital costs, as applicable (i.e., return on investment, return of investment, and taxes, net of tax credits, as applicable) to first-year-real-leveled costs. Consistent with the treatment of non-capital revenue requirement in PacifiCorp's IRP modeling, all other bid costs will be summarized in nominal dollars and formatted for input into to the IRP models.

PacifiCorp’s proprietary excel model will calculate the delivered revenue requirement cost of each bid, inclusive of any applicable carrying cost and net of tax credit benefits, all operations and maintenance expenses, property taxes, generation taxes, direct assigned interconnection costs and PacifiCorp Transmission estimated network upgrade costs, as applicable (see Table 4). In developing the delivered cost for each bid, PacifiCorp requires certain cost data as inputs to the bid preparation model. Table 4 contains a summary of the cost / benefit components included in PacifiCorp’s bid preparation model by bid structure.

Table 4. Summary of Net Cost Components by Bid Structure

Component	PPA	Tolling	BTA	Benchmark
Initial Capital Revenue Requirements (net of ITC, if solar)	-	-	(X)	(X)
Ongoing Capital Revenue Requirements	-	-	(X)	(X)
PTC Schedule Benefit (if wind)	-	-	X	X
Terminal Value ⁴²	-	-	X	X
O&M, Lease/Royalty, Insurance	-	-	(X)	(X)
Property Taxes	-	-	(X)	(X)
State Generation Tax (if Wyoming or Montana)	-	-	(X)	(X)
Network Upgrade Revenue Requirements	(X)	(X)	(X)	(X)
PPA Price Schedule ⁴³	(X)	-	-	-
Storage Costs (Toll or Call Option Price Schedule for PPA/Tolls, or capital cost schedule for BTAs)	(X)	(X)	(X)	(X)
Integration Cost	(X)	-	(X)	(X)

*Demand-side resources will be evaluated on a cost of capacity basis net of benefits specific to state cost-effectiveness requirements.

Any internal assumptions for key financial inputs (*i.e.*, inflation, discount rates, marginal tax rates, asset lives, AFUDC rates, *etc.*) and PacifiCorp carrying costs (*i.e.*, integration costs, owner’s costs, *etc.*) will be applied consistently to all bids, as applicable, and reviewed by the IEs prior to finalizing the bid preparation model for PLEXOS. Bids with different price structures and terms will be normalized prior to uploading into PLEXOS.⁴⁴

Projected renewable resource performance data (expected hourly capacity factor information) and degradation schedules will also be processed for input into the PLEXOS model. PacifiCorp will process verified capacity factors for inclusion in the production cost models. Upon determination

⁴² The terminal value assumptions included in the evaluation of utility-owned resources are limited to three components: 1) the remaining usable life for transmission assets (62-year useful life); 2) the remaining usable life of non-transmission assets (land and improvements) (30 year life); and 3) the remaining value of development rights (30 year life)

⁴³ Price scheduled included in Appendix C-2 shall include all development, financing, construction, operations and maintenance costs, including the cost of providing security required in the proforma agreements.

⁴⁴ R746-420-3(4)(c)

of bid eligibility, PacifiCorp will engage a third-party subject matter expert to verify the capacity factor of the proposed wind and solar resources meeting the RFP eligibility criteria, consistent with Oregon rule 860-089-0400 5(a), so that technical due diligence is completed in parallel with the non-price scoring effort and so that validated resource estimates are ready and available to be input into PLEXOS.

As part of the preparation for inputting bid results into PLEXOS, bidder's resource estimates by hour (i.e., 8760s) will be re-shaped based on a similar technology and location present in the 2018 reference year, consistent with the methodology used in the 2021 IRP.

D. PLEXOS ANALYSIS: BID SELECTION AND PORTFOLIO OPTIMIZATION

The IRP team will evaluate the bids using PLEXOS, the same production cost models used in the 2021 IRP. The IRP production cost models will select the optimized portfolio of resources proposed as part of the 2022AS RFP as well as any demand-side bids received as part of the voluntary targeted demand-side RFP issued by Q3 2022. The IRP modeling tools will select from the supply-side and demand-side bids the least cost resources based on bid cost and performance data.

PacifiCorp will summarize for the IEs how the IRP evaluation models function, and the IEs will be provided with the inputs and outputs of PLEXOS model runs used during the evaluation process.

1. Bid Resource Portfolio Development

The PLEXOS model is used to develop an optimized portfolio of resources and candidates for the final shortlist. PacifiCorp uses PLEXOS to develop, test and evaluate the cost of multiple resource portfolios including sensitivities to understand the relative performance of portfolio and resource alternatives under certain conditions.

2. Reliability Tests

PacifiCorp will perform a reliability assessment to ensure that the selected portfolio of resources can meet all hourly load and operating reserve requirements with sufficient margin⁴⁵ to account for other system uncertainties such as non-normal weather events. Should incremental flexible resource capacity be required to maintain system reliability, additional resources will be selected from the bids that are capable of providing incremental flex capacity to hit the targeted reliability requirements.

3. Price Policy Scenarios and Risk Analysis

⁴⁵ Consistent with the reserve requirements in the 2021 IRP.

PacifiCorp evaluates portfolios under a range of different environmental policy and market price scenarios (policy-price scenarios).⁴⁶ PLEXOS calculates the stochastic mean present value revenue requirement (PVRR) and the risk-adjusted PVRR for various policy-price scenarios⁴⁷ to help identify whether top-performing portfolios exhibit especially poor performance under the range of scenarios. PacifiCorp summarizes and analyzes the portfolios to identify the specific bid resources that are most consistently selected among the policy-price scenarios.

In this way, PacifiCorp uses PLEXOS to optimize its selection of bid resources to identify the lowest cost, reliable portfolio under multiple scenarios for further consideration as part of the final shortlist process. PacifiCorp may select one or more 2022AS RFP resource portfolios for further scenario risk analysis.

PacifiCorp uses PLEXOS to test each portfolio and evaluate its ability to perform under dynamic weather and market conditions. PLEXOS measures the stochastic risk of each portfolio through its production cost estimates. By holding a resource portfolio fixed and using Monte Carlo simulations of stochastic variables, including load, wholesale electricity and natural gas prices, hydro generation, and thermal unit outages, PLEXOS can measure the expected cost of each portfolio in an uncertain future.

4. Price Scoring

PLEXOS will calculate the relative system costs and benefits of each resource included in the model for evaluation. The operational characteristics of every bid will be included in the model so that PLEXOS will generate a value stream specific to each bid that will then be used to calculate a price score in accordance with **Appendix R - Bid Scoring and Modeling**.

More information about bid modeling techniques and price scoring, including an example of how the bid scoring will work, may be found in **Appendix R**.

E. FINAL SCORING AND RANKING TO RECOMMEND FINAL SHORTLIST

Following the PLEXOS analysis to select resources and determine price scores for each of the bids, PacifiCorp will combine the price and non-price scores to generate a total final bid score and ranking for each bid (both supply side and demand side bids). In the event that the ranked bids are inconsistent with the selected resources and preferred portfolio resulting from the PLEXOS performance optimization models, in coordination with the IEs, PacifiCorp will investigate the

⁴⁶ Policy-price scenarios will be conceptually consistent with those used in the 2021 IRP (i.e., alternative environmental policy assumptions among low, medium, and high price scenarios), but updated to reflect PacifiCorp's assessment of the most current information. Policy-price scenario assumptions will be established and reviewed with the IE before benchmark bids are received and opened.

⁴⁷ The stochastic mean metric is the average of system net variable operating costs among 50 iterations, combined with the real-levelized capital costs and fixed costs taken from PLEXOS. The risk-adjusted metric adds five percent (5%) of system variable costs from the 95th percentile to the stochastic mean. The risk-adjusted metric incorporates the expected value of low-probability, high-cost outcomes.

discrepancy(ies) and may add or remove resources and run additional iterations of PLEXOS including, but not limited to, reliability tests and price-policy scenarios.

When considering tiebreakers for inclusion in the final shortlist, PacifiCorp will give preference to renewable energy and demand-side resources that provide environmental and economic benefits to communities afflicted with poverty or high unemployment, or that suffer from high emission levels of toxic air contaminants, criteria air pollutants, and greenhouse gases when ranking projects.⁴⁸

PacifiCorp will hold regular meetings with the IEs both in the preparation process for preparing model inputs and analyses and after proposals are received during the evaluation and selection process. Before establishing a final shortlist, the IEs will be provided all bid preparation files and all of the PLEXOS outputs in order to evaluate the scoring and selection process. PacifiCorp may take into consideration, in consultation with the IEs, other factors that are not expressly or adequately factored into the evaluation process outlined above, particularly any factor required by applicable law or Commission order to be considered.⁴⁹

PacifiCorp will summarize and evaluate the results of its scenario risk analysis, considering PVRR results, to identify the specific least-cost, least-risk bids in consideration of non-price scores. Based on these data and certain other factors as described above, and in consultation with the IEs, PacifiCorp may establish a final shortlist.

Selection of the final shortlist will not be conditioned on the results of any future restudy arising out of the applicable PacifiCorp Transmission cluster study process.

After the final shortlist is established and approved, PacifiCorp will engage in negotiations with the selected bidders to finalize their contract and prepare the contract for execution. Selection of a bid to the final shortlist does not constitute a winning bid. Only execution of a definitive agreement between PacifiCorp and the bidder, on terms acceptable to PacifiCorp, in its sole and absolute discretion, will constitute a winning bid proposal.

F. BENCHMARK BID CONSIDERATIONS

In compliance with Oregon rule 860-089-0350, prior to receiving and evaluating market bids, PacifiCorp will i) complete due diligence and non-price scoring for all benchmark bids and forward such models and result to the IEs, ii) complete the bid preparation models for each benchmark resource and upload them into PLEXOS and iii) run the performance optimization and provide initial pricing for each benchmark bid relative to proxy resources. The non-price scores, bid

⁴⁸ Pub. Util. Code § 399.13(a)(5)(7)(A) requires the following: “In soliciting and procuring renewable energy resources for California based projects, each electrical corporation shall give preference to renewable projects that provide environmental and economic benefits to communities afflicted with poverty or high unemployment, or that suffer from high emission levels of toxic air contaminants, criteria air pollutants and greenhouse gas emissions.”

⁴⁹ California Pub. Util. Code § 399.13(a)(8)(A), WAC 480-107-035, Utah R746-420-3, OAR 860-089-0400.

preparation model inputs, PLEXOS output, and initial price scores will be provided to the IE and filed with the Commission prior to opening market bids.

After PacifiCorp received market bids, PLEXOS will be re-run comparing all benchmark and market bids to provide a final price score for each benchmark and market bid. PacifiCorp will apply the same assumptions and bid scoring and evaluation criteria to the benchmark bids that are used to score other bids. Prior to opening and scoring the market bids, PacifiCorp will have filed with the Commission, and submitted to the IEs for review and comment, its detailed bid preparation models and non-price scores for the benchmark resources developed in consultation with the IEs and any other supporting cost or related information.

The Benchmark bids will be validated by the IEs and no changes to any aspect of the Benchmark bids by PacifiCorp will be permitted after the filing and receipt of market bids. All relevant costs, assumptions, model inputs and characteristics of the Benchmark bids will be validated by the IEs prior to receiving any of the bids and are not subject to change during except as provided herein.

Benchmark bids will not be subject to change unless updates to other bids are permitted. If, during the course of the RFP process, the Commission or the IEs determines that it is appropriate to update any bids, PacifiCorp will make the equivalent update to the score of the benchmark resource.

PacifiCorp and the IEs will file under protective order(s) an assessment of the benchmark scores as well as cost and other information as required.

In this way, in compliance with Washington rule 480-107-024(3), PacifiCorp will not disclose the contents or results of competing market bids to personnel involved in developing the utility's benchmark bids. Further in compliance with Utah rule R746-420-3(3)9e), by completing the due diligence and scoring of Benchmark bids prior to accepting market bids, PacifiCorp assures that resource evaluations will be conducted in a fair and non-preferential manner.

G. STATE REGULATORY CONSIDERATIONS

Following the final shortlist selection, PacifiCorp may consider resources additions and changes required for state compliance purposes.

For example, to address Washington's CETA requirements, in consultation with the IE, PacifiCorp will evaluate the final shortlist bids designated in part to serve Washington customers. As part of the Section 6 Evaluation and Selection Process, PacifiCorp will have established a price and non-price score for each bid. A bidder may have offered an alternative diversity strategy with a different supplier, contractor or workforce diversity target and a different price for a proposed resource. PLEXOS, during the price scoring step of the evaluation process will have established a price score for each bid alternative. Similarly, each of the alternatives may have a different non-price score based on the unique diversity strategy and other attributes. In the event that the total ranking (combination of price and non-price score) for one of the bid alternatives for the resource is selected for the final shortlist based on its total score and ranking in consideration of the PLEXOS portfolio optimization recommendations, then PacifiCorp will consider the bid alternatives. In the event that one of the bid alternative offered a diversity strategy more compatible with CETA goals,

PacifiCorp would, in coordination with the IE, analyze the incremental cost of the preferred bid alternative and may recommend moving forward with a higher cost, more favorable resource bid alternative to address Washington’s CETA goals, with the understanding that any incremental cost will be allocated to Washington customers.

It is in this state regulatory consideration step that PacifiCorp will review the recommended list of renewable and non-emitting resources to be assigned to Washington customers and consider the Appendix B-2, Section 10 bid narrative responses as well as the Appendix P Equity Questionnaire responses. In accordance with WAC 480-107-035, PacifiCorp will review the Equity Questionnaire for each resource and evaluate the associated risks and benefits to vulnerable populations and highly impacted communities associated with those bids. PacifiCorp, in consultation with the IE, may add or replace resources allocated to Washington customers in order to meet CETA goals. Per CETA rules, the incremental cost associated with those resources would later be assigned to Washington customers. If for example, a demand-side bidder offers a program to increase the number of households/businesses who will participate/enroll in demand response, load management, and behavioral programs as a result of this proposed resource, and if the bid offered a unique opportunity to contribute to PacifiCorp’s customer benefit indicators in Washington, yet was not recommended to the final shortlist due to its price and non-price score ranking, then PacifiCorp, in coordination with the IE, may recommend adding such a resource on behalf of Washington customers, so long as the incremental cost would be assigned to Washington customers.

As part of the state regulatory consideration step related to Oregon, PacifiCorp will consider small-scale and distributed supply-side resources under 20 MW which were not selected to the final shortlist but which might be purchased on behalf of Oregon customers to contribute to the Company’s AR 622 requirements.

H. RESOURCES NOT SELECTED TO FINAL SHORTLIST

Following PacifiCorp’s selection of resources for system customers and any additional resources required to meet specific state compliance obligations, PacifiCorp may conduct a secondary process to match renewable resource bids that are not chosen to the final shortlist to customers interested in voluntary renewable programs. This secondary, discretionary process shall have no bearing on the outcome of the least-cost, least-risk resources chosen for system customers and state regulatory requirements.

SECTION 7. AWARDING OF CONTRACTS

A. INVITATION

This RFP presents only an opportunity for bidders to make proposals to PacifiCorp. No proposal is itself a binding contract unless the parties execute definitive and complete documentation providing otherwise.

PacifiCorp may in its sole discretion do any one or more of the following:

1. Determine which proposals are eligible for consideration in response to this RFP.

2. Issue additional subsequent solicitations for information and conduct investigations with respect to the qualifications of each bidder.
3. Supplement, amend, or otherwise modify this RFP, or cancel this RFP with or without the substitution of another RFP.
4. Negotiate with bidders to amend any proposal.
5. Select and enter into agreements with the bidders who, in PacifiCorp's sole judgment, are most responsive to the RFP and whose proposals best satisfy the interests of PacifiCorp and its customers, and not necessarily on the basis of price alone or any other single factor.
6. Waive any irregularity or informality on any proposal to the extent not prohibited by law.
7. Reject any or all proposals in whole or in part.
8. Vary any timetable.
9. Conduct any briefing session or further RFP process on any terms and conditions.
10. Withdraw any invitation to submit a response.

B. BASIS OF REJECTION

Proposals may be rejected for any reason including but not limited to not meeting the minimum eligibility requirements identified in Section 3.1 of this RFP.

C. NON-RELIANCE LETTER

All parties will be required to sign **Appendix G-2 - Non-Reliance Letter** if they qualify for the final shortlist.

D. POST-BID NEGOTIATION

PacifiCorp will negotiate final contract terms following issuance of the final shortlist. PacifiCorp will include in its final evaluation prior to contract execution any factor that may impact the total cost of a resource, including but not limited to all of the factors used in the final shortlist cost analysis plus consideration of accounting treatment and potential effects due to rating agency treatment, if applicable.

PacifiCorp has no obligation to enter into any agreement with any bidder to this RFP and PacifiCorp may terminate or modify this RFP at any time without liability or obligation to any bidder. In addition, this RFP does not in any way prevent PacifiCorp from entering into any agreement that PacifiCorp deems prudent, in PacifiCorp's sole discretion, at any time before, during, or after this RFP process is complete. Finally, PacifiCorp reserves the right to negotiate only with those entities that propose transactions that PacifiCorp believes in its sole discretion have a reasonable likelihood of being executed.

E. SUBSEQUENT REGULATORY ACTION

Unless mutually agreed between the parties in a definitive agreement or unless required by actual (or proposed) law or regulatory order, PacifiCorp does not intend to include a contractual clause whereby PacifiCorp is allowed to adjust contract prices in the event that an entity who has regulatory jurisdiction over PacifiCorp does not fully recognize the contract prices in determining

PacifiCorp's revenue requirement. As of the issuance date for this solicitation, PacifiCorp is unaware of any such actual law or regulatory order.

F. RFP RESULTS

PacifiCorp will comply with Washington and Oregon rules for posting of the RFP results. Washington requires a summary of each bid be posted within thirty (30) days after the close of the bidding period. Oregon requires after execution of all contracts or cancellation of the RFP that 1) individual bidder's score be made available to the bidder, upon request,⁵⁰ and 2) a publicly available filing be made in the Oregon RFP docket providing the average bid score and the average price of the final shortlist by resource type.⁵¹

⁵⁰ OAR 860-089-500(6)

⁵¹ OAR 860-089-500(5)

RFP Appendix A-1.4 - Solar



Solar Photovoltaic Renewable Resource Technical Specification 2021



**RFP APPENDIX A-1.4 SOLAR
WORK SPECIFICATIONS (BTA)**

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1.0 ACRONYMS AND ABBREVIATIONS

AC	alternating current
A	ampere
ASCE	American Society of Civil Engineers
ASTM	American Society for Testing and Materials
CPT	control power transformer
DC	direct current
EL	electroluminescence
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
kW	kilowatt
kWh	kilowatt hour
LPS	lightning protection system
MW	megawatt
MW _{AC}	megawatt alternating current
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
O&M	operation and maintenance
PCB	polychlorinated biphenyl
PCC	Point of Common Coupling
PV	photovoltaic
PVC	polyvinyl chloride
QA/QC	quality assurance/quality control
SCADA	supervisory control and data acquisition
SCCR	short-circuit current rating
SPD	surge protection devices
SWPPP	Storm Water Pollution Prevention Plan
TÜV	Technischer Überwachungsverein
UL	Underwriters Laboratories, Inc.
V	Volt

V _{AC}	volts alternating current
V _{DC}	volts direct current
VDE	association for electrical, electronic, and information technologies

2.0 LIST OF APPENDICES TO APPENDIX A

- A-1 Not Used
- A-2 Interconnection Agreement (Seller provided)
- A-3 Permit-Matrix (Seller provided)
- A-4 Not used
- A-5 Project One-line Drawing and Layout (Seller provided)
- A-6 Division of Responsibility (Owner provided)
- A-7 Owner Standards and Specifications (Owner provided)
- A-8 PVSYST Performance Summary Report (Seller provided)
- A-9 Product Data Input Supply Forms (Seller provided)
- A-10 Not Used

3.0 REFERENCE PACIFICORP STANDARDS

RFP Appendix A-7 contains the following Owner standards that apply to this specification:

- (01) Attachment 1A Project Document Formatting and Requirements.
- (02) Attachment 1B Project Document Deliverables.
- (03) Computer Aided Design (PacifiCorp Energy) General AutoCAD/Drafting Standards (Specification DCAP876).
- (04) Renewable Resources: Engineering Procedures/CAD Standards, Volume 8 Consultant Drafting Procedures and Standards (For Engineering Drawings)
- (05) 04.1 Substation Equipment Power Transformers, ZS-001 and b) 04.2 Two-Winding Distribution Transformer, ZS-102.
- (06) Material Specification ZS 061, Electrical Equipment-Insulating Oil.
- (07) Material Specification ZS 065, Wind, Ice, and Seismic Withstand.
- (08) Material Specification ZS 066, Contaminated-Environment Protection.
- (09) Procedure SP-TRF-INST, Transformer Receiving, Installation and Testing.
- (10) Asset Management Form 006F, Meter and Relay Equipment Memorandum.
- (11) PacifiCorp Engineering Handbook, Part 6B.5 Fence Application and Construction.
- (12) PacifiCorp Engineering Handbook, Part 6B.6 Substation Grounding.
- (13) PacifiCorp Protective Relaying Standard, Document Number: GEN-ENG-RELAY-0001.
- (14) PacifiCorp Protective Relaying Standard, Arc Flash Hazard Standard, Document: GEN-ENG-RELAY-0002.
- (15) PacifiCorp Protective Relaying Standard, "Relay Current Transformer (CT) & Potential Transformer (PT) Insulation Integrity Test," Document: GEN-ENG-RELAY-0003.
- (16) PacifiCorp Protective Relaying Standard, "Thermal Plant Protective Relay Maintenance and Testing-PRC-005," Document: GEN-ENG-RELAY-1003.
- (17) PacifiCorp Protective Relaying Standard, "Relay Testing & Commissioning Checklist."
- (18) PacifiCorp Protective Relaying Standard, "Relay Installation Procedure," Document: GPCP-EQPMNT-INST.
- (19) PacifiCorp Protective Relaying Standard, "Current Transformer Installation Procedure (Relay)," Document: GPCP-CT-INST.
- (20) PacifiCorp Protective Relaying Standard, "Current Transformer Installation Form (Relay)," Document: GPCP-CT-INST.
- (21) PacifiCorp Substation High-Voltage Warning Signs, SG-001.
- (22) Specification for Substation Equipment Installation Testing and Commissioning.
- (23) SV002 Bird and Animal Protection-General Installation Instructions
- (24) SV251 Bird and Animal Protection for Miscellaneous Equipment

(25) TD051 Danger Sign

OTHER RELEVANT DOCUMENTS

PacifiCorp “Open Access Transmission Tariff”. FERC Electric Tariff

4.0 TECHNICAL SPECIFICATION

This is Appendix A - Solar “Solar Photovoltaic Renewable Resources 2020 – Technical Specification”, which will subsequently become a contract document, as a supplement to the Build Transfer Agreement (“The Agreement”). Capitalized terms used and not defined herein have the meanings given in the Agreement unless the context requires otherwise.

4.1. Introduction and Seller Responsibilities

Seller shall provide all required services and materials for the successful completion of the Plant. Seller’s responsibilities shall include environmental permitting, design, engineering, procurement of equipment, Site preparation work, foundations, installation of all equipment, bulk material and commodities supply, and Site finishing work. Seller also shall deliver project management, construction management, commissioning and startup, and testing of work, all as described in this document including all referenced appendices and standards which will subsequently become a contract document.

Seller shall construct all roads, foundations, electrical systems, control systems, monitoring systems, communications, ancillary structures, storage facilities, security systems, and fencing, and shall erect and commission and start-up the photovoltaic (PV) System in the locations and orientations set forth in the Site plan and Site layout drawings and in accordance with this document, and all related specifications that relate thereto.

Installation of the PV System shall be performed by a recognized, experienced Contractor in accordance with federal, state, local, and utility specifications and requirements and in accordance with the relevant state energy office. The electrical installation of the PV System shall be performed in accordance with the same requirements. The Work shall be performed by an electrical contractor licensed in the state where the project will be constructed. The work shall be performed by a licensed Contractor approved by the relevant State authority. Seller shall provide comprehensive onsite construction management for the Plant and shall commission and start-up the Plant. Seller shall manage, supervise, inspect, and furnish all labor, equipment, materials, temporary structures, temporary utilities, products, and services related to the foregoing, all on a turnkey basis.

These specifications are intended for use by Sellers providing a Solar PV Plant to be owned by PacifiCorp (Owner). The PV Plant shall be designed, built, commissioned, and started-up by the Seller based on these PV Specifications, and all other Owner requirements including its interconnections for connecting to the transmission or distribution system. Upon completion of the quality assurance/quality control (QA/QC) procedures and Plant Acceptance the PV Plant shall be turned over for care and custody by Owner. Seller shall perform the Work in accordance with the following:

- (01) In a manner that is sufficient, complete, and adequate in all respects necessary for the Plant to successfully achieve Final Acceptance by the Guaranteed Final Acceptance Date.
- (02) In conformance with the professional standards, skill, expertise, and diligence of design and construction of professionals regularly involved in utility-grade, utility-scale, grid-connected solar PV power projects in the United States.
- (03) In compliance with the terms of the contract documents, the operating guidelines, the Utility’s interconnection requirements (**RFP Appendix A-2 – Interconnection Agreement**), and all applicable laws, standards, and permits including PacifiCorp’s “Access Transmission Tariff”, FERC Electric Tariff.

- (04) Approved as to form, use, and content by all government authorities and private entities authorized to administer or enforce any building, electrical, or construction code or standard whose approval of the final design of the Plant, or any portion thereof, is necessary for the construction, operation, or interconnection of the Plant.

4.2. Performance Characterization

The predicted PV system performance estimate must be provided in **RFP Appendix A-8** and is based on the performance characterization data in **RFP Appendix C-2 and C-3**. The predicted PV system performance information that is to be provided shall include the PVSyst report, the 12X24 output in an Excel format, and an hourly profile 8760 output in an Excel format.

4.3. Permitting

Seller shall apply for and obtain all permits and authorizations necessary for construction and to support operations of the Plant, as per the attached permitting matrix (**RFP Appendix A-3**). Copies of all applicable permits will be provided to Owner within 5 business days after they are obtained or completed.

4.4. Construction and Installation

Prior to beginning construction, Seller shall provide a comprehensive onsite construction management plan for the construction of the Plant in accordance with all applicable laws and policies and Health, Safety, and Environmental Plans of the Seller and if work is performed on Owner property, meet all safety program requirements of Owner including Appendix A Contractor Health Safety and Environmental Requirements, Appendix A Contractor Safety Plan Requirements, and all changes to applicable law and Owner policies. No later than 15 days prior to initial Site mobilization, Seller shall prepare and submit such Plans to Owner. Seller shall also provide Owner with an evaluation and appropriate documentation of the safety record for any licensed Subcontractor that will be performing work on the Plant.

Seller shall assemble, construct, and install with its own labor forces and/or with Subcontractors labor, tools, and equipment necessary to complete the Plant, including the following Works:

- (01) Site preparation, including but not limited to drainage required by the civil engineering plan, and remove excess debris
- (02) Coordination with Owner when trenching is performed
- (03) Direct current (DC) cabling and combiner and junction boxes
- (04) Alternating current (AC) trenching and cabling
- (05) Inverters, switchgear, and transformers and accompanying supports and/or concrete pads
- (06) All equipment from the DC solar array up to and including the point of interconnection with the electric utility system
- (07) Perimeter security fencing, access gates, and security systems (described in section A-3.9 Security)
- (08) Security lighting
- (09) Installation of the monitoring system, meteorological station(s), and revenue grade metering.

Installation of all required Customer Owner interconnection structures of equipment – e.g. Substation or disconnects, meter and GOAB poles.

Seller shall provide all utilities necessary during construction, including but not limited to electricity, water, toilets, fuel and communications. Seller shall be responsible for all costs associated with

construction power. The following sections and associated appendices describe the scope of work and technical specification for the Plant.

4.5. Site and Plant Description

Seller shall, at its own cost and expense, design, engineer, procure, construct, test, permit, and start up a utility scale PV solar system with a design output as stated in its proposal.

Except as otherwise expressly provided in the Agreement, Owner is not responsible for providing any material, labor, or services of any kind during Seller's execution of the Work. Seller is fully responsible for all development, permitting, engineering, procurement, construction, interconnection coordination, and startup and testing activities, and shall deliver a complete, operational, and reliable turnkey Plant to Owner. Seller shall provide civil, electrical and structural engineered drawings stamped by an engineer certified in the state where the project will be constructed, materials and equipment, installation of PV modules, installation of electrical systems including inverters, electrical connection to the existing electrical infrastructure, and construction of mounting structures on which the PV modules are installed. Seller shall provide comprehensive onsite construction management for the Plant and shall commission the Plant. Seller shall manage, supervise, inspect, and furnish all labor, equipment, materials, temporary structures, temporary utilities, products, and services related to the foregoing, all on a turnkey basis.

4.6. Design and Engineering

Seller shall design and engineer the Plant in accordance with prudent utility practices, with the professional standards, skill, expertise, and diligence of design and construction of professionals regularly involved in utility-grade, utility-scale, grid-connected solar PV power projects for public utilities in the United States. The design must conform to the requirements and conditions of all applicable permits, codes and standards, and laws, and it must be in compliance with the operating guidelines and meet the Owner specifications.

Seller is responsible for all engineering for the Plant. All design drawings, specifications, and calculations shall be signed by a professional engineer-of-record in the state where the project will be constructed. The Agreement provides for submission to Owner of complete design drawings, data, and documents for review and comment. These engineered design drawings, data, and documents must be submitted to Owner for review and comment before construction is to begin.

Seller is responsible for ensuring that all components are installed min 1 foot above the 100-year flood plain (e.g., inverter stations, substation, supervisory control and data acquisition [SCADA] system, Security System, control building, PV modules, tracker motors, switchgear, transformers, combiner boxes, etc.). The Seller is responsible for ensuring that all PV modules and combiner boxes are installed above the maximum snow height.

Any third-party study or independent engineering reviews including, but not limited to, the geotechnical study and the corrosion study shall be provided to Owner.

4.7. Engineering Design Package

Based on the review of the Plant Site and infrastructure, Seller shall design (or have designed by consulting engineers) a Plant (including all layout, civil, electrical, and structural components) that will produce the required electricity and that is capable of being operated in a safe, normal, reliable, and continuous manner as required by the contract documents at all operating conditions and modes specified below. The system design shall comply with all applicable laws and regulations and applicable permits. Owner may utilize a third-party or independent engineering consultant to perform technical reviews. Studies prepared by the Seller's third-party consultants shall be provided to the Owner for review.

The Engineering Design Package shall include but not be limited to all items required in **Appendix A-7.2 Attachment 1B – Project Document Deliverables**:

- (01) Studies related to the project, such as the geotechnical engineering report and the lightning protection study
- (02) Schematic and preliminary designs
- (03) Design calculations
- (04) All drawings including mechanical, electrical, structural, civil, and construction drawings (Site plans, schematic single lines, wiring diagrams and detail drawings). Drawings shall follow **Appendix A-7.03**.
- (05) Project schedule
- (06) Product description information
- (07) Bill of Materials
- (08) Equipment details, descriptions, and specifications
- (09) Commissioning and start-up plan
- (10) Full power test plan (capacity test)
- (11) Layout of equipment
- (12) GIS Shapefiles of all project equipment (transformers, junction boxes, overhead line poles, access roads, etc.)

The Engineering Design Package shall be provided prior to commencement of construction.

4.8. Site Layout, Maps, Line Drawings

Prior to beginning construction or procuring equipment, Seller shall submit to Owner Site layout design drawings, data, and documents for review. The design shall include a vehicle access road to provide maintenance, cleaning, and public safety access with a 30-year service life (assuming regular maintenance) that shall comply with state and local county surface requirements.

The Seller shall plan and execute construction of earthwork methods and culverts (or other water control devices) to control surface drainage from cuts and fills and prevent erosion and sedimentation in compliance with the Storm Water Pollution Prevention Plan (SWPPP).

4.9. Structural Engineering

Seller shall supply or design the PV arrays' mounting systems, foundations, and piers, as well as any equipment pads and buildings on the Site. The designs of these components shall be based on the requirements of applicable codes, standards, and permits, and the information/specifications provided by the module, inverter, transformer, switchgear, racking/tracking structures, and all other vendors.

Concrete designs shall conform to the requirements listed in the latest applicable editions of ACI 318 Building Code Requirements for Structural Concrete (ACI 318) and ACI 336.1-01 Specification for the Construction of Drilled Piers, if applicable. At a minimum, compressive strength of concrete shall not be less than 4000 psi (28 MPa).

Steel designs shall conform to the requirements listed in the latest applicable edition of AISC Manual of Steel Construction. Seller shall be responsible for full design of all structural components including connections. Load combinations used in design shall be defined as according to the latest edition of ASCE 7 or local applicable codes, whichever is most restrictive. The designer shall consider various wind load configurations to ensure that the most critical loading conditions are captured.

Welding shall be performed in accordance with AWS D1.1 Structural Welding – Steel (AWS) by AWS certified welders. The Seller shall ensure that installation tolerances and structural deflection are followed.

4.9.1. Geotechnical Analysis

Geotechnical analysis shall be provided by Seller and performed by a qualified geotechnical engineering firm employing a licensed Professional Engineer. The results of the analysis shall be used when designing the foundations for the structures on the Site.

At a minimum, the following should be included in the analysis:

- (01) Review publicly available geotechnical information and reports. This may include soils and geologic maps and literature, photographs, hydrogeology reports, groundwater reports, and water well data.
- (02) Coordination and mobilization of the geotechnical services team for subsurface exploration of the Site. This should include working with the local utilities to mark any existing underground utilities (such as cables, gas lines, piping, etc.) in advance of mobilization.
- (03) Study the Site to determine the presence of faults, ground fissures, slope instability on the Site or adjacent lands, and other potential geologic hazards that could affect the structural design, construction, and long-term operation of the Plant.
- (04) Drilling or digging of exploratory borings and pits. The amount and depth shall be determined by the Seller's geotechnical engineering firm.
- (05) Performance of cone penetration tests. The amount and depth shall be determined by the Seller's geotechnical engineering firm.
- (06) Laboratory testing of collected soil samples from the borings and test pits. An evaluation of the in-place moisture content and dry density, gradation, plasticity, consolidation characteristics, collapse potential, expansivity, shear strength, soil resistivity for the purposes of determining cable ampacity, chloride content, sodium sulfate content, and solubility potential (total salts) should be conducted.
- (07) Analyze the corrosivity of the soil. Include a recommendation for the type of cement to be used in any concrete foundations. Also include recommendations for corrosion protection for underground steel, including rigid metal conduit (such as the need for polyvinyl chloride [PVC] coatings).

Provide design criteria that can be used as required for performing L-Pile calculation – structural soil layers, K values, etc.

A detailed geotechnical report shall be provided outlining the tasks performed and the results of the testing. Included in the report should be any recommendations for the foundation designs, structural support designs, corrosion protection for both underground steel and concrete, pile drive frequency, minimum pile size, and any geologic conditions that may prevent the development of the project. Specifically, an opinion on the viability of driven piles as the PV racking supports should be provided.

4.9.2. Environmental Loads

All structures on the Site shall to be designed using environmental loads as specified in the American Society of Civil Engineers (ASCE) 7-16 (year 2016) code book *Minimum Design Loads for Buildings and Other Structures*. These include wind loads (Chapter 6), snow loads (Chapter 7), rain loads (Chapter 8), ice loads (Chapter 10), and earthquake loads (Chapter 11). Each structure on Site shall be

grouped in Occupancy Category II as defined in Table 1-1 of ASCE 7 - 2016. The corresponding importance factor shall be used for each load calculation.

4.9.3. Racking/Tracking Foundations and Supports

All foundations and supports must be designed using the calculated environmental loads discussed above and soil properties provided in the geotechnical report. Foundations and supports shall meet the recommendations found in the geotechnical report. Foundations and supports shall be designed for a minimum 30-year lifetime, including all environmental factors and corrosion. Foundations and supports should be designed to withstand the impacts and contact pressure from the installation method (such as a vibratory hammer). Any damage to corrosion protection coatings during installation should be repaired. Foundations and supports, including any field-applied modifications (e.g., holes drilled), shall meet the requirements in Corrosion Protection. The pile calculations shall account for the top 12 inches of soil to not have any load bearing capacity due to long term erosion and other effects over the course of the structure life. Pre-drilled or other special foundation types will be evaluated on a case by case basis.

4.9.4. Equipment Pads

All equipment pads shall be located such that adequate personnel access is provided to such equipment. A minimum of 4 feet (or 1.5 meters) horizontal clearance from obstructions that would otherwise limit access to the equipment on the pad shall be provided around all equipment pads. The pads shall be sized sufficiently to allow safety and adequate working space around the equipment. The inverter stations, switchgear, substation (if applicable), and other buildings shall be elevated minimum 1 foot above the Federal Emergency Management Agency 100-year flood plain. The slope of the earthwork around the inverter stations and other equipment shall allow safe and ergonomic access to the equipment.

4.9.5. Corrosion Protection

Corrosion protection shall be utilized on the structures of the Plant. The type and amount shall depend on the selected materials of construction and conditions at the Site. A study of these conditions along with recommendations from the geotechnical report shall be used to design the corrosion protection.

The corrosion protection study shall be performed by a qualified corrosion expert and documented with references and calculations showing that the foundations, supports, racking, fasteners, and conduit shall meet a 30-year design life in aboveground and belowground conditions. If galvanized materials are used, field-applied zinc coatings shall meet American Society for Testing and Materials (ASTM) A780, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings. This standard contains minimum requirements for the material, surface preparation, and application process. For example, repairs to damage due to vibratory pile driving shall conform to ASTM A780.

It is preferred that all holes in structural members requiring galvanization shall have the holes drilled before the galvanization is applied. Should holes be drilled in the field, galvanizing shall be applied to the exposed steel as specified in ASTM A780. All field welds shall have a field-applied galvanization as specified in ASTM A780. For example, if torque tubes with a 3-mil (0.003-inch) hot-dip galvanization are to be welded in the field, a field-applied coating, such as hot stick repair, shall meet or exceed the original 3-mil coating thickness of the torque tube per ASTM A780 requirements.

Only steel bolts with pre-applied corrosion inhibitors or stainless-steel bolts and fasteners shall be allowed in the entire mounting structure.

4.9.6. Single Axis Tracking Structures

In the event a tracking system is utilized, the system shall be designed using the environmental loads and the Occupancy Category as discussed in Environmental Loads. The torque tubes, attachments, module mounting brackets, fastening hardware, foundations, and supports shall have a 30-year design life. Equipment shall have corrosion protection coatings as discussed in section Corrosion Protection.

A common feature of many trackers is the “stow” option during high winds. This feature will change the tracker’s tilt to a more favorable angle to decrease the wind loads on the racking, supports, and foundations during high wind conditions. If a “stow” is required to meet design wind loads, a backup energy source (e.g., a backup emergency battery system) shall be installed on the Site to ensure that the tracker shall be able to move into the stow position if the power from the grid is interrupted during high wind conditions in excess of the vendor’s design limit or the foundation design limit.

4.10. Civil Engineering

Seller shall design all systems in accordance with applicable codes and standards. Seller shall design necessary road improvements to meet state and local transportation codes, standards, conditional use permit stipulations and conditions, and requirements presented by construction equipment, delivery vehicles, and operation and maintenance traffic. Seller shall perform required Site preparation, to include earthworks, SWPPP, and erosion control. Seller shall attempt to minimize earthwork and vegetation disruption for the installation of the Plant to the extent it is compliant with the use permits; however, site grading and surfacing shall be designed to control vegetation to minimize fire danger and provide the ability to operate and maintain the Plant. Any land contours that may affect PV electrical generation should be included in the PV system performance estimate. If required, Seller shall import engineered fill to slope the Site and prevent accumulation of standing water. Any direct burial cabling shall be protected with adequate bedding materials to ensure long-term cable integrity. Dust control shall be maintained in accordance with state and county requirements until Final Acceptance is achieved. Seller shall provide other Site maintenance as needed during construction. Seller shall coordinate interaction between Owner and any permitting authorities regarding the Work.

4.10.1. Human Access

Seller shall make access to all equipment safe and reasonably ergonomic for maintenance staff. For example, if an inverter pad is elevated, the earthwork surrounding the concrete pad shall have a safe approach slope.

4.10.2. Erosion Control

Seller shall submit a location-specific erosion control plan for state and/or local jurisdiction approval prior to construction.

All areas of temporary soil disturbance are to be graded, if necessary, and re-vegetated in a timely manner to limit erosion as required by the local jurisdiction. A weed management plan for site reclamation shall be developed and submitted to Owner for review prior to construction.

All storm water and erosion control measure details to include installation, operation, and maintenance requirements.

The civil design shall include specifying applicable seeding notes and details for temporary and final/permanent site stabilization. Seed mix specifications shall be outlined on the civil plans. Seed mixes to be low lying, native mixes.

Protection of sensitive features during construction as established by environmental, biological, and/or historic studies.

The Seller shall provide an Erosion and Sediment Control Plan document that includes, and not limited to, at least the following sections:

- (01) Initial Land Disturbance
- (02) Construction Period Disturbance
- (03) Stabilization Plan
- (04) Post Construction Stabilization Plan
- (05) Long Term Maintenance Plan

4.10.3. Grading and Drainage

The grading and drainage plan shall be designed and installed in accordance with state and/or local code and permit requirements. All structures required for the drainage plan, if any, shall comply with state standard specifications for drainage facilities.

The Seller shall design the site in a manner which properly manages storm water and/or groundwater such that minimal pooling/ponding of water occurs in any of the array or access road areas. Efforts shall be made to minimize earthwork and balance total cut/fill on site for a zero off-haul/import condition. Efforts shall be made to balance different areas on site to limit the earthwork haul lengths as most practical.

Efforts shall be made to maintain the pre-construction drainage patterns and peak flow rates at the outlet locations, for the post-construction condition.

Grading and associated earthwork shall be considered for site optimization and racking selection. Grading shall be conducted to allow installation of racking system per any mechanical and other installation tolerances.

Earthwork quantities shall be tabulated on the civil plans.

The Base Flood Elevation shall be determined based on the higher elevation and worst effect scenario between the Official Floodplain limits published by the authorities or the site-specific study to determine the flood height. The site-specific study shall take into consideration a 100-year Design Event (statistically computed) and/or local Historical Storm data. 100-yr Design Event (statistically computed) and/or check with local Historical Storm.

The site shall be designed such that all critical electrical equipment (combiner boxes, inverters and transformers) have a minimum freeboard height of 1 foot above the Water Surface Elevation or applicable Base Flood Elevation (BFE) as determined in the site Hydrological and Drainage Study Report. All PV modules have a minimum freeboard of 1 foot above the WSE or applicable BFE. Additionally, the site design shall meet any governing agency requirements. If requirements conflict, the more stringent requirement shall govern.

Grading, Storm Drainage and Erosion Control Plan. Contracted civil engineer (contracted by Seller) will prepare a grading and erosion control plan in accordance with state and/or local municipality requirements. Plan will depict federal, state and locally regulated waters and required buffers, as appropriate. Contracted engineer will prepare permit application forms and drawings. Seller will coordinate with Owner to obtain required signatures prior to submitting and will deliver the land disturbing permit to Owner upon receipt. This plan shall include:

- (01) Project Description (Topography, Watercourses, Soils, Regulatory Floodplain, etc.)
 - a. Pre-Construction Conditions
 - b. During Construction Conditions
 - c. Post-Construction Conditions

- (02) Applicable Construction Notes
 - a. Construction Methods and Standard Details
 - b. Confirmation of applicable Codes and Standards
- (03) Results
 - a. Pre, During and Post Construction flows, water depths, velocities, etc.
 - b. Sizing details (ditches, swales, culverts, basins, etc.)

Seller shall design the solar PV array in such a manner that all arrays and above ground PV system equipment and electrical equipment are outside of any pooling/ponding of water due to 100-year storm event. If the Seller has no alternatives but to build portions of the array within areas of water pooling/ponding based on a 100-year storm event, the Contract shall specifically request an approval from the Owner to do so. In that scenario, the Seller shall prepare a hydrology study to assess peak flows and flood risk across the project site for a 100 -year storm event. The Civil, Electrical and Structural design takes into account the results of the Hydrology Study and the design specifications. Seller shall implement the findings of the Hydrology Study such that water sensitive equipment and structures will be elevated above or sited outside the areas identified in the Hydrology Study within the 100-yr flood limits. The contract shall implement a design to effectively de-water any areas water pooling/ponding after a 100-year storm event. No areas within the facility shall have water pooling/ponding for longer than 72 hours after a 100-year rain event intensity. Lesser rain intensities shall not result in water ponding/pooling anywhere within the solar PV facility.

4.10.4. Dust Control

Seller shall apply dust control materials to minimize raising dust from construction operations and traffic, including haul routes, using only dust control mixtures approved by the state and/or local jurisdictions.

4.10.5. Fire Prevention and Protection

As part of its Safety Plan, the Seller shall include a fire prevention and response plan.

The Seller shall perform all work in a fire-safe manner.

The Seller shall comply with all state, federal, and local fire prevention regulations.

4.10.6. Construction Access

Seller shall abide by all load limits established by the applicable Department of Transportation (DOT) for the relevant state where the Plant is built.

Seller shall be responsible for providing, operating, and maintaining equipment, services, and personnel with traffic control and protective devices, meeting the requirements of the *Manual of Uniform Traffic Code Devices* as required, to allow traffic flow on haul routes and onsite access roads in a safe manner. Seller shall be responsible for any costs to comply.

Seller is responsible for construction of temporary access around areas of excavation and other construction activity, if necessary and as required. Seller is responsible to obtain state and/or local jurisdiction permits for developing temporary or permanent access from public road rights-of-way.

4.10.7. Site Access Roads

The Site access road, if not currently in place, shall be designed and installed by the Seller. If the Site access road does exist, then it is to be improved by the Seller to a 20-foot gravel road. This design shall be based on sufficient soils and subsurface investigation by a qualified professional to ensure that the constructed road will meet its intended purpose. The design life of the access road shall be 30

years, assuming minimal maintenance without full re-surfacing. The Site access road shall be a gravel road sufficient to satisfy the loading requirements of the equipment vendors and to provide all-weather access for operation and maintenance of the Plant. Site access roadway design shall comply with state and/or local permit requirements.

Temporary construction roads and staging areas not connected to permanent roads (if any) shall be restored by Seller in accordance with permit requirements and post construction stabilization plan.

Seller shall provide a minimum setback of 20 feet between the perimeter fence line and any equipment or as directed by local authorities if more distance is required. This setback space may be used as a perimeter road.

For interior service roads as necessary, Seller shall allow a minimum road width of 16 feet with 20 feet min clear access. Pathways between rows of modules and circuit blocks may be narrower but designed with consideration of procedures required for accessing all modules and array equipment for maintenance and repairs. Interior roads (as needed) shall be 16 feet wide. Pathways between rows of modules and circuit blocks may be less. Road surfacing shall meet local fire and emergency vehicle access requirements

Seller shall follow the Geotechnical Engineer's recommendations for subgrade preparation, prior to construction of the access roads, as well as for any aggregate base material selection, placement, and compaction.

Drainage patterns shall not be interrupted due to the placement of the roadway or water conveyance shall be provided on the side the roads. Where needed properly sized culverts or low water crossing shall be provided. It is the Seller's responsibility to ensure that all road designs adhere to the approved storm water runoff plans. Where road wash-out is a concern, hydrological effects shall be considered in the road design – max overtopping depth at low road locations, velocity at max depth, estimated shear stress vs permissible.

Roads shall have a minimum 30-foot inside radius, unless otherwise instructed by state or local requirements. A smaller turning radius may be approved with written approval from the Owner.

Earthwork

4.10.8. General

Earthwork includes, but is not limited to, the following:

- (01) Trench excavation (including rock excavation) and backfill for underground utilities
- (02) Excavation and backfill (including rock excavation) for foundations
- (03) Installation of granular fill and surfacing around concrete structures, drainage facilities, towers, and related Site structures, and within roadways
- (04) Finish grading around all concrete pads (e.g., an inverter pad) shall have a safe approach slope leading to the top of the pad or to a small step up not to exceed 8 inches in height

Seller shall make its own estimate of the types and extent of the various materials to be encountered or required to accomplish the Work.

Seller shall utilize sustainable practices where practical, such as recycling shipping containers, pallets, etc. All materials that are not practically recyclable shall be disposed of in an approved landfill. Seller shall clean up any spill or contamination that may occur on Site in accordance with approved standard procedures.

4.10.9. Excavation

Seller shall be responsible for making all excavations in a safe manner and consistent with the requirements of the Occupational Safety and Health Administration (OSHA).

Seller shall provide adequate measures to retain excavation side slopes to ensure that structures, equipment, and persons working in or near the excavation are protected.

Seller shall protect all above grade and below grade utilities.

4.10.10. Construction Signage

Seller shall provide temporary signage for local traffic control in accordance with state DOT or local county requirements and in accordance with the Agreement.

4.10.11. Fencing

Seller shall utilize temporary fencing whenever an existing fence is removed and as necessary to maintain security and prevent the movement of livestock and other natural wildlife. Seller shall provide a minimum setback of 20 feet between the perimeter fence line and the solar panels and project substation. Additional setback may be required by other standards. Fencing shall meet PacifiCorp design standards of **Appendix A-7.10**.

4.10.12. Site Finish Grade

Seller shall leave the Site in a clean condition upon completion of the work. Efforts shall be made to restore area to a clean condition as soon as practical. Seller shall remove all trash, debris, and stockpiles. The Site access roads shall be returned to a condition that meets the original specification by repairing road damage such as ruts, gouges, and weather damage that may have occurred during construction.

The Site finish grade within the equipment footprint and in areas required for operation and maintenance of the Plant shall be fully stabilized in a manner that meets or exceeds local county requirements.

Provisions of the SWPPP for final storm water drainage shall be implemented.

Seller shall seed and mulch all areas of the Plant Site that have been disturbed beyond the permanent portion of the Site and access road, per the SWPPP. Seller shall follow the post construction stabilization plan for restoration guidance. It is preferred that the Seller use low water, low maintenance plans for re-seeding. Plant Design and State Requirements

Any technical requirements under any applicable state incentive program shall be met by the Seller. For example, any technical requirements under the state energy office incentive structure shall be met by the Seller for the state where the Plant is built.

4.11. Electrical Engineering

Seller shall provide all electrical engineering design services, meeting applicable codes and standards and the requirements of Pac Trans.

The engineering and design shall include the appropriate sizing and cabling (above and below ground) that will connect all applicable equipment to the point of interconnection. The Plant electrical system shall be designed for electrical system losses on the DC wiring system to be no more than 2 percent average within an inverter block and losses on the AC wiring system no more than 2 percent within a single distribution circuit. All DC disconnects at the inverter (s) and combiner boxes shall include a visible gap when in the open position or integral voltage and current detection such that no special PPE is required to ensure the circuit is deenergized.

The overall sequence of power flow for the photovoltaic plant shall be DC power generated by individual modules arranged in strings and the strings wired to a central point among them to be combined into larger groups of strings. These combiners are connected to the inverter DC bus input. The inverter outputs AC power at low voltage, is stepped up immediately, and is fed into the medium voltage collector system. The collector system is comprised of several AC circuit limited in size by the max ampacity of a 1250 kcmil per phase conductor between the substation and the first inverter in the circuit. The total size of the project will be optimally distributed across the required circuits and fed into the transmission system at the project substation through the point of interconnect.

All protection equipment used throughout the system shall be sized, specified, and coordinated to reduce damage to surrounding components in the event of a fault.

The above ground portion of the electrical systems shall be neatly routed to facilitate access, troubleshooting, maintenance, etc.

Trench depth for electrical wires shall be as follows:

- (01) Bottom of trench ~ 3.5 feet typical for DC trench
- (02) Bottom of trench ~ 4 feet below finish grade for AC trench (28 kV)
- (03) Bottom of trench ~ 5 feet below finish grade if both DC and AC (28 kV) in same space

The electrical design shall include the design of equipment grounding and lightning and surge protection for the entire Plant Site. Seller shall provide a comprehensive surge protection system and provide a lightning risk assessment. The results of the lightning risk assessment and consultation with Owner will be the basis for determining the extent of the lightning protection system (LPS) that is required.

An arc flash study shall be performed per **Appendix A-7.13**. Incident energy values based on the protection coordination shall be used for arc flash labeling and as the basis for the PacifiCorp arc flash safety procedures.

Seller shall design and specify all communications hardware and software required for system protection and remote monitoring and control. All monitoring and communication supplemental equipment and cabling shall be designed and specified by Seller, subject to Owner review.

The power delivered to the grid must at all times meet the interconnect requirements for power factor. A one-line drawing is required illustrating the power factor control strategy.

4.11.1. Communication System

Seller shall procure and install a SCADA system as required in the Interconnection Agreement.

Seller shall install communications systems as required by the Interconnection Agreement.

Seller shall install communications systems as required in Security.

Seller shall supply all equipment necessary to connect to Transmission Provider's fiberoptic cable for each of the communications described in this section.

4.11.2. Communications System Testing and Warranty

Seller shall test the installed communication system to demonstrate its ability to meet the requirements of its intended use. Testing shall be performed when the final system interconnections have been made.

4.11.3. Security

Seller shall provide a security system for the Plant. The security system around the perimeter shall include a 7-foot-high chain link fence with 1-foot top guard (total 8-foot high) of three strands of nine-gage barbed wire. The perimeter fence shall include three locked gates: two with a width of 20 feet for vehicles and one pedestrian entrance with a width of 4 feet. Fencing shall meet guidelines in section A-3.6.4 Fencing. Seller shall utilize temporary fencing whenever an existing fence is removed and as necessary to maintain security and prevent the movement of livestock and local wildlife.

Perimeter signage shall be provided by Owner and installed by Seller in accordance with Owner standards. Signage shall be installed every 65 feet along the perimeter fence and on all gates. Signage shall be installed five feet above ground level.

Signage that will be provided by the Owner will include the following:

Warning! Hazardous Voltage Inside Keep Out

English SI# 7999852

Spanish SI# 7999854

No Trespassing

SI# 8252306

Mounting Hardware

SI# 7999092

The Seller shall be responsible for security during construction.

Seller shall contract with AVTEC SYSTEMS INTEGRATOR, A DIVISION OF CACHE VALLEY ELECTRIC, (Security Sub-Seller), to provide and install the necessary security equipment. Contact:

Avtec – System Integrator
Michael Petric
(801) 908-4191
michael.petric@cve.com

This equipment may include, but is not limited to:

- (01) LED Spot or LED flood lights.
- (02) Security cameras located such that they are capable of adequate identification of intruders covering the perimeter of the Site. Cameras shall be placed at a height that permits line-of-sight access to the property and minimizes shading onto the PV array.
- (03) Cameras with a control and detection system that assists in the detection and identification of intruders.
- (04) Network - Digital Video Recorders used to record video that could be used for evidence in the event of theft or vandalism.

- (05) Seller shall negotiate with the Security Sub-Seller to identify the scope of work that will be performed by the Security Sub-Seller, to ensure that a complete and operational security system as described by the Security Sub-Seller is provided. The Security Sub-Seller shall provide to the Seller the security system design, which will indicate the location of cameras, DVRs, security lighting and any security communications equipment, based on the Seller's overall System design. The work that may be provided by the Security Sub-Seller may include the furnishing and installation of wiring, cabling, labor, tools, equipment, and ancillary materials required for a complete and operational security system. At minimum, it is expected the Security Sub-Seller will provide the following equipment: cameras, network DVRs, and any specialized security communications equipment.
- (06) Seller shall be responsible for the furnishing and installation of all necessary conduit, 120 Volt alternating current (V_{ac}) power extensions for all Security related equipment. Seller to allocate a minimum /of (3) three each – 1” conduits from each Inverter Pad.
- (07) Seller shall provide a free-standing weather proof enclosure with adequate space required for Security Control Equipment as specified by the Security Sub-Seller. Seller may also install the solar facility SCADA equipment, in accordance with Section A-4.12, within the same enclosure.
- (08) Installation of telephone lines, and/or cellular modem(s), and/or local area network for the interconnectivity of all related Security System Equipment.
- (09) Seller shall provide fiber optic cable for Security System Communications. Fiber optic cable shall consist of a minimum of (4) four fiber strands between each inverter pad. Security fiber strands provided can be included in the fiber optic cabling that is provided as part of the SCADA Communications System.
- (10) The system shall be complete, tested, and fully operational. Prior to construction, Seller shall provide the following:
 - (11) Descriptive statement and single-line block diagram to show how all related equipment will interface and operate as a complete system.
 - (12) Product data: manufacturer's technical data sheets on each product to be used.
 - (13) Drawings, including plans, elevations, equipment mounting heights, and dimensions required to show devices' locations and demonstrate accessibility compliance in accordance with referenced documents.
 - (14) Detailed schematic wiring diagrams for all system devices; wiring information shall include cable type, conductor routings, quantities, and connection details at devices.
 - (15) Manufacturer's user's manuals for operations, administration, installation, and maintenance.

Security System Installation

All system components and appurtenances shall be installed in accordance with the manufacturer's specifications, referenced practices, guidelines, and applicable codes. All necessary interconnections, services, and adjustments shall be furnished as required for a complete and operable system as specified. Control signal, communications, and data transmission line grounding shall be installed as necessary to preclude ground loops, noise, and surges from adversely affecting system operation.

All security system wiring shall be installed in dedicated conduit throughout. Cable shall not be pulled into conduits or placed in raceways, compartments, outlet boxes, junction boxes, or similar

fittings with other wiring. All low-voltage wiring outside the control console, cabinets, boxes, and similar enclosures shall be plenum rated where required by code.

All wiring conductors connected to terminal strips shall be individually numbered and each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with the name and number of the device as identified and shown on the drawings.

4.11.4. Cybersecurity Requirements

General Security Criteria

1. Please confirm you have and maintain security controls to protect the Company's networks, systems, software, Confidential Information, and Data no less rigorous than those set forth in the latest published version of ISO/IEC 27001 – Information Security Management Systems– Requirements and ISO/IEC 27002 – Code of Practice for International Security Management.
2. If providing a web portal or web service, please confirm that web services use HTTPS/TLS version 1.2 or later for all content.
3. Please confirm you encrypt all Company data while at rest as well as when in transit over the network.
4. Please confirm that all Company-related file transfers are encrypted while at rest as well as when in transit over the network.
5. For responses above, please confirm all encryption uses NIST-approved algorithms and key lengths.
6. Please confirm you support federated single-sign-on (SSO) authentication for any Company accounts, whether via web interface or mobile application. You must have the ability to support Azure Active Directory.
7. If you do not support federated single-sign-on (SSO) authentication, please confirm that Accounts provided by you support multi-factor authentication compliant with NIST SP 800 63-3 Authentication Assurance Level 2. Provide documentation that supports compliance and describe supported authentication mechanisms.
8. Please confirm, by provision of supporting documentation, that email sent while under the Contract to the Company by you or by any service: Originates from a domain(s) with a published Domain-based Message Authentication, Reporting and Conformance (DMARC) policy of “reject” and with a published Sender Policy Framework (SPF) policy consisting of valid senders and a “fail” directive (-all). If the optional DMARC “pct” directive is used, “pct” must be set to “100”.

9. Please confirm, by provision of supporting documentation, that email sent while under the Contract to the Company by you or by any service passes a Domain-based Message Authentication, Reporting and Conformance (DMARC) authentication check.
10. Please confirm, by provision of supporting documentation, that email sent while under the Contract to the Company by you or by any service is signed by a DomainKeys Identified Mail (DKIM) 2048 bit key.
11. Please confirm, by provision of supporting documentation, that email sent while under the Contract to the Company by you or by any service supports Transport Layer Security (TLS).
12. Please describe your process to disclose known vulnerabilities to the Company related to products or services provided as they pertain to the proposed service.
13. Please describe methods supplied to the Company to verify software integrity and authenticity for any software or patches provided by you as they pertain to the proposed service.
14. Please describe your process for security event monitoring and notification/alert/response plans, including response to security incidents affecting the Company.
15. Please confirm you will notify the Company of a security incident as soon as practicable, but no later than 48 hours after discovery.
16. Please confirm you will coordinate responses to security incidents with the Company that pose a security risk to the Company.
17. Please confirm that all rights to any data provided by the Company shall remain exclusive property of the Company.
18. Please confirm you will not share data with third parties for unrelated commercial purposes, such as advertising or advertising-related purposes.
19. If remote access of any type will be required as part of the service, please fully describe your requirements for remote access.
20. If remote access of any type will be required as part of the service, confirm your ability to conform to Company requirements for intermediate host methods for remote access, such as Citrix or Virtual Desktop,

21. If remote access of any type will be required as part of the service, and if a virtual private network is required, please confirm your ability to terminate in a demilitarized zone network (DMZ). Note that direct virtual private network connectivity to Company corporate networks is always prohibited.
22. If remote access of any type will be required as part of the service, confirm that you will notify the Company when remote or on-site access is no longer needed by your representatives, where applicable.
23. Please list facilities proposed in bid located outside the continental United States.
24. Please list any support staff used during the term of this contract located outside the continental United States.
25. Please confirm you will disclose third parties upon which you depend to deliver the Company offering (such as third-party software, implementation, hosting, for example).
26. Please describe your methods to securely ship and deliver products to the Company as they pertain to the proposed service.

For Hosted or Cloud Services:

27. If your service is comprised in whole or in part of a cloud-based or hosted services solution, please confirm you currently undergo, or are willing to undergo, annual Statement on Standards for Attestation Engagements (SSAE) Service Organization Control (SOC) 2 Type 2 audits (“Audit”) for your enterprise or covering the scope of services for the term of the contract with the Company, as appropriate. Note that a datacenter audit alone will not be sufficient. You may include an audit for datacenter/colocation provider for informational purposes.
28. If your service is comprised in whole or in part of a cloud-based or hosted services solution, please confirm that your administrative access complies with NIST SP 800 63-3 Digital Identity at Authentication Assurance Level 2 or higher, where compromise of one factor does not contribute to compromise of the other factor. Provide compliance documentation and describe supported authentication mechanisms.

5.0 EQUIPMENT

5.1 Equipment Supply

As described in detail throughout this document, Seller shall purchase and furnish to the Site all material required to complete the Plant, including the following material:

- (01) Miscellaneous steel
- (02) Support steel posts
- (03) Components (nuts, bolts, clamps, etc.)
- (04) PV modules
- (05) Fixed tilt racking or single axis tracker equipment (as applicable) and components
- (06) DC cabling and combiner boxes
- (07) DC junction boxes
- (08) AC cabling
- (09) Power centers, including inverters
- (10) Electrical switchgear
- (11) Transformers
- (12) Meteorological station
- (13) Snow Monitoring System
- (14) Remotely accessible data acquisition system
- (15) All materials related to drainage required by the civil engineering plan
- (16) All electrical conduit and junction boxes
- (17) Concrete equipment pads
- (18) Fencing, gates, lighting, security cameras, and security camera recording equipment
- (19) Communications structure (if required)

Each item of equipment to be supplied by Seller shall be subject to inspection and testing during and upon completion of its fabrication and installation as per PacifiCorp Facility Connection (Interconnection) Requirements for Distribution Systems (34.5 kilovolts and below).

Seller shall provide the manufacturer's flash test data for all modules to Owner upon procurement of modules.

Prior to the arrival of equipment and materials at the Site, the Seller shall install a fenced, secured area and provide security for the storage of such equipment and materials. Seller shall notify Owner of the location and layout of intended staging areas, parking areas, storage areas, office areas, workshops, and other temporary facilities. Temporary construction roads and staging areas not converted to permanent roads (if any) shall be restored in accordance with all permit requirements.

Seller shall be responsible for receiving and storing all freight at the Site in a secure manner.

Installed equipment and materials shall be new, of good quality and suitable grade for the intended purpose, and not a lower grade or quality than specified in the design and engineering plans or in manufacturers' recommendations. Where applicable, utility-grade equipment shall be used. Commercial- or residential-grade equipment shall not be acceptable. No equipment shall utilize polychlorinated biphenyls (PCBs).

If Seller proposes to use equipment that is non-utility grade, it is the responsibility of Seller to identify the equipment and report it to Owner for approval. It is the responsibility of Seller to identify any equipment using SF₆ gas. It is the responsibility of Seller to identify any proposed batteries and provide quantities and associated data sheets. It is the responsibility of Seller to provide data sheets and quantities on any proposed chemicals used on the Plant. Seller shall provide a list of all major equipment to be purchased, constructed, and installed as part of the Plant. The list shall identify both the items and quantities.

5.2. Signage and Labeling

Permanent naming placards should be placed on all equipment, including inverters, combiner boxes, transformers, and others according to the NEC and Owner specifications. Naming on placards and/or

tags shall match drawing naming convention. Security signage shall be in accordance with A-3.9 Security. All signage must meet current industry standards. Placards and signs shall have a life span of 20 years.

All cables shall be labelled to meet applicable codes and standards. All cables shall have a label affixed to the outer jacket with a Brady or equivalent cable marker at each termination of a type accepted by Owner before installation. Labelling will match the point to point drawings. A method for ensuring labeling is complete must be included in the Seller's QC Inspection Point Program.

5.3. Grounding and Bonding

Seller shall provide detailed information (such as ground-grid drawings and calculations) for all proposed Plant grounding. Seller is responsible for designing and providing the Plant system grounding and equipment grounding. The Plant grounding design shall be done in accordance with Institute of Electrical and Electronics Engineers (IEEE) standards for generating stations. Substation grounding shall be done in accordance with IEEE standards for substation grounding. All grounding designs shall be reviewed by Owner prior to Seller commencing work.

All ground conductors shall be stranded copper and may be bare if exposed. Ground conductors in conduits shall be green-insulated. Ground lugs shall be mechanical and rated aluminum to copper. All below grade connections shall be exothermic welds. Step-up transformers and inverters and the Plant switchgear shall be bonded to the ground ring at opposing corners of the equipment. Mounting structures shall be grounded in a manner that is sized for maximum available short-circuit current and lightning current (if required).

Seller shall submit to Owner grounding and lightning calculations for assurance of safe step and touch potentials on the Site, in accordance with Owner's standards. Seller shall conduct a ground resistivity test, as prescribed by Owner prior to testing, with opportunity for witness as provided in the Agreement, to verify that the grounding system meets minimum requirements for the overall grounding scheme. Interior fencing (including without limitation internal fences around interconnection equipment and inverters) shall be installed and grounded and substation grounding shall be done in accordance with PacifiCorp Engineering Handbook Parts 6B.5 and 6B.6. Fencing around the perimeter of the overall Plant Site shall not need to meet the aforementioned Handbook standards but shall be grounded in accordance with local codes. Perimeter fences shall not be shared with the substation fence and shall be at least 30 feet from the fence around the interconnection equipment. A ground grid meeting the requirements of IEEE 80 shall be installed in the area of the interconnection equipment.

5.4. Bird and Animal Protection

Bird and animal protection at the Project Substation shall be provided following Owners Standards referenced in Appendix "A-7".

5.5. Surge and Lightning Protection

Seller shall provide a lightning risk assessment performed to industry standards by a certified lightning protection professional, as outlined in section A-4.4.2 External Lightning Protection System (LPS). The results of this assessment, in consultation with Owner, shall be the basis for determining the requirements and extent of the facility LPS and a surge protection system that provides protection of the PV panels, DC power circuit, inverters, measurement control and communications systems, and other major electrical equipment.

5.6. Surge Protection

A staged, comprehensive surge protection system, inclusive of Type 1, 2, and 3 surge protective devices (SPDs), shall be incorporated as determined by the lightning risk assessment (A-3.7.1 Electrical Engineering) or as required by the photovoltaic and inverter manufacturers in all relevant pieces of electrical equipment. Protection shall be provided within the inverter on both the DC and AC sides as required by inverter manufacturer. Additionally, surge protection shall be provided in combiner boxes, trackers, and measurement control and communication systems as determined by the lightning risk assessment study. Type 3 surge protection installed within that equipment shall be mounted on DIN rails and must have finger safe replaceable modules that can be exchanged without the use of tools. SPDs shall be applied on all power circuits (AC and DC) and all communications and control circuits in a coordinated, staged manner. The operating status of the power SPDs shall include visual indication and shall be able to be remotely monitored by a set of integral contacts.

In addition to the performance requirements indicated above, all SPDs shall be compliant to the respective domestic or international standards, including, but not limited to, the following standards and guidelines:

Underwriters Laboratories, Inc. (UL) Standard 1449 3rd edition.

IEEE Guideline C62.41.1-2002

IEEE Guideline C62.41.2-2002

IEEE Standard C62.42.0 -2016

IEEE Standard C62.45-2002

IEEE Standard 1100-2005

5.7. SPDs for PV DC Power Circuits

SPDs applied on PV DC power circuits shall meet all the requirements listed above in this general section and shall be specifically designed for and labeled to UL 1449 3rd edition and UL's Certification Requirement Decision for PV DC application. DC PV SPDs shall be rated for a short-circuit withstand capacity (I_{SCWPV}) of not less than 1,000 amperes (A). The SPDs must be specifically designed to be able to disconnect themselves from an energized DC circuit by means of an internal integral fused circuit and do so without damage caused by faulting arcs. SPDs must be selected for the voltage system that they are to be applied (such as 600; 1,000; 1,200; or 1,500 V_{DC}). SPDs shall be from an equipment manufacturer regarded as a Tier 1 Supplier. Surge Suppression, Inc. of Destin, Florida is the preferred manufacturer of any required SPDs.

5.8. SPDs Applied on AC Power Circuits

SPDs applied on AC systems must meet all the requirements listed above in this general section and must be specifically designed for and compliant to UL 1449 3rd edition. SPDs must be selected for the system voltage where they are to be applied. SPDs are to have a short-circuit current rating (SCCR) higher than the short circuit availability where they are installed, therefore not requiring external fusing. SCCR of 200,000 A is ideal. SPDs shall be from an equipment manufacturer regarded as a Tier 1 Supplier. Surge Suppression, Inc. of Destin, Florida is the preferred manufacturer of any required SPDs.

5.9. SPDs for Measurement, Control, Instrumentation and Communications Circuits

All critical non-power circuits are to be protected with appropriate DIN rail-mounted pluggable surge protection for the system they are applied. Surge protection bases are to permit signal continuity even if the SPD module is removed from the base. SPDs shall be from an equipment manufacturer regarded as a Tier 1 Supplier. Surge Suppression, Inc. of Destin, Florida is the preferred manufacturer of any required SPDs.

5.10. External Lightning Protection System (LPS)

Based on the findings of the lightning risk assessment and/or the discretion of the Owner, an external LPS may be required to be installed. If so, Seller shall provide an LPS to protect the overall plant from direct lightning strikes to any portion of it, including, but not limited to, solar panels, inverters, outside cabinets, and buildings housing electrical equipment. The LPS shall consist of air terminals of proper height and spacing (using the rolling sphere method), properly rated and properly designed and placed down-conductors to assure safety of personnel during discharges, and a properly designed and installed ground system.

The systems shall be designed in accordance with the latest globally recognized standards for such designs, which are either International Electrotechnical Commission (IEC) 62305-1 and IEC 62305-3, or NFPA 780.

Grounding systems shall be in compliance with IEEE Standard 142-1982, IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems.

Designs are to be provided by a recognized expert LPS design firm, supplier, or professional engineering firm, and are to be submitted to the Owner.

All components of the LPS shall be in compliance with the selected system design standard chosen.

Careful consideration must be given to the design and placement of all air terminals to have no shadowing effect on PV panels.

5.11. Photovoltaic Modules

The PV modules shall:

- (01) Meet IEC 61215 (crystalline silicon PV modules) or IEC 61646 (thin film PV modules).
- (02) Meet IEC 61730: Photovoltaic Module Safety Qualification.
- (03) Meet IEC 61701: Salt Mist Corrosion Testing of Photovoltaic Modules; Severity 6.
- (04) Be listed to UL standard 1703 for the voltage specified.
- (05) Include all known and future duties, tariffs, export tariffs, customs, demurrage, and shipping costs.
- (06) Be from an equipment manufacturer regarded as a Tier 1 Supplier.
- (07) Module supplier should provide a bankability report from an independent engineer.
- (08) Manufacturer should provide an established track record of installed systems throughout the United States.
- (09) Demonstrate workmanship quality through a third-party factory audit or testing score such as VDE Quality Tested certificate, or Solar buyer's Independent Quality Assessment overall rating of "Good" or better with zero critical findings.
- (10) Demonstrate a 25-year rated lifetime via long-term outdoor testing and/or accelerated lifetime laboratory testing. Testing such as Thresher testing, DNV-GL's "PV Module Reliability Scorecard," Atlas 25+ PV Module Durability Testing (Desert Climate Classification preferred), or Technischer Überwachungsverein (TÜV) long-term sequential testing of the specific model of the PV module selected is an acceptable demonstration of a 25-year module expected life.

- (11) Demonstrate that damp heat testing is performed at proposed design voltage (e.g., 1,500 V_{DC}).
- (12) Demonstrate proposed module is Potential Induced Degradation (PID) free.
- (13) Be only factory “firsts” meeting all QA/QC requirements. No “seconds,” or modules not meeting all quality control requirements shall be allowed.
- (14) Demonstrate manufacturing quality by electroluminescence (EL) testing of every module for defects.
- (15) Preferred PV module vendors¹ are:
- ~~a) Canadian Solar~~
 - ~~b) First Solar~~
 - ~~c) Hanwha Q CELLS~~
 - ~~d) JA Solar~~
 - ~~e) Jinko Solar~~
 - ~~f) Kyocera~~
 - ~~g) LG~~
 - ~~h) LONGi Solar~~
 - ~~i) Mission Solar~~
 - ~~j) Panasonic~~
 - ~~k) Phono Solar~~
 - ~~l) REC Solar~~
 - ~~m) Renesola~~
 - ~~n) Sanyo~~
 - ~~o) Solar Frontier~~
 - ~~p) SolarOne~~
 - ~~q) SolarWorld~~
 - ~~r) SunPower~~
 - ~~s) Trina~~

¹ BTA and Benchmark supply contracts shall be subject to prohibited vendor and supplier audit provisions. For more information, see Section 3.2.18 (Prohibited Vendors), and Section 3.2.19 (Supply Chain Audit) of the pro forma contracts in Appendix E-2.1:
https://www.pacificorp.com/content/dam/pcorp/documents/en/pacificorp/suppliers/rfps/pacificorps-2022-all-source-request-for-proposals/appendix-e-g/PacifiCorp_2022AS_RFP_App_E-2.1_PPA_Document%E2%80%93Generating_Resource_Only.pdf

Demonstrate batch consistency by documenting that the batch of modules proposed for this project meets performance requirements. A minimum of five modules shall be tested to ensure performance and reliability under accelerated lifetime tests. Documentation shall include flash test results and EL images before and after the tests shown in Figure 1. Costs of the modules, shipping, testing, and

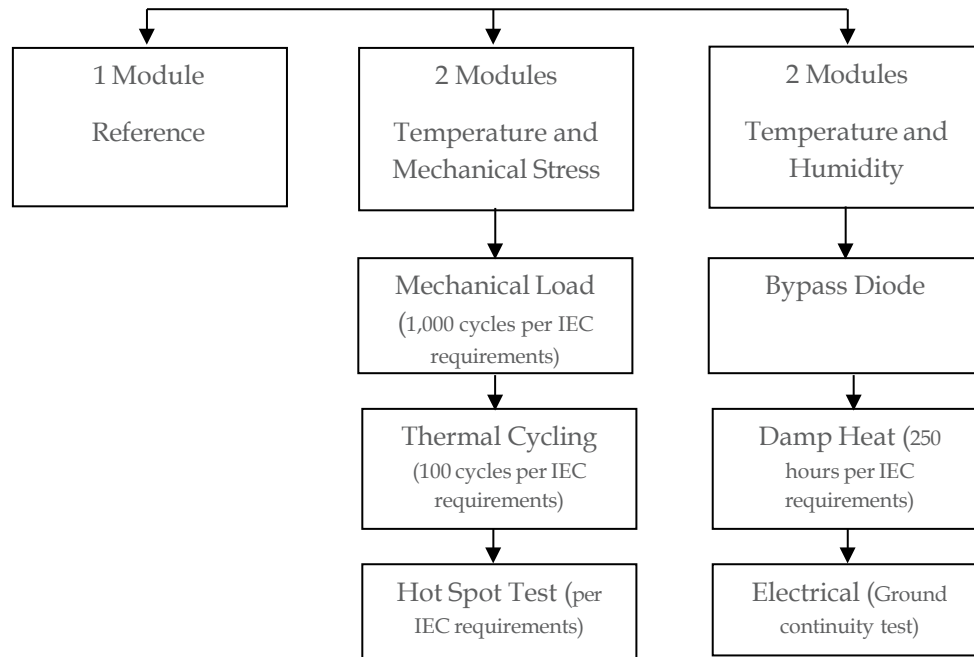


Figure 1: Module Manufacturing and Batch Quality Assurance

summary report are the responsibility of the Seller. The documentation of the batch, module sampling, EL imaging, flash testing, and summary report shall be provided to the Owner.

Note that the Owner, at its sole discretion, may randomly select up to 20 PV modules shipped to the Plant for delivery to a third party for quality verification testing. The costs of such verification testing will be the responsibility of Owner. Owner reserves the right to refuse the Bidder's proposed module if the independent tests indicate performance, workmanship, batch quality, or reliability issues.

PV module manufacturer shall:

- (01) Be ISO 9001 certified (alternatively, ISO 62941)
- (02) Be ISO 14001 certified
- (03) Have a minimum of 5 years' experience manufacturing PV modules

5.12. Padmount Transformers

Transformers shall meet transformer efficiency standards set forth in the most recent version of the U.S. Department of Energy "Energy Conservation Program for Commercial Equipment: Distribution Transformers Energy Conservation Standards; Final Rule." Transformers shall be rated for inverter source operation and the environment in which they will operate. The transformer shall be supplied with a no-load tap changer with 5 high-voltage taps capable of operating at +5, +2.5, -2.5, and -5 percent above and below nominal collector system voltage at full rating. The transformer shall be supplied with a fused disconnect switch on the transformer high-voltage side to isolate the transformer in case of an internal fault. The switch/transformer configuration shall be designed for loop feed. Transformers shall be either dry-type, biodegradable fluid, or less-flammable oil insulating

fluid. Enclosure finish shall be a top powder coat that is designed for a 25-year service life. Seller shall provide and install pad mount transformers as provided in the Agreement. Owner shall reserve the right to attend factory witness testing of padmount transformers.

Seller that interconnects to the PacifiCorp system shall provide equipment and perform the work in compliance with the requirements of the **RFP Appendix A-2 - Interconnection Agreement, RFP Appendix A-7.04**, and other applicable standards and specifications listed in **Appendix A-7 – Owner Standards and Specifications**.

5.13. Inverters

The inverter units shall be utilized for inverting the DC input from the Plant to AC output. Seller may use large-scale, central inverter or string inverter design strategies. However, either design shall be capable of operating under all required federal, state, and local standards and codes, and be capable of providing all the required grid support.

Inverters shall be calibrated and set so that the AC output, after inverter clipping and losses between the inverter to the meter, shall not exceed the Plant AC capacity at the meter. Seller shall supply and install inverters, transformer pads, and wiring/cabling to this equipment in accordance with National Electrical Code (NEC) and any other applicable standards. Seller will tie into the existing medium-voltage distribution system, connecting the system to the new generation facilities via medium-voltage transformers.

Inverters selected for this project shall:

- (01) Be UL listed to 1741 (Standard for Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources).
- (02) Comply with IEEE 1547-2018, including testing to IEEE 1547.1 and IEEE C62.45. Regulatory standards compliance shall also include IEEE C62.41.2 and CSA107.1-01.1. Inverters shall have voltage and frequency ride-through functionalities, as well as be capable of actively regulating voltage levels by providing adjustable active and reactive power. The inverters/plant controllers shall have the capability of reducing their active power during certain pre-determined conditions, as specified in the Interconnection Agreement. The inverter shall have the capability to meet the following:

Ride-through region for voltage and voltage trip settings

Voltage at Point of Common Coupling (% Nominal Voltage)	Ride-Through Until (s)	Operating Mode	Maximum Trip Time (s)
>120			0.16
110- 120	12	Momentary Cessation	13
88 - 110	Continuous Operation	Continuous Operation	Continuous Operation
70 - 88	20	Mandatory Operation	21
50 - 70	10	Mandatory Operation	11

0 -50	1	Momentary Cessation	1.5
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Default Interconnection System Response to Abnormal Frequencies

System Frequency Default Settings	Range of Adjustability (Hz)	Default Clearing Time (s)	Range of Adjustability (s)	Ride Through until (s)	Ride Through Operational Mode
f > 62	62 - 64	0.16	0 - 300	No Ride through	Not Applicable
60.5 - 62	60 - 62	300	0 - 300	299	Mandatory Operation
58.5 - 60.5	indefinite				
57.0 - 58.5	57 - 60	300	0 - 600	299	Mandatory Operation
< 57.0	53 - 57	0.16	0 - 5	No Ride through	Not Applicable

Notwithstanding the above, the inverter and associated system shall meet all requirements specified in the Interconnection Agreement. Seller shall notify Owner at least two weeks prior to factory acceptance tests that will be performed to demonstrate these capabilities. Owner, or its representative, shall have the opportunity to witness factory acceptance tests.

The inverter and associated equipment shall meet all standards for operating on the transmission or distribution systems including all aspects of dynamic grid support noted in A-4.7 b. above and the additional requirement for providing Primary Frequency Response as dictated by FERC and included in the PacifiCorp interconnection standards for Small and Large Generators.

Inverter shall be capable of providing voltage droop control.

- (01) Carry a minimum 5-year standard warranty with options for at least a 20-year extended warranty.
- (02) Be designed for a 30-year lifetime, assuming regular maintenance (including replacement of inverter components).
- (03) Have a maximum harmonic distortion less than 3 percent of total harmonic distortion at rated power output.
- (04) Have an efficiency greater than 98 percent not including medium-voltage padmount transformer according to the California Energy Commission (CEC) test procedures for peak efficiency.
- (05) Be capable of rated output at 50° C or higher.
- (06) Incorporate a no-load, two-pole, lockable disconnect switch or fusible disconnect for main DC power disconnect for maintenance personnel safety with visible gap between contactors when in the open condition. DC load break switches should be installed at the combiner boxes and at the inverters (located as close to the array as possible). Be equipped with lightning protection.

Skid-mounted package units containing all equipment including DC switches, master fuse boxes, inverters, step-up transformers, and other power conditioning system equipment are preferred. Skid-mounted package units with integrated steps, side rails, and other safety features are preferred. The inverter manufacturer must approve all structures that contain inverters, especially as it relates to ventilation and temperature.

Inverters located outdoors shall be enclosed in lockable enclosures with a minimum rating of National Electrical Manufacturers Association (NEMA) 3R and with coatings in accordance with section A-3.3.5 Corrosion Protection. Any sensitive electronic equipment associated with, or part of, the inverter shall be installed in a NEMA 4 rated enclosure.

To the extent practicable, inverters should be mounted/oriented in such a way to avoid the effects of the sun (for example, facing the LCD display north to reduce sun exposure). If an LCD screen will be exposed to direct sunlight, a shade canopy shall be installed to provide shading for the screen.

Enclosure must have a door interlock system to prohibit the door(s) from being opened while energized.

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 the vendor shall furnish an external on/off (start/stop) switch.

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.

Inverters shall be equipped with all hardware for data collection and communication to the central SCADA server.

Inverter shall be equipped for direct external communication and control to Owner. If communications to Transmission Provider's SCADA system is required by the Interconnection Agreement, then inverter communications and all available inverter controls shall be provided to the Transmission Provider over Transmission Provider's telecommunication network (see **RFP Appendix A-2**).

Inverter shall include a fused, and disconnectable control power transformer (CPT).

Plant design for inverters rated to 1,500 or 1,000 V_{DC} shall comply with NEC Articles 690 and 490, and all other requirements applicable to installations rated over 600 volts (V).

Buildings, storage facilities, and enclosures shall be provided to the extent that protection is needed; the environment needs to be maintained for the long-term reliability, availability, and operation of the equipment; or that it is required by law or the Interconnection Agreement.

Inverter manufacturer shall:

- (01) Be certified to ISO 9001 and ISO 14001 standards.
- (02) Be regarded as a Tier 1 Supplier.
- (03) Shall have supplied a minimum of 100 MW capacity in utility-scale projects located in North America.

Preferred inverter vendors² include the following firms:

² [BTA and Benchmark supplier contracts shall be subject to prohibited vendor and supplier audit provisions. For more information, see Section 3.2.18 \(Prohibited Vendors\), and Section 3.2.19 \(Supply Chain Audit\) of the pro forma contracts in Appendix E-2.1](#)

- a) Huawei
- b) Sungrow

- e)a) SMA
- e)b) TMEIC
- e)c) ABB
- e)d) Power Electronics
- e)e) SolarEdge
- e)f) Yaskawa-Solectria Solar
- e)g) Ingeteam
- e)h) Kaco New Energy
- e)i) Enphase

5.14. Medium Voltage Cable and Equipment

MEDIUM VOLTAGE AC WIRING

- (01) Governing Standards
 - a) NEC
 - b) UL 1072
 - c) ANSI/ICEA S-94-649
 - d) AEIC CS-8
 - e) RUS-1
 - f) One or more of the following ASTM specifications: B3, B8, B230, B231, B609
- (02) Wiring Material
 - a) Medium voltage AC conductors shall be, single-phase, EPR or TRXLPE insulated cables, 100% or 133% insulation voltage rating as per design requirements, MV -90 rated, and shall have a concentric neutral.
 - b) Conductors may be made of either aluminum or copper.
 - c) Insulation rating shall meet or exceed the highest expected continuous circuit voltage. The outer jacket may be PVC or XLPE, however shall bare the UL marking and list of conductor size and ratings.
 - d) iv. In general, bare copper concentric neutral under jacket shall be 100% (full) for cable smaller than 500 KCMIL, 1/3 for 500 KCMIL, and 1/6 for 750 KCMIL and larger, unless short circuit calculations indicate larger neutral is required. Engineer shall coordinate with Owner on protection tripping maximum clearing time to use in the calculation. For any neutral size less than 1/6 the Owner must approve. v. Note: 133% insulation shall be required for delta connected circuits, if the circuit is not effectively grounded at the point of interconnection or substation breaker. vi. MV cables shall be of the UL type specified and have been designed, manufactured, and/or tested according to the following standards: UL 1072, ICEA S-94-649 (NEMA WC 74).

5.15. Overcurrent Protection Devices

DC AND LOW VOLTAGE AC OVERCURRENT PROTECTION DEVICES

- (01) Governing Standards
 - a) NEC Article 240

- b) UL 248-1
 - c) UL 1066
 - d) UL 489
 - e) IEEE Std C37, all applicable sections
- (02) Application
- a) Seller shall provide overcurrent protection devices for all conductors, busses and electrical equipment that may be damaged due excessive current on the circuit.
 - b) Seller shall provide overcurrent protection devices for all other equipment that may be damaged due to a fault or overcurrent event within the facility's circuits.
 - c) All overcurrent devices shall be selectively coordinated such that the branch level circuits are deenergized first, leaving as many feeder and main level circuits in operation as possible during a faulting event.

MEDIUM AND HIGH VOLTAGE OVERCURRENT PROTECTION DEVICES

- (01) Governing Standards
- a) NEC Article 240
 - b) IEEE Std C37
- (02) Application
- a) Seller shall provide overcurrent protection devices for all conductors, busses and electrical equipment that may be damaged due excessive current on the circuit.
 - b) Seller shall provide overcurrent protection devices for all other equipment that may be damaged due to a fault or overcurrent event within the facility's circuits
 - c) All overcurrent devices shall be selectively coordinated such that the branch level circuits are deenergized first, leaving as many feeder and main level circuits in operation as possible during a faulting event.
 - d) HV protection shall be coordinated and agreed with the utility, as required.

5.16. Surge Arresters

- (01) Governing Standards
- a) IEEE C62
 - b) IEEE SA – 1672
 - c) IEEE 1299
 - d) NESC
- (02) Application
- a) All AC circuits and equipment shall be protected from transient over voltage events with the use of surge arresters.
 - b) Medium Voltage surge arresters shall be metal oxide varistor type, and shall be rated for the anticipated maximum continuous over voltage (MCOV) level for the circuit.

5.17. Switches**(01) Governing Standards**

- a) IEEE C37
- b) IEEE 1247
- c) UL 98
- d) UL 363
- e) UL 489
- f) NEC

(02) Application

- a) Switches shall be installed in the electrical circuits where indicated on the engineering plans.
- b) Switch voltage and current ratings shall be suitable for the application.
- c) All switches intended to be used for load break applications shall be marked as such, otherwise Seller shall label the device as non-load break rated.

(03) Types of switches

- a) Pad Mount
 - a. SF-6
 - b. Vacuum
- a) Gang Operated Air Break (GOAB)
- b) Knife Blade Disconnect
- c) Rotary
- d) AC or DC Contactor

5.18. Relays**(01) Governing Standards**

- a) IEEE C37
- b) NESC

(02) Application

- a) Protective relays shall be used for the automatic protection of circuits that cannot be protected by the sole use of fuses or stand-alone circuit breakers. This includes but is not limited to all medium voltage feeder and main circuits, substation transformers, and medium and high voltage buses.
- b) Relays must be microprocessor controlled.
- c) Relays may be single or multi-function devices, as long as the appropriate protective functions and setting levels can be achieved.

- d) Schweitzer Engineering Laboratory (SEL) is the preferred manufacturer, however the Seller may select alternative vendors upon approval from the owner.

5.19. Instrument Transformers

(01) Governing Standards

- a) IEEE C57.13
- b) UL 506

(02) Application

- a) Instrument transformers shall be used for converting primary line voltage or current to a level that may be read by an instrument such as a relay or meter.

(03) Ratings

- a) Instrument transformer current and voltage ratings shall be determined by the EPC Seller, based on their application. ii. All instrument transformers used for metering shall be of metering class, relay class transformers are not acceptable. For operational metering, 0.5 class accuracy is acceptable, with 0.2 class required for revenue metering.
- b) Relay or metering accuracy class instrument transformers may be used for protective relay applications, as long as the accuracy meets the requirements of that application.
- c) All Instrument current transformers shall be of accuracy class 0.15B0.5 with full output at two (2) times base rating.
- d) All Instrument potential transformers shall be of accuracy class 0.3%.

5.20. Battery & Battery Chargers

(01) Governing Standards

- a) IEEE 450-2010
- b) IEEE 36-1928
- c) IEEE 485
- d) IEEE 937
- e) UL 1236
- f) UL 1642
- g) UL 1989

(02) Application

- a) Batteries shall be used to provide uninterrupted power supply to electronics throughout the project.

(03) Types of Batteries

- a) Lead Acid
- b) Nickle-Cadmium
- c) Lithium Ion

5.21. Fiber Optic Cable and Data Conductors**FIBER OPTIC CABLE**

- (01) Governing Standards
 - a) ANSI/ICEA S-87-640
 - b) ANSI/EIA/TIA 455
 - c) ANSI/EIA/TIA 568
 - d) NEC Article 770
- (02) Cable Specification and Construction
 - a) All fiber optic cables shall be single mode, 24-strand, all-dielectric, indoor and outdoor rated, as applicable for the intended use, rated for installation in direct burial, in conduit, or aerial applications.
 - b) Fiber optic cables shall be rated temperature conditions between -40°C and 70°C.
- (03) CAT5 AND CAT6/ETHERNET CABLES
 - a) ANSI/EIA/TIA 568
 - b) NEC Article 800 and 840
- (04) Cable Specifications and Construction
 - a) All CAT5, CAT5e, CAT6 and other non-optical cables shall be constructed with shielded twisted pairs, cabled within a polyolefin insulated sheath, with an abrasion-resistant PVC or polyethylene outer jacket.

5.22. Raceways, Conduit Bodies & Boxes

- (01) Governing Standards
 - a) NEC
 - b) NESC
- (02) Materials Specification
 - a) All conduits and raceways inside buildings/interior locations shall be EMT.
 - b) All EMT fittings shall be compression type, not set screw type.
 - c) All raceway fittings in outdoor locations shall be rain-tight compression type, unless otherwise noted.
 - d) Schedule 40 PVC shall be used for buried conduits (not under roads) or for conduits encased in concrete unless otherwise noted on the drawings.
 - e) Raceways in exposed exterior locations or under roads shall be schedule 80 PVC.
 - f) PVC installed in exposed exterior locations shall be marked as UV resistant.
 - g) "L" and "T" conduit bodies shall not be used. Mogul-type conduit bodies shall be considered by Owner upon request.

- h) HDPE couplings with other types of conduit shall be listed for those conduit types, or approved by Owner
- i) Use Meyers (or approved equal) hub listed to provide moisture protection for conduit entrances in all applicable locations unless conduit enters from the bottom side of enclosure.
- j) All vertical mv conduit sweeps shall have minimum 36-inch radius. Horizontal mv conduit sweeps shall have minimum 60-inch radius.

5.23. Fixed Tilt Racking Structure

The fixed tilt racking system (if applicable) shall include the racking structure and all module mounting hardware. The racking vendor may supply the supports if desired, or the supports may be provided by a third party. The rack's azimuth and tilt angle shall be specified on the engineering drawings.

The racking system shall be designed using the environmental loads and the Occupancy Category as discussed above in section A-3.3.2 Environmental Loads. The racking structures, support attachments, module mounting brackets, fastening hardware, and supports (if applicable) shall have a 30-year design lifetime. Equipment shall have corrosion protection coatings as discussed in Corrosion Protection.

If the racking structure is a component of the solar array grounding and bonding strategy, the racking system shall meet UL 2703. Manufacturers' directions pertaining to grounding and bonding shall be followed.

Fixed tilt racking vendors under consideration shall have installed a minimum of 500 megawatts (MW) capacity in utility-scale projects.

5.24. Single Axis Tracking Structure

The single axis tracking system (if applicable) shall include the racking structure, mounting hardware, drive motor(s), and controller system. Additionally, any equipment required for the safe operation and wind stow (if applicable) should be included in the bid. The vendor may supply the supports if desired, or the supports may be provided by a third party. The trackers shall be oriented on a north-south axis and shall automatically track the path of the sun each day. All control equipment enclosures shall be rated NEMA 4.

Flexible cords or cables, where connected to moving parts of PV tracking arrays shall follow National Electrical Code 690.31 (E) pertaining to the number of strands required in flexible cabling, keeping in mind that this is a minimum standard and the number of strands may be significantly higher than Table 690.31 (E).

If the tracking structure is a component of the solar array grounding and bonding strategy, the tracking system shall meet UL 2703. Manufacturers' directions pertaining to grounding and bonding shall be followed.

Self-powered tracking systems shall be UL 3703 listed.

The tracking system shall be designed using the environmental loads and the Occupancy Category as discussed in section A-3.3.2 Environmental Loads of this specification. The torque tubes, support attachments, module mounting brackets, all fastening hardware, and supports (if applicable) shall have a 30-year design lifetime. Equipment shall have corrosion protection coatings as discussed in section A-3.3.5 Corrosion Protection. PV modules may be either 60-cell or 72-cell modules. Modules shall be oriented as modeled in Seller PVsyst or other modeling tool used by the Seller for System design.

As discussed in section A-3.3.6 Single Axis Tracking Structures, many trackers feature a “stow” option. If this feature is required for the racking, supports, and foundations to satisfy the design wind loads, a backup energy source shall be installed on the Site to ensure the tracker will be able to move into stow position during winds in excess of the supplier’s design wind speed if the power from the grid is interrupted. Owner does not require the backup energy source if the stow feature is not needed. Seller shall design the PV arrays’ mounting systems, foundations, and piers as provided in the Agreement. The design shall be based upon standard industry practice, including the requirements of applicable codes, standards, and permits, as well as the information and specifications provided by the module, inverter, transformer, switchgear, racking, and all other vendors.

Single axis tracking vendors under consideration shall have installed a minimum of 500 MW of capacity in utility-scale projects.

5.25. Direct Current Fused Combiner Boxes

Combiner boxes shall be rated for maximum system voltage and maximum system continuous and short-circuit currents.

Design should follow combiner box manufacturer instructions pertaining to temperature rating of output conductor in order to use 90° F conductor rating, combiner box manufacturer must certify box assembly as 90° F rated.

Enclosures shall be rated NEMA 4 and shall have integral key lock or provisions for padlocking.

DC inputs shall be fused with finger safe fuse holders for all hot conductors

Fuses shall have blown fuse indication.

Combiner box output shall have a means to be externally disconnected.

If the combiner box has a lightning protection device, the device should include a visual trip indicator.

5.26. Meteorological Stations

Seller shall provide complete solar meteorological weather stations for the Plant per the requirements of IEC 61724 -1 “Photovoltaic System Performance – Part 1: Monitoring” for Class A monitoring. The quality and quantity of stations will be as per Class A.

The required minimum measurements shall be as follows to meet Class A:

- (01) Global horizontal irradiance (measured by two instruments)
- (02) Plane of array irradiance (in the plane of the tracker if used)
- (03) Ambient air temperature and relative humidity
- (04) Cell temperature on a single solar module in the array
- (05) Wind speed and direction (measured at 2 and 10 meters)
- (06) Precipitation (rainfall)
- (07) PV module soiling and back of module temperature sensor

Below is a list of the general features the monitoring station shall include and other provisions the design shall accommodate:

- (01) Equipment calibration certificates
- (02) Summary of common calibration recertification timelines
- (03) Functional specifications for the measurement devices

- (04) Electrical schematic and mechanical installation drawings, proposed commissioning plan (flow chart) and site troubleshooting and problem resolution protocol (flow chart) for the monitoring systems
- (05) O&M manual that includes an overall description of the monitoring system, the routine O&M plan and schedule of maintenance events and procedures
- (06) Equipment and installation warranties

5.27. Supervisory Control and Data Acquisition

Seller shall supply and install an Owner-approved monitoring hardware and software package, including interconnection communications. The monitoring system must be selected to provide its 5-year Commercial Solar Monitoring Equipment and Service Package for the Plant. SCADA pricing shall include hardware and software (including all software subscriptions) for a minimum of 5 years. The monitoring system shall provide energy generation data, historical data, solar insolation attributes, and meteorological data. The system shall be configured to sample data at a rate of once per second, with 1-to-10-minute average intervals and shall be configured to update the server at least once every 15 minutes. The system shall be configured to sample and store the 1-to-10-minute averaged interval data for a period of 24 months.

The Seller shall supply a meteorological station that will provide current weather data as noted in section A-4.11 Meteorological Stations.

The monitoring system shall be capable of issuing alarms and notices to instantly alert the system manager and operation and maintenance (O&M) Seller to potential system problems and outages. The metering and monitoring system shall comply with the accuracy requirements and general standards set forth in IEC 61724.

The metering scheme shall be capable of reading the net electrical energy to the grid during daylight hours and the nighttime auxiliary loads when the Plant is in standby mode. The metering and monitoring system shall be compliant with Western Renewable Energy Generation Information System certification requirements for Renewable Energy Credit sales or trading per section A-4.13 Revenue Meter.

Data from the monitoring system can be accessed through the system's dashboard, which allows for public and administrator panel views. All electronics shall be enclosed in a NEMA 4 enclosure. This system may be housed in the same enclosure as the security equipment (see Section A-3.9). The data shall be collected at hardwired locations and transmitted wirelessly via a cellular modem to be provided and installed by Seller. Seller shall test the installed communications system to demonstrate its ability to meet the requirements of its intended use. Testing shall be done when the final system interconnections have been made.

Seller shall furnish and install all materials and equipment necessary to complete the SCADA installation. The monitoring system shall be configured for automatic reporting of generation statistics required by Owner. The data shall be collected at the hardware locations and transmitted wirelessly via a wireless SCADA system to be provided and installed by Seller. Points to be monitored by the SCADA system shall include, at a minimum:

- (01) Meteorological station
 - a) Monitor and record all items in section A-4.11 Meteorological Stations
- (02) Inverters
 - a) AC voltage
 - b) DC voltage
 - c) AC current

- d) DC current
- e) Kilowatts (kW)
- f) Kilowatt hours (kWh)
- (03) Metering
 - a) Monitor and store data from the Plant meter on an interval between 5 and 20 seconds
- (04) Transformers
- (05) Tracker control system integration, remote monitoring, and control
- (06) Any buildings or shelters
- (07) Plant switchgear

The following shall make up the SCADA calculated values list:

- (01) Model versus actual performance in kW and kWh
- (02) Day's energy in kWh
- (03) Month's energy in kWh
- (04) Year to date energy in kWh
- (05) Total lifetime energy in kWh
- (06) Plant performance ratio, current value
- (07) Plant performance ratio, day's average
- (08) Plant performance ratio, month's average
- (09) Plant performance ratio, year to date average
- (10) Plant performance ratio, since commissioning

All monitored plant electrical generation equipment (e.g., inverters, transformers, switchgear) shall be monitored to capture real time AC and DC electrical characteristics, including:

- (01) Voltage
- (02) Current
- (03) Power
- (04) Frequency
- (05) Power factor

All monitored plant electrical generation equipment (e.g., inverters, transformers, switchgear) shall be monitored to capture all diagnostic information, including:

- (01) Temperatures
- (02) Alarms
- (03) Status indicators
- (04) Fault states

5.28. Revenue Meter

A bi-directional revenue grade meter shall be installed to measure the total Plant output at the switchgear for accurately metering energy (kWh) generated by the Plant. The revenue grade meter shall be American National Standards Institute C12.20 0.2% Class UL listed, ISO9001 certified, which is accepted by all authorities requiring revenue grade. The meter must have a display for easy reading of current power generation and lifetime generation and shall be compliant with Western Renewable Energy Generation Information System certification requirements for Renewable Energy Credit sales or trading.

This revenue meter will be supplied by the Transmission Provider. Seller shall coordinate with the Transmission Provider for the installation of same.

5.29. Security Cameras and Related Equipment

The material furnished shall be in accordance with, but not limited to, the following codes and standards:

- (01) NFPA 70 - National Electrical Code
- (02) NFPA 101 - Life Safety Code
- (03) UL 294 - Access Control Systems (if applicable)
- (04) UL 1076 - Proprietary Burglar Alarm Units and Systems
- (05) American with Disabilities Act - Public Law 101.336
- (06) State Building Code

5.29.1. General Requirements

All security system components shall be UL labeled.

5.29.2. Security System Components

Security system components may consist of LED spot or LED flood lights, cameras, alarms, network video recorders, communication lines, and all wiring required for all the components. The security system shall be sufficient to monitor and deter any theft or vandalism onsite. The security component supplier shall provide detailed specifications of each component.

The Security Sub-Seller and Seller shall coordinate with the SCADA design/instrumentation and control engineer to ensure sufficient bandwidth is available on the network to accommodate the proposed security system. Owner may elect to reduce the equipment needs based on the location of the Site and subsequent security requirements.

Surveillance cameras and pan/tilt/zoom (P/T/Z) drives shall meet the following minimum requirements. Surveillance cameras and P/T/Z drives shall be provided by the Security Sub-Seller. Alternative solutions providing higher upgradeability and compatibility with future products are acceptable at no additional cost, subject to Owner's approval.

- (01) The P/T/Z unit shall meet the following design and performance specifications:
 - a) The unit shall be microprocessor controlled with network / IP based programming via standard WEB based interface.
 - b) Each pan/tilt drive unit shall operate as an independent unit with exclusive programming and setup data contained on each unit's nonvolatile memory.
 - c) The unit shall be capable of 360-degree continuous pan rotation with a vertical unobstructed tilt of +36 to -85 degrees.
 - a. Manual Control Speeds of: 0.1 degree to 40 degree per second (Pan), and 0.1 degree to 30 degree per second (Tilt)
 - b. Preset Speeds of: 100 degree per second (Pan) and 30 degree per second (Tilt)
 - d) The unit shall pan and tilt under manual control.
 - e) The unit shall be capable of 16 learned tours and 256 configurable preset locations for Alarm Call-up configuration.
- (02) The camera shall meet the following specifications:

- a) The sensor type shall be 1/2-.8-inch Type Exmor CMOS Sensor.
 - b) The camera shall provide a minimum of 1080p (1920x1080) resolution, at 30 Images per second (ips).
 - c) Camera shall provide a minimum of 2 simultaneous video streams: Dual H.264 or H.264 and Scalable MJPEG.
 - d) Camera shall allow for control and monitoring of video via IPv4 and IPv6 Networks.
- (03) The motorized lens shall meet the following design and performance specifications:
- a) The camera shall provide 16:9 Aspect Ratio and shall provide a 30X optical zoom and 12X Digital Zoom.
 - b) The lens shall provide horizontal angle of view of 59.5 degrees (wide) to 2.1 degrees (telephoto).
 - c) The lens shall feature an automatic focus with manual override.
 - d) A step-down power transformer shall be provided for each camera. Transformers shall be rated 120/24 V_{AC} and shall have an adequate Volt-ampere rating for the load at 40 degrees C ambient air temperature. Individual Fuse Distribution shall be provided.
- (04) The camera and lens housings shall be weatherproof and part of an Integrated Optics Cartridge (IOC). The IOC shall accommodate specified camera and lens combinations. IOC shall be dry nitrogen filled to 10 psig, to protect Camera Sensor / Lens optics from condensation and corrosion.
- (05) Camera assembly shall be provided with integrated IR Illumination. IR Illumination Transmitters shall be integrated to the Pan / Tilt Assembly Housing to provide IR Illumination for areas being viewed by the camera.
- a) IR Illumination shall be provided for distances up to and including 330 feet from each camera location.

5.29.3. Video Wiring System

- (01) Description: 100-ohm, four-pair UTP, covered with a black PVC jacket.
- a) Comply with ICEA S-90-661 for mechanical properties.
 - b) Comply with TIA/EIA-568-B.1 for performance specifications.
 - c) Comply with TIA/EIA-568-B.2, Category 6.
 - d) Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
 - a. Communications, Direct Burial Rated: Type F/UTP, complying with NFPA 262.
 - b. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher. All terminations shall use TIA/EIA 568B wire termination color coding.
- (02) Power and/or Auxiliary Input/Output cable shall be multi-conductor twisted shielded cables selected for use with the specific equipment to be controlled for installation in concealed conduit system. Cables shall have outer jacket of PVC and shall be suitable for direct burial installation.
- (03) All cables and conductors that serve as control, sensor, low voltage power, or data conductors shall have surge protection circuits installed at each end that meet the IEEE C37.90.1 surge withstand capability test. Fuses shall not be used for surge protection.

5.29.4. Network Video Recorder and Multiplexor

- (01) The network video recorder (NVR) and multiplexer shall be provided as one integrated unit. The NVR shall be provided by the Security Sub-Seller.
- (02) The NVR shall provide for live and playback viewing while the system continues to record new images. It shall be capable of time division, multiplexing multiple cameras and storing their digitized and compressed images on integral hard disk drives, and search and retrieval either locally at the unit or from a remote work station using a graphical user interface. It shall have Ethernet connectivity.
- (03) The NVR shall record video on an internal hard disk drive(s). It shall support multiple internal and external hard disk drives of minimum 500 gigabytes, or large enough to store up to 1 month of the camera recordings.
- (04) The NVR shall support archiving of images on an external archiving device. It shall support recording on portable / removable storage media.
- (05) The NVR viewing software shall provide the following displays as a minimum in live and playback mode: full-screen, sequencing, quad, 9-way, or 12-way. It shall allow the user to rearrange cameras in any multi-screen display, in both live and playback modes. The display options shall include but not limited to:
 - a) Camera tilting
 - b) Title display, per monitor
 - c) Time and date, per monitor

5.29.5. Security Software

The Security Sub-Seller shall provide a minimum of two software and database management licenses. Seller shall provide two copies of the software on CDs for backup and a complete user manual. Software shall be Windows compatible. Seller shall provide free software upgrades during the warranty period of the system as a minimum.

5.30. Wires, Cable and Connectors

Seller shall provide information about proposed wire, cable, and connectors, including all underground facilities. Cable shall be designed and installed for a service life of 30 years. Cable for DC feeders and PV panel interconnect shall be 2-kilovolt 90°C (wet or dry) power cable type USE-2 or RHH/RHW-2 with XLPE jacket and UL 1581, VW-1 rating or approved equal for intended use capable of meeting DC collection system design current requirements. Externally installed cables shall be sunlight and ultraviolet resistant, suitable for direct burial, and conform to NEC 300.5 Underground Installation, Table 300.5 Minimum Cover Requirements, rated to the maximum DC voltage of the Plant.

PV panel interconnect connectors shall be: (i) latching, polarized, and non-interchangeable with receptacles in other systems, and (ii) tap branch connectors with multi-contact termination connectors. Grounding member shall be first to make and last to break contact with mating connector and shall be rated for interrupting current without hazard to operator.

Cables shall be listed and identified as PV wire as stated in NEC Article 690. If a cable tray is utilized, there shall be no self-tapping screws, only a clamping mechanism to secure the top. All underground cable shall be mapped and identified along its entire run with hazard tape and tracing, 18 inches above the cable elevation and 18 inches below finish-grade elevation.

Galvanized, rigid metal conduit where underground cable is exposed above ground or stubbed up to junctions or poles shall be used. Rigid metal conduit shall be included in the corrosion mitigation plan and shall be designed for a 30-year life in the Site soils and conditions. All 90-degree bends shall be in long sweeps installed in accordance with standard utility practices. Underground cable shall be direct-buried a minimum of 3 feet below finish-grade elevation. **No underground cable splicing shall be acceptable under any circumstance.** All cable splices shall be brought above ground and housed in a suitable enclosure or, if below grade, placed in a suitable vault that is clearly marked.

Cables shall be labeled in accordance with Section A-4.2 Signage and Labeling.

5.31. Plant Switchgear

Switchgear shall be located outdoors in a NEMA 4 lockable enclosure. Switchgear shall include an auxiliary compartment containing all instrument transformers associated with the protective relays and the 120/240-V CPT shown in the one-line diagram(s). The protective relay system shall be specified, designed, and installed in accordance with interconnecting utility's requirements. Switchgear monitoring and communication hardware shall be included to meet the requirements of sections A-4.12 Supervisory Control and Data Acquisition and A-4.13 Revenue Meter, and the metering requirements of Owner. Relay current transformers shall be C400 accuracy class.

The CPT shall be fused and disconnectable. The CPT shall be sized, and single-phase breakers shall be included to supply power to a 120-V convenience receptacle and an energy efficient light within the switchgear enclosure, switchgear heaters, and the 240/120-V_{AC} panelboard within the communications shelter (if applicable). The switchgear main breaker shall have vacuum fault interrupters and shall have provisions for bifurcation. Medium-voltage protective device selection and relaying should be based on the use of Schweitzer Electric Laboratories relays or approved other, as required and specified in the Interconnection Agreement.

In general, the interconnection design and components should meet the requirements of the interconnecting utility and the interconnection agreement (including the necessity of a grounding transformer if required).

5.32. Emergency Direct Current Battery System

The batteries and charger's location shall be specified in accordance with temperature and shading requirements, and the battery system shall meet the requirements set forth in the Interconnection Agreement. The battery system shall be sized: to provide DC power to trip, close, and recharge the switchyard 8 hours after a loss of power; recharge within 12 hours; and supply sufficient power to the SCADA and communications systems for 12 hours minimum. The battery sizing calculation shall be provided by Seller to Owner.

6.0 WARRANTIES

6.1. General Seller Warranty

Seller shall follow all material requirements of the warranties of the principal equipment suppliers using the procedures detailed in the manuals delivered upon completion of the Plant. All warranties shall be passed to Owner and shall be enforceable throughout the warranty period.

6.2. Solar Module Warranty

Provide the proposed module warranty duration, terms and conditions. At a minimum, solar module manufacturer shall provide a 25-year linear warranty on the solar modules with at least 80 percent of power output guaranteed at 25 years as more particularly described and provided in the module warranty to be provided by the Seller. The solar module manufacturer shall confirm that the warranty applies on an "as installed basis," i.e., it will confirm the panels were installed according to its requirements and specifications for installation.

Racking and Tracking System Warranty

Provide the proposed tracker warranty duration, terms and conditions. The tracking manufacturer, if applicable, shall supply a 5-year warranty for the installed structure and a 5-year warranty on the motor, and the racking design shall be certified by both the tracking manufacturer and the solar module manufacturer such that all warranties apply on an “as installed” basis. An extended warranty for parts only (motorized drives) shall be provided for a period of 10 years by Seller.

The racking manufacturer, if applicable, shall supply a 10-year warranty for the installed structure, and the racking design shall be certified by both the racking manufacturer and the solar module manufacturer such that all warranties apply on an “as installed” basis.

The racking and tracking manufacturer shall supply a minimum five (5) years full parts and labor replacement warranty, as more particularly described and provided by the Seller.

6.3. Inverter Warranty

Provide the proposed inverter warranty duration, terms and conditions. The inverter manufacturer shall provide a 5-year full parts and labor replacement warranty, as more particularly described and provided by the Seller. A six to 10-year warranty also may be offered by the inverter manufacturer. The inverter manufacturer shall confirm its warranty on an “as installed basis.”

6.4. Transformer Warranty

The transformer manufacturer shall provide a 5-year warranty for the transformers, as more particularly described and provided by the Seller.

6.5. SCADA Monitoring System and Security Equipment Warranty

Provide the proposed SCADA Monitoring System warranty duration, terms and conditions. Provide the proposed security system warranty duration, terms and conditions. The SCADA and security equipment system manufacturers shall provide a 5-year full parts and labor replacement and software upgrade warranty, as more particularly described and provided by the Seller.

6.6. Performance Warranty

This section not used.

7.0 APPLICABLE CODES AND STANDARDS

The Plant’s design, engineering, construction, interconnection, startup, and testing shall follow the applicable codes, standards, and publications that are in effect at the time of Plant initiation, and which are consistent with current utility industry standards. The codes and standards utilized shall be the latest editions in effect at the notice to proceed date.

Materials manufactured within the scope of Underwriters Laboratories shall conform to UL standards and have an applied UL listing mark. If no UL compliance is available, material and equipment shall be labeled or listed by a nationally recognized testing laboratory.

Where codes do not govern specific features of the equipment or system, Prudent Utility Practice, equipment manufacturer specifications, and standard industry standards shall apply. Where local codes or ordinances will have an impact on the design, Owner and Seller shall jointly address these with the local authorities having jurisdiction as provided in the Agreement.

8.0 DISTRIBUTION OR TRANSMISSION INTERCONNECTION

Seller is responsible for the cost of designing, procuring equipment for, and installing all interconnection and metering facilities required to deliver the Plant’s electrical output to the Point of Interconnection, in accordance with this Agreement and the Interconnection Agreement. Seller shall be aware of the relevant interconnection requirements for Small Generators, (less than 20 MW), and Larger Generators, (Greater than 20 MW) and design, install and operate the PV Plant accordingly.

Seller shall be fully responsible for working with and coordinating with the transmission provider to assure that the Plant is properly designed, constructed, and prepared to interconnect with the distribution system. Seller shall provide the interconnection equipment and structures to the Point of Interconnection as shown on the detailed design drawings and specified in the Interconnection Agreement. Seller shall coordinate its work on interconnection with the Owner and perform in accordance with any applicable requirements in the Interconnection Agreement. Seller shall provide Owner and the transmission provider with at least 15 days advance written notice of the first test that involves either backfeed or delivering energy to PacifiCorp and must be in compliance with the Interconnection Agreement.

9.0 OPERATIONS AND MAINTENANCE — MANUALS AND TRAINING

9.1. Documentation

Seller shall supply Owner with all manuals and/or handbooks (in printable electronic format) that provide, either in a single manual or handbook or collectively, complete operating and maintenance instructions (including inventories of spare parts and tools and parts lists with ordering instructions) for each major piece of equipment and system of the Plant. Each such manual and handbook shall comply with the requirements as set forth below and in **RFP Appendix A-7.2**.

9.2. Manuals

Seller shall provide Owner with six (6) paper copies and one editable electronic copy of all manuals.

Hard copy manuals shall be on standard 8-1/2" x 11" paper. Drawings and schedules which are to be bound into the manual shall also be 8-1/2" x 11" or 11" x 17" folded. Each manual shall be assembled and bound in heavy-duty post binders designed for rough usage. Light duty and ring binders are not acceptable. Binder capacity shall not exceed four inches, nor shall material included exceed the designed binder capacity. If the material to be furnished exceeds this capacity rating, multiple volumes shall be furnished. Binders shall be sized to the material to be contained, and capacity should not be more than approximately one-half inch greater than the thickness of material within the binder. All documents, illustrations, specifications, equipment data sheets, drawings, operating and maintenance instructions shall be in the English language. Use of the English system of units on documents is preferred; if the metric system of units is used, the drawing, data sheet, specification or illustration shall clearly indicate that the metric system of units is used. Each manual shall include a Table of Contents, front cover, side label and laminated index tabs and shall be of a consistent format.

The electronic copy of the manuals shall be organized in folders consistent with tabs in the paper manuals. Electronic copies of installation, operation and maintenance manuals shall be organized from the most general information in the top directory to the most specific information in the lowest level folder. The top-level folders shall include a document containing a directory of the subfolders describing the contents of each subfolder. Electronic copies of Installation, Operation and Maintenance manuals shall be organized by project, system, subsystem, equipment and components. Manufacturers' or vendors' electronic manuals shall be delivered as individual files. Seller shall not merge or combine manufacturer and vendor provided files containing manuals.

The manuals to be provided shall include:

Design Manuals

- (01) Design manuals shall contain the following items:
- (02) Drawing List, Drawing and Specification Identification System, Units of Measurement and Formats

- (03) System List and Equipment Numbering System
- (04) List of applicable drawings
- (05) System design requirements
- (06) System and equipment descriptions
- (07) Equipment lists itemizing type, performance and technical requirements.
- (08) Overall performance data

Start Up, Operation and Shutdown Manual for the Plant, including comprehensive and complete procedures for checkout, startup and testing of the Project and will include as a minimum the following items:

- (01) Plant start-up and shutdown procedures
- (02) Startup schedule
- (03) Startup organization chart
- (04) Administrative procedures
- (05) Data sheets
- (06) Test procedures for all tests required for Mechanical and Electrical Completion and Final Acceptance.
- (07) Turnover sequences and procedures
- (08) Safety clearance procedure
- (09) Work responsibility matrix
- (10) Installation, Operation, and Maintenance Manuals for the Equipment, including information typically supplied for equipment and/or systems such as the following items:
 - (11) System or equipment startup and shutdown procedures
 - (12) Description / design criteria of each item of equipment
 - (13) Nameplate information and shop order numbers for each item of equipment and components thereof
 - (14) Operating procedures and instructions for commissioning, startup, normal operation, shut down, standby and emergency conditions and special safety precautions for individual items of equipment or systems
 - (15) List of any start-up prerequisites
 - (16) Normal range of system variables
 - (17) Operating limits and hazards for all equipment and systems including alarm and trip set points for all devices
 - (18) Testing and checking requirements
 - (19) Effect of loss of normal power
 - (20) Tolerance of electrical supply frequency variation
 - (21) Final performance and design data sheets, specifications and performance curves for all equipment including test data and test curves
 - (22) Preventive maintenance schedule and maintenance instructions for equipment including standard and special safety precautions
 - (23) Lubrication schedule showing requirements and specifications for lubricants for equipment
 - (24) Dismantling and assembly procedures for equipment with associated tests and checks prior to returning equipment to service.

- (25) Detailed assembly drawings to complement assembly procedures mentioned above including parts lists and numbers for replacement ordering.
- (26) Setting and running clearances and tolerances
 - a) Cleaning procedures
 - b) Specifications for any gases, chemicals, solvents or lubricants
 - c) Drawing showing space provided for equipment maintenance for equipment and any fixed facilities for maintenance such as trolley beams, etc.
 - d) Methods for trouble-shooting
 - e) List of maintenance tools furnished with equipment
 - f) Installation instructions, drawings and details
 - g) Vendor drawings as appropriate
 - h) Installation, storage and handling requirements.

The above requirements are a minimum; however, requirements which are clearly not applicable to specific items or components may be deleted, however, any additional information which is necessary for proper operation and care of the equipment shall be included.

10.0 SPARE PARTS

No later than 90 days after the Effective Date the Seller shall provide to the Owner a recommended spare parts list, including quantities and prices if purchase with the contract, for the equipment and systems provided by the Seller. The recommended spare parts list shall include all expendable items that may be required during the operation of the Project. Each of the spare parts shall be fully identified by reference to the spares list, part number, cost, and manufacturer drawing number. Seller shall also identify spare parts that the Seller recommends should be stocked locally to ensure prompt repair due to any failure that can be reasonably expected, considering the length of time required to obtain replacement parts.

The Seller shall provide, receive, store locally, distribute and restock spare parts, materials, test equipment, instruments, tools, and consumables required for start-up and operation of the systems and equipment within its scope until **[Substantial Completion]**.

If the Seller, his suppliers, or sub suppliers cease manufacture of any of the spare parts, or if for any reason any spare part will become unavailable at any time during the life of the facility, the Seller shall notify the Owner in writing at least 180 days prior to the unavailability of such spare parts. The Seller shall provide the Owner the opportunity to purchase sufficient stock of spare parts to support the system for its expected life.

11.0 TOOLS AND EQUIPMENT

Seller shall provide all special tools, test instruments and computer programs, as applicable for maintenance and operation which are not normally or readily available. The Seller shall submit a complete list of tools and equipment needed for erection/installation and maintenance and a list of special tools and equipment that will be provided, including prices. Special tools and equipment shall become the property of the Owner at the completion of the PV installation. The Owner reserves the right to purchase additional quantities of tools if desired.

12.0 FINAL PLANT COMPLETION

Following is the step-by-step procedure for orderly completion of the Plant:

- (01) Mechanical and Electrical Completion
- (02) Q/A Q/C testing
- (03) Commissioning and Start-up procedures and tests
- (04) Interim operating time
- (05) Capacity Test
 - a) If Plant passes Capacity Test (Go to Final Acceptance and hand-over)
 - b) If failed Capacity Test – allowable period for corrective measures for re-testing of Capacity Test
- (06) Substantial Completion
- (07) Final Completion and hand-over to Owner

12.1. Step 1 Mechanical and Electrical Completion

Seller shall achieve Mechanical and Electrical Completion and assure that the Plant has been synchronized with the PacifiCorp Interconnection Facility (in accordance with PacifiCorp's requirements) before conducting the Capacity Test. Mechanical and Electrical Completion shall mean:

- (01) Equipment for the Plant has been installed, including with the required connections and controls to produce electrical power.
- (02) All equipment related to the solar tracking system (if applicable) has been installed and checked for alignment, lubrication, and rotation.
- (03) All remaining electrical systems have been checked out and are ready for operation.
- (04) All electrical continuity and ground fault tests and all mechanical tests and calibrations have been completed.
- (05) All instrumentation is operational and has been calibrated in accordance with manufacturers' standards and guidelines and, where possible, loop checked.

12.2. Synchronization Procedures and Requirements

All testing shall be done in accordance with the Interconnection Agreement and all the requirements to achieve electrical and mechanical completion of the plant.

12.3. Step 2 Quality Assurance/Quality Control

Seller shall submit to Owner a copy of its QA/QC plan for review not later than 45 days after contract execution for Owner review and comment. The Plant shall be managed in accordance with the program.

The QA/QC program shall include, but is not limited to, such procedures and systems as the following:

- (01) Road construction
- (02) Rebar and conduit placement
- (03) Concrete placement and testing
- (04) All wire insulation testing—Megger testing or very low frequency testing

- (05) Mechanical system—trackers, mounting structures, tracker controls
- (06) Factory testing of inverters and transformers by the manufacturer
- (07) PV source open-circuit measurements— V_{OC} at combiner boxes
- (08) Fuse tests
- (09) Termination pull testing
- (10) All visual inspections
- (11) Grounding continuity testing
- (12) Earth-ground resistivity testing
- (13) PV module inspection and manufacturer documentation of factory test per the manufacturer's existing program
- (14) Metering and instrumentation calibration testing
- (15) Step-up transformer testing
- (16) Inverter phase rotation and matching with utility
- (17) Relay settings at the point of interconnection to Owner
- (18) Verification of security camera system operations, including device points, sequences, and communications
- (19) Other Seller-prescribed procedures

All QA/QC testing procedures onsite shall be witnessed and documented by a qualified representative of Seller. Owner shall observe and witness QA/QC as necessary and at its discretion. A qualified engineer of Seller shall date and sign documentation indicating completion and acceptance of each onsite QA/QC test procedure.

12.4. Step 3 Commissioning and Startup

Seller shall provide the proposed commissioning and startup plan for the Plant at least 45 days prior to the proposed commissioning and startup dates. The plan shall follow procedures as dictated in IEC 62446-1.

Seller shall coordinate with Owner to develop an acceptable commissioning plan that includes a checkout and startup procedure. This work will assure: that systems are activated in a manner that is safe for personnel as well as for the equipment, that Seller work is complete and according to the contract documents, and that the systems perform as required by the contract documents and are ready to be turned over to Owner. As the construction and installation of the systems nears completion, Seller shall prepare punch lists and conduct system walk-downs, sub-system and system checkouts, startups, testing, and turnovers.

The final approved Acceptance Test and Commissioning Procedures shall follow IEC 62446-1, and at minimum, include the following:

- (01) Safety plan during startup and commissioning
- (02) Review of all QA/QC testing on the DC and AC sides of inverters
- (03) Detailed procedure for Plant startup, including switching sequencing
- (04) Confirm testing and energizing inverters in conformance with manufacturer's recommended procedures; note operating voltages; and confirm inverter is performing as expected

- (05) Under full sun conditions, and after at least 15 minutes of operation, taking and recording Plant operating data—such as but not limited to megawatts direct current, megawatts alternating current (MW_{AC}), V_{DC} , V_{AC} , I_{DC} , I_{AC} , Solar Radiation, etc.
- (06) Testing the system control and monitoring system to verify that it is performing correctly
- (07) Testing the communication system for offsite monitoring
- (08) Testing the Plant metering and protective relaying to verify they meet utility requirements
- (09) Detailed procedure for interface and initialization with the grid
- (10) Documentation of successful startup and commissioning procedure
- (11) Written notification submitted by Seller to Owner that the completion of Acceptance Testing and Commissioning has occurred

Upon successful completion of energizing and startup, the Plant will be considered operable. The Plant will then move to the Interim Operating Period where Seller shall make the Plant ready for Capacity Testing.

12.5. Step 4 Interim Operating Period

Following successful completion of the startup and commissioning of the Plant, the Seller shall have a maximum of 45 days to resolve any operating issues. The Owner-designated operating and maintenance team shall receive training regarding the Plant during this period. After the successful execution of the Interim Operating Period, the Seller shall perform a Capacity Test Procedure to verify the rated output for the Plant. Seller is not required to use the maximum 45 days, rather it is an allowance of time.

12.6. Training

The Seller shall provide training for the PV system as specified below. The Seller shall determine the content and duration for each training session. The suggested class durations in this specification are meant to illustrate the level of training expected. Performance evaluation testing of all trainees (i.e. a written test) is required for all classes except the Orientation Training

12.7. Operator Training

The Seller shall provide the necessary training in proper operation of the PV system and related equipment. It is anticipated that this session will last 3-5 days. This session will be limited to a maximum of 20 people. Emphasis shall be placed on hands-on operating experience interspersed with the critical background as necessary, including switching procedures and emergency response training.

12.8. Maintenance Training

The Seller shall provide necessary training in maintenance of the PV system and related equipment, providing maintenance by the Owner option is chosen. The maintenance training shall be scheduled after successful completion of the availability guarantee period. It is anticipated that maintenance training will last 3-5 days. This session will be limited to a maximum of 20 people. The maintenance training shall include, but not be limited to:

- (01) normal maintenance methods
- (02) repairs and replacement
- (03) diagnostic procedures
- (04) equipment calibration
- (05) re-energization

- (06) special tests
- (07) special tools
- (08) safety and grounding procedures

12.9. Step 5 Capacity Test

Upon notification that the Plant is ready for field testing, the Seller, in the presence of Owner-designated engineers or a third-party independent engineer, shall complete the Capacity Test. The Test will be performed under field environmental conditions (in the field irradiance, temperature, and measured capacity in MW_{AC}) according to the procedures described in IEC TS 61724-2 “Photovoltaic System Performance Part 2: Capacity Evaluation Method”. The metering and monitoring procedure for the Capacity Test shall conform to the IEC Standard “Photovoltaic Systems Performance – Part 1 Monitoring”. For the basis of the Capacity Test, that the inverter stations will be producing AC power at a power factor of 1.0.

Seller shall submit its proposed plan to comply with the testing procedures 60 days prior to the date that Seller anticipates the commencement of the test. The Seller shall include in the testing procedure the proposed reference conditions for the testing which will be reviewed and approved by the Owner and its engineers. The objective of the Capacity Test is for Seller to demonstrate to Owner that the Plant has achieved the performance (in MW_{AC}) under the reference test conditions (irradiance, ambient temperature, wind, and other parameters used to define the capacity performance). Seller’s Capacity Test procedure submittal shall, at a minimum, include a listing of test instrumentation, calibration procedures, test duration, type of data collected and collection frequency, test data collection procedures, and test reporting conforming to IEC 61724 Parts 1 and 2.

The objective of the testing shall be for the Seller to compare the actual measured capacity (MW_{ACTUAL}) to the contracted capacity ($MW_{CONTRACT}$) which are defined as follows:

MW_{ACTUAL} = The Plant capacity in MW_{AC} as measured resulting from the IEC 61724 capacity test at the reference test conditions.

$MW_{CONTRACT}$ = The Plant ‘guaranteed contract capacity’ by Seller in MW_{AC} at reference test conditions. (Seller bid)

Seller shall submit preliminary results of the Capacity Test within 24 hours of the conclusion of the test. Upon Independent certifier’s acceptance of the preliminary test results, Seller shall submit to Owner a detailed test report within 10 business days of the completion of the Capacity Test. The test report shall consist of the following:

- (01) Any agreed upon deviations to the test procedures
- (02) Instrument calibration sheets/certificates
- (03) Test data (manual and from the data acquisition system)
- (04) Corrected test data
- (05) Field notes
- (06) Calculations
- (07) Power factor at which test was taken
- (08) Post-test uncertainty analysis
- (09) Conclusion

If the rating falls below the guaranteed output, Seller shall take measures to bring the Plant up to the required rating.

If Seller chooses to take corrective measures to bring the power rating up to an acceptable level, then retesting may occur following notification to Owner in writing.

12.10. Step 6 Substantial Completion

After the startup and commissioning is successfully demonstrated to Owner's satisfaction in accordance with **RFP Asset Purchase and Sale Agreement**, the Plant will be considered Substantially Complete. To demonstrate substantial completion, the Seller shall:

- (01) Commission the completed system in accordance with the tests to verify that:
 - a) The system is capable of being operated at all levels and operating modes in accordance with the operating guidelines, applicable laws, applicable standards, applicable permits, prudent utility practices, and requirements of the contract documents.
 - b) The Plant is functioning as expected within acceptable parameters and as designed at a nameplate capacity as per the final results of the Capacity Test.
- (02) Facilitate completion or execution of any incentive- or rebate-related documents or other documents required for any warranty to become effective or to be assigned to Owner.
- (03) Coordinate with PacifiCorp confirming that the facility has been installed per the Interconnection Agreement.
- (04) Cause the Plant and all items of equipment and improvements at the Plant to be designed, manufactured, installed, calibrated, and tested where applicable in accordance with the published standards (as of the dates specified) listed in this Technical Specification; Seller shall notify Owner of any standards of such organizations that are inconsistent with each other and advise Owner of the manner in which it intends to resolve such inconsistency in accordance with the published standard.
- (05) Acceptance testing of security system shall include verifying that each device point and sequence is operating correctly.
- (06) Provide Owner a startup manual in conformance with section A-8.1.1 as part of the plant startup procedures.
- (07) Provide Owner with all training and documentation as required to satisfy the requirements for Substantial Completion as listed in **Appendix A-7.2**.
- (08) Within 45 days prior to Substantial Completion Seller shall complete training of Owner in the operation and recommended maintenance of the Plant.

12.11. Step 7 Final Completion

After Substantial Completion, Seller shall complete all punch-list items; demobilize; clean and clear the Site; submit all as-built drawings; O&M manuals, and spare parts lists; complete all training; deliver all spare parts onsite; and transfer all permits to Owner. Prior to submitting its request for a Final Acceptance Certificate, Seller shall perform the following tasks without limitation:

- (01) Identify punch-list items and provide timeline for completion. Following the Final Acceptance Date, Seller shall complete the items on the punch-list in accordance with the standards described herein, and as quickly as reasonably practical. Seller shall coordinate with Owner regarding continued Site access.
- (02) Conduct a final clean-up of the Site.
- (03) Remove all its equipment from the Site (other than equipment, supplies, and materials necessary or useful to the operation or maintenance of the Plant, and equipment, supplies, and materials directed by Owner to remain at the Site until completion of the Plant).

- (04) Tear down and remove all temporary structures on the Site built by Seller or its Subcontractors and restore such areas to a condition consistent with that of a newly constructed solar PV power plant, except as required by any provision of this Agreement.
- (05) Remove all waste, rubbish, and hazardous material from and around the Site and disposed in accordance with all state, federal, and local regulations.
- (06) Provide Owner with copies of all O&M manuals and warranties for the Plant.
- (07) Provide final as-built documents upon completion.
- (08) Complete all performance testing in accordance with the Capacity Test.
- (09) Meet all requirements listed below.

12.12. Requirement for Final Completion

Final Completion of the Work shall be deemed to have occurred only if all the following have occurred:

- (01) Seller has achieved Substantial Completion in accordance with Article 14;
- (02) Owner has received final “as-built” drawings in accordance with the terms of this Contract;
- (03) the Punchlist Items have been completed to the reasonable satisfaction of Owner;
- (04) Seller has delivered the Final Release and Waiver of Liens and Claims in accordance with Section 7.6 and has delivered such other documents and certificates as Owner has reasonably requested to ensure compliance with all Applicable Laws;
- (05) Seller has paid Owner all amounts due hereunder and not in dispute; and
- (06) Seller has delivered to Owner a Notice of Final Completion stating that all the preceding conditions in this Section 15.4 have been satisfied.

12.13. Procedures for Final Completion

When Seller believes that it has achieved Final Completion, it shall deliver to Owner a Notice of Final Completion. Such Notice shall contain a report in a form reasonably acceptable to Owner, and with sufficient detail to enable Owner to determine that Seller has achieved Final Completion. Owner shall, within twenty (20) Days following receipt of such Notice, either: (a) approve Seller’s Notice of Final Completion, indicating Owner’s acceptance of the achievement of Final Completion; or (b) if reasonable cause exists for doing so, notify Seller in writing that Final Completion has not been achieved, stating in detail the reasons therefor. If Owner delivers the Notice under the preceding clause (b), Seller promptly shall take such actions, including the performance of additional Work, to achieve Final Completion, and upon completion of such actions, shall issue to Owner a revised Notice of Final Completion pursuant to this Section 15.5. Such procedure shall be repeated as necessary until Final Completion has been achieved. If Owner fails to respond to Seller’s submitted Notice of Final Completion within the time set forth above, Owner shall be deemed to have approved Seller’s Notice of Final Completion. For all purposes of this Agreement, the Final Completion Date shall be the date on which Seller delivers to Owner the Notice of Final Completion that Owner ultimately accepts or is deemed to have accepted (or pursuant to a later determination under the dispute resolution procedures, should have accepted). Any disputes regarding the existence or correction of any such alleged

deficiencies shall be resolved pursuant to Article 35. Contract shall cause Final Completion to occur no later than sixty days following the Substantial Completion Date.

RFP Appendix A-1.6 – Battery Energy Storage



Battery Energy Storage System Technical Specification

October, 2021

PACIFICORP

BATTERY ENERGY STORAGE SYSTEM

TECHNICAL SPECIFICATION

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1.0 OUTLINE OF WORK

1.1 General

Owner desires a qualified bidder (Seller) to provide a Battery Energy Storage System (BESS) to be used for grid support applications under a Build Transfer Agreement (BTA) basis at Seller proposed location. The entire BESS facility shall be controlled by the BESS Supervisory Control and Data Acquisition (SCADA) System and Controller as described below in this Technical Specification. The Project includes all the necessary design, engineering, procurement, manufacture, build, construction, commissioning, start-up, testing, performance verification, and Owner personnel training. The Project shall be engineered and constructed according to Industry Standards using prudent utility practices.

1.2 Definitions and Abbreviations

°C	Celsius
°F	Fahrenheit
A	Ampere, unit of Electrical Current
AC	Alternating Current
AGC	Automatic Generation Control
ASCE	American Society of Civil Engineers
ASTM	American Society for Testing and Materials
BESS	Battery Energy Storage System
BOL	Beginning of Life
BTA	Build Transfer Agreement
Change of Ownership	As defined in the LGIA
Seller	Qualified integration firm and/or OEM vendor
CPT	Control power transformer
dBA	A-weighted decibels
DC	Direct Current
DOD	Depth of Discharge
Down Reserve	The capability of the BESS to inject AC power to the grid at the point of interconnection (POI) in response to remote commands, and/or frequency response
DR	Distributed Resources
EL	Electroluminescence
EN	European Standard
EOL	End of Life
EPC	Engineer-Procure-Construct as the primary or general Contractor
EPS	Electric Power System
Frequency Response	The capability of the BESS to provide response for frequency deviations above and below the frequency set point (or dead band) of the BESS, within the ramp rate limits for the Project

FRT	Frequency Ride-Through
GHS	Global Harmonized System
GHz	GigaHertz
HMI	Human Machine Interface
HV	High Voltage
HV _{AC}	High voltage alternating current
HVAC	Heating, Ventilation & Air Conditioning
Hz	Hertz, unit of electrical frequency
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
Inverter	All inverters in this specification refer to Four-Quadrant, Bidirectional, Smart Inverters.
ISO	Independent System Operator
kHz	kiloHertz
kW	kiloWatt
kWh	kiloWatt-hour
kV	kiloVolt
LGIA	Large Generation Interconnection Agreement
LHFRT	Low and high frequency ride through
LHVRT	Low and high voltage ride through
Load Following	The ability of the BESS to provide real power response to a specific, metered electrical location (i.e., the point of interconnection (POI)) based on the variations of real power demand at the specified location
LPS	Lightning protection system
LV	Low Voltage
MHz	MegaHertz
mil	Unit of measurement for length (thousandth of an inch)
MPT	Main Power Transformer
ms	milliseconds
MV	Medium Voltage
MVT	Medium Voltage Transformer
MVA	Mega Volt Amp
MW	MegaWatt
MW _{AC}	MegaWatt alternating current
MWh	MegaWatt hours
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NVR	Network Video Recorder
O&M	Operation and maintenance
OEM	Original Equipment Manufacturer

Output Frequency Range	The range of frequency under which the Project will operate according to its specification
Output Voltage Range	The range of AC grid voltage under which the Project will operate according to its specification
Owner	PacifiCorp
P/T/Z	Pan/tilt/zoom
PCB	Polychlorinated biphenyl
PCC	Point of Common Coupling
PCS	Power Conversion System
Peak Shaving	The ability of the system to provide power to the grid above a threshold power demand level during peak demand periods to maintain net power demand at the substation below the threshold level.
PID	Proportional Integral Derivative loop control
PLC	Programmable Logic Controllers integrated with the BESS and SCADA System
POI	Point of Interconnection, which shall be where system ties in to the existing Transmission or Distribution Network
Project	BESS for grid support applications
pu	per unit
PV	Photovoltaic
PVC	Polyvinyl chloride
QA/QC	Quality assurance/quality control
QP	quasi-peak
Ramp Rate	The rate, expressed in MegaWatts per minute, that a generator changes its power output.
RAS	Remedial Actions Scheme
Rated Apparent Power	The real or reactive power (leading/lagging) that the BESS can provide at the POI continuously without exceeding the operating limits of the BESS
Rated Continuous Charge Power	The rate at which the BESS can capture energy for the entire SOC range of the BESS
Rated Continuous Discharge Power	The rate at which the BESS can continuously deliver energy for the entire specified SOC range of the BESS
Rated Discharge Energy	Total energy the fully-charged BESS can deliver to the POI at the rated continuous discharge power without recharging.
Revenue Metering Point	There are three Revenue Metering Points: Project Totalizing meter at the POI; the Project BESS (low side of the transformer); and the Project PV (low side of the transformer).
rms	root mean square

SCADA	Supervisory Control and Data Acquisition
SCCR	Short-circuit current rating
SGIA	Small Generator Interconnect Agreement
SOC	State of Charge, measured in % relative to the maximum possible amount of energy that can be stored by the system, with fully charged being 100% and fully discharged being 0%.
SPCC	Spill Prevention Control and Countermeasures
SPD	Surge protection devices
Standby mode	BESS standby mode means that the battery is charged to the specified level and is not providing or receiving power from the grid
SWPPP	Storm Water Pollution Prevention Plan
System Round-Trip Efficiency	The ratio of the delivered output energy of the BESS to the absorbed input energy required to restore it to the initial SOC under specified conditions through the Design Life.
Total Response Time	Starting when the command is received at the BESS boundary and continuing until the BESS discharge power output reaches 100 +/- 2% of its rated power, measured at the POI
Transmission Provider	Rocky Mountain Power
TÜV	Technischer Überwachungsverein (third party factory audit or testing score)
DOT	Department of Transportation
UL	Underwriters Laboratories, Inc.
Up Reserve	The capability of the BESS to absorb AC power from the POI in response to remote commands, and/or frequency response
UPS	Uninterruptible Power Supply
μV/m	microVolts per meter
V	Volt, unit of Voltage (Electric Potential)
VA	Volt-Ampere, unit of Apparent Power
V _{AC}	Volts alternating current
VAR	Volt-Ampere Reactive, unit of Reactive Power
V _{DC}	Volts direct current
VDE	Association for electrical, electronic, and information technologies
VESDA	Very Early Smoke Detection Apparatus
V _{oc}	Open Circuit Voltage
VRT	Voltage Ride-Through
W	Watt, unit of Real Power

2.0 KEY PROJECT TECHNICAL AND OPERATING REQUIREMENTS

Seller has the ultimate flexibility to determine the size and main operational parameters of their proposed BESS system, whether as a standalone system or as a compliment to a wind or solar generating asset, in order to deliver the most value to the Owner. However, the following guidelines are offered to aid in narrowing down the range of available options related to BESS sizing, controls and capabilities to support the Seller in the proposal development process. Further technical details can be found in section 5.1.1, Table 1.

2.1 System Sizing and General Requirements

- For solar paired assets, the BESS AC power capacity base case is 25% of Solar AC rated generating capacity; Seller is free to offer additional options or variations from this base case.
- Standalone utility scale energy storage is typically a minimum of 10MW peak power and can be substantially larger. Seller to offer optimized project size.
- The base case duration is assumed to be 4-hours for all BESS systems, and they will perform energy time shifting and renewable capacity firming functions, but as elaborated below, systems will be evaluated on their flexibility to perform additional services when desired by the Owner;
- Seller can assume that the BESS will typically be cycled to a depth of discharge of 80% of the system rated dischargeable energy capacity;
- Systems should be capable of charging in various modes including constant-current, constant-voltage and constant-power;
- Systems should be capable of achieving a full state of charge at a constant power charge rate of 1.0 (CP of 1);
- For PPAs, Seller can assume that the BESS will be cycled annually at least 200 full DoD cycles. In addition, however rare, the system should be capable 1) of not cycling on some days or 2) of being called upon by Owner to continuously charge and discharge over a 24-hour period on other days.
- Although grid charging of solar paired BESS is not expected to be used during the first 5 years of operation to preserve the ITC benefit, Owner expects all BESS systems whether stand-alone or renewable energy paired storage systems to have the capability to charge from the grid.
- Typical discharge cycle:
 - June through September: 3.5-4.0 hours every evening
 - All other months: 2.5 hours in the evening ramp and 1 hour in the morning

2.2 Operating Strategy & Use Cases

- Primary:
 - The BESS should be capable of ramping toward a charge or discharge target updated every four (4) seconds by the Owner's dispatch signal. BESS shall charge and discharge when load following while also maintaining positive power flow to the POI unless explicitly directed.
 - Typical storage discharge will be used to economically balance external grid load and resources, for instance during evening (and morning) net load ramp(s). Individual batteries and subsystems will be consolidated and managed via a Battery Management System (BMS). Each BESS will have a SCADA System and Controller that receives signals from the Owner's AGC. In addition, CAISO feeds into Owner's AGC. Whether any individual BESS is following one or both (AGC/CAISO) depends on the mode /

scheduling strategy. In general, Owner wants the generating asset to have the capability to follow either; however, there will be conditions where the resource will not be dispatched in AGC.

- Secondary:
 - The Owner's four-second dispatch signals may reflect five-minute market dispatch signals from CAISO Western Energy Imbalance Market (EIM).
 - The system operator may call for up to maximum discharge for 60 minutes for contingency reserve events [several times per week] or until a battery state of charge limit has been reached [rare].
 - The BESS should respond to significant system frequency deviations with up to maximum discharge for approximately 1 minute [several times per month].
 - The system operator may call for reactive power to provide voltage support. The reactive power capabilities of PCS equipment currently on the market is sufficient to meet the anticipated need for reactive power by supporting +/- 0.95 power factor at the POI, and larger ranges may be required under certain project conditions. Reactive power studies are required to meet the LGIA requirements and project specific details will be addressed

2.3 Augmentation

- Owner will manage augmentation needs and Seller should prepare their cost proposals exclusive of the cost of future augmentation.
 - However, design and pricing must allow for the possibility of future augmentations in proposed site layouts and electrical designs for purposes of developing firm cost proposals. This means allowing for additional site area that may be required and allowing for additional MV circuits to be connected into the substation switchgear as examples. Seller can assume that up to 30% of BOL BESS capacity may be needed over the course of a project lifetime and cost proposals should be inclusive of this supporting infrastructure.
 - Owner will consider additional optional pricing from Seller that includes augmentation

2.4 Flexible Warranties

For all BTA bids, as a part of their RFP bid response, Seller is required to provide 1) a completed Appendix K General Services Contract-Operations & Maintenance Services for Project and 2) Appendix A-10 Plant Performance Guarantee/Warranties. Seller is encouraged to provide a long-term performance guarantee. Owner will require a significant amount of flexibility to operate the BESS in a manner that maximizes overall value for the company, and which may be location specific and change from year to year. Therefore, the Owner will require Seller to offer performance warranties that are flexible and allow for a variation in operating parameters. It is expected that during the RFP process, the parties will be able to develop a formula to forecast the guaranteed degradation rate for the remainder of the contract term based on actual averages and ranges (min, max) of key operational parameters. These may include:

- Constant power charge and range (e.g. CP from 0.9 to 1.1)
- Discharge rate and range (e.g. CP from 0.5 to 1.2)
- Operating temperature
- Annual number of cycles and depth of discharge
- Calendar (degradation)

2.5 Seller Responsibilities

Seller shall provide all required services and materials for the Project to achieve final completion and pass all necessary tests. Seller's responsibilities shall include all permits normally and customarily provided by Seller, design, engineering, equipment procurement, Site preparation work, foundations, installation of all equipment, bulk material and commodities supply, and Site finishing work. Seller also shall deliver project management, construction management, commissioning and startup, and testing of work, all as described herein, including all referenced appendices and standards, which will subsequently become a part of the build transfer agreement.

Seller shall construct all roads, foundations, electrical systems, control systems, monitoring systems, communications, ancillary structures, storage facilities, security systems, and fencing. Seller shall also erect and commission the BESS in the locations and orientations set forth in a proposed site plan and site layout drawing and in accordance with this specification, and all related specifications that relate thereto.

2.6 Conditions of Services

The BESS consists of all the direct current (DC) components from the BESS modules through the PCS plus the MVT. The BESS shall be "Utility Grade" (defined later in this Technical Specification). The balance of the Project (from the output of the PCS to the point of interconnection as defined in the LGIA shall comply with this Technical Specification and be compatible with applicable Owner standards and LGIA requirements. The balance of plant items include but are not limited to:

- Wiring, conduit, trenches and grounding
- Switchgear and current limiters
- Metering, as shown in the LGIA.
- Transformers
- Power poles
- Equipment pads
- Communications to Owner equipment.

The Project shall be designed to maintain the guaranteed performance metrics presented in this Technical Specification. The Project is limited to the use of electrochemical energy storage and PV technologies that have demonstrated appropriate technical and commercial maturity. The Project should include BESS equipment capable of exceeding the technical and operating needs of Owner.

The Project shall include full provisions for training, operation and maintenance of the Project and all associated equipment.

2.7 Preferred Main Supplier List¹

¹ BTA and Benchmark supply contracts shall be subject to prohibited vendor and supplier audit provisions. For more information, see Section 3.2.18 (Prohibited Vendors), and Section 3.2.19 (Supply Chain Audit) of the pro forma contracts in Appendix E-2.1: https://www.pacificorp.com/content/dam/pcorp/documents/en/pacificorp/suppliers/rfps/pacificorps-2022-all-source-request-for-proposals/appendix-e-g/PacifiCorp_2022AS_RFP_App_E-2.1_PPA_Document%E2%80%93Generating_Resource_Only.pdf

This section contains a list of preferred materials and equipment suppliers. In the event that Seller is considering the selection of a material or equipment supplier, that is not listed herein, Seller shall request approval from Owner prior to executing any contract for the procurement of such material or with such equipment supplier. Equipment catalog cut sheets shall be submitted for Owner review and approval prior to procurement.

2.7.1 Preferred cable suppliers:

- Prysmian/General Cable
- Southwire
- Okonite

2.7.2 Preferred junction box suppliers:

- Hubbell (Trinetics)
- SolarBos

2.7.3 Preferred pad-mount transformer suppliers:

- Cooper-Eaton
- General Electric
- Howard
- Virginia Transformer

2.7.4 Preferred 34.5-kV disconnect switch suppliers:

- Cleveland / Price
- Morpac
- Roya.
- Southern States
- USCO

2.7.5 Preferred 34.5-kV circuit breaker suppliers:

- ABB (with spring/hydraulic mechanism)
- Siemens
- EMA

2.7.6 Preferred grounding rod suppliers:

- Blackburn
- Weaver

2.7.7 Preferred cable splice suppliers:

- 3M

2.7.8 Preferred fault indicator suppliers:

- Schweitzer

2.7.9 Preferred compression connection suppliers:

- Burndy
- CMC
- Polaris Connectors

2.7.10 Preferred Power Conversion System suppliers:

Sungrow

- SMA
- TMEIC
- Power Electronics
- Parker

2.7.11 Preferred Battery Suppliers

LG Chem

- Samsung
- Tesla
- CATL
- Toshiba
- Panasonic

3.0 STUDIES

3.1 Grounding System Study

Seller shall perform studies to determine the parameters for the Project's grounding system in WinIGS, CDEGS or equivalent. Acceptable solutions shall conform to Owner's Standard #10. In addition, Seller shall meet all safety requirements for step and touch potential plus all requirements from the LGIA.

3.2 Electrical System Studies

Seller shall prepare electrical system studies as required to configure the Project and to determine control response and settings. Seller shall develop a positive sequence power flow model and a dynamic model in the latest version of PSSE or equivalent software as required by the grid operator at the point of interconnect. The short circuit and arc flash models and reports will be made in SKM and be made available for Owner's use. Seller shall include in their harmonic study, the harmonic profile of the project in the interconnection requirements. Electromagnetic Transient modeling shall be performed in PSCAD. Studies shall be provided in sufficient detail to demonstrate the functionality as described in this Technical Specification and shall be completed prior to the commencement of detailed design and identified in the project schedule. These system studies shall be updated/as-built with final system design changes and provided to Owner at the end of the Project. These studies, at a minimum, shall address and solve the following concerns:

- Harmonic analysis of the proposed system.
- Minimum system requirements and configuration for proper operation of the BESS (i.e., requirements to stabilize a self-commutated power conversion system [PCS]).
- Minimum spacing requirements between equipment to maintain safe energization and maintenance conditions.

- Battery degradation and expected power output at end of life of the BESS.
- Charge and discharge curves of the project for potential tie into other renewable systems
- Requirements for Volt-Ampere Reactive (VAR) support, peak shaving, battery charging and other support services as described in this Technical Specification.
- Safety requirements for operation compliance with applicable codes and standards.

3.3 Required Dynamic Models

3.3.1 Frequency Models

- Seller shall prepare individual models of the fundamental positive sequence behavior of the BESS.
- Owner shall be provided PSSE models in the version required by the interconnection authority that accurately represent the control characteristics and dynamic behavior of the BESS in response to balanced voltage and frequency disturbances. This model shall be provided with all available information once the 60% design is complete and refined to reflect the final design configuration at IFC.
- Fully detailed equivalent models are required; generic models from the WECC approved model library are preferred if they can accurately model the BESS behavior in response to voltage disturbances and system frequency disturbances.
- The PSSE models shall be validated for accurate representation of disturbances that are within the model's appropriate range of application, using a validated electromagnetic transient model or full-scale testing.
- The PSSE models shall be fully documented.
- The PSSE models must be non-proprietary and shall be accessible to other utilities, system operators, asset owners, and other entities associated with the interconnection.
- The PSSE models shall be updated by Seller prior to any change to the inverter controls or control parameters that affect the dynamic performance.
- Seller shall ensure compatibility of the provided PSSE models with the version of PSSE that Owner utilizes at the start of commercial operation. Upgrades and modification of the models to maintain compatibility with ongoing PSSE versions shall be the responsibility of Seller over the lifetime of system performance.

3.3.2 Model Inputs

The PSSE model should reflect the current design of the power plant and a general network equivalent or detailed network, depending upon interconnection study requirements.

3.4 Electrical Design Parameters

For design purposes, the power system characteristics, at the Project location, and for which the BESS will be required to provide rated output, shall be considered are as follows:

- The nominal power at the POI will be defined by the Seller and duration for the base case is planned at four (4) hours
- Maintain frequency and voltage within the utility set limits
- Supply required real and reactive power at a power factor range set by the utility

In addition, the BESS will be required to operate, without damage, with voltage and frequency ride through characteristics as specified in the LGIA.

3.4.1 Grounding

A suitable equipment grounding system shall be designed and installed for the Project. Seller will be responsible for providing an effective grounding mechanism. Seller shall provide detailed information (such as ground-grid drawings and calculations) for all Project grounding. Seller is responsible for designing and providing the Project system grounding and equipment grounding. The Project grounding system shall provide personnel protection for step and touch potential in accordance with Institute of Electrical and Electronics Engineers (IEEE) 80. Equipment and systems not covered by IEEE 80 shall comply with grounding requirements of National Electrical Code (NEC) 2017. The system also shall be adequate for the detection and clearing of ground faults. The Project grounding system shall be reviewed and approved by Owner.

All exposed non-current carrying metal parts shall be solidly grounded. Particular attention shall be given to prevention of corrosion at the connection of dissimilar material such as aluminum and steel.

All ground conductors shall be stranded copper and may be bare if exposed. Ground conductors in conduits shall be green-insulated. Ground lugs shall be mechanical and rated aluminum to copper. All below grade connections shall be exothermic welds. Step-up transformers and inverters and the Project switchgear shall be bonded to the ground ring at opposing corners of the equipment. Mounting structures shall be grounded in a manner that is sized for maximum available short-circuit current and lightning current (if required).

Seller shall submit to Owner grounding and lightning calculations for assurance of safe step and touch potentials on the Site, in accordance with Owner's standards. Seller shall conduct a ground resistivity test to verify that the grounding system meets minimum requirements for the overall grounding scheme. Interior fencing (including without limitation internal fences around interconnection equipment and inverters) shall be installed and grounded and substation grounding shall be done in accordance with Owner's Standards and Specification, Appendix A-7.11. Fencing around the perimeter of the overall Project Site shall not need to meet the aforementioned Handbook standards but shall be grounded in accordance with local codes. Perimeter fences shall be at least 30 feet from the fence around the interconnection equipment. A ground grid meeting the requirements of IEEE 80 shall be installed in the area of the interconnection equipment.

3.4.2 Bird and Animal Protection

Bird and animal protection at the Project Substation shall be provided following Owner Standards referenced in Appendix "A-7".

3.4.3 Control and Instrumentation Cabling

All cabling shall be new and continuous for each run; splices are generally not acceptable. On a case by case basis, splicing may be reviewed and approved by Owner. All conductors shall be copper. All cabling, which may be exposed to mechanical damage shall be placed in conduits, wireways, overhead trays, or other enclosures suitable to Owner. All below grade runs shall be in buried conduit unless proximity to a roadway requires concrete duct bank. Alternating Current (AC) and DC circuits shall be installed in separate conduits. Wires shall have identifying labels or markings on both ends. The labels shall identify the opposite end destination.

Control and instrumentation wiring shall be separated from power and high voltage wiring by use of separate compartments or enclosures or by use of separate wireways and appropriate barrier strips within a common enclosure according to the National Electric Code (NEC) or governing standard.

BESS control and instrumentation system wiring shall be bundled, laced and otherwise laid in an orderly manner. Wires shall be of sufficient length to preclude mechanical stress on terminals. Wiring around hinged panels or doors shall be extra flexible (Class K stranding or equivalent) and shall include loops to prevent mechanical stress or fatigue on the wires.

The instrumentation and control cable shields, where applicable, shall be multi-point grounded.

Wiring to terminal blocks shall be arranged as marked on wiring diagrams. Terminal groupings shall be in accordance with external circuit requirements.

Raceway and cable systems shall not block access to equipment by personnel.

3.5 Permitting

Seller shall apply for and obtain all permits and authorizations necessary for construction of the Project. Copies of all applicable permits shall be provided to Owner within five business days after they are obtained or completed. Seller shall provide a permit matrix to Owner for approval.

3.6 Audible Noise

The maximum sound level generated from the BESS and any associated equipment supplied by Seller under any output level within the Project operating range, shall be limited to the maximum allowed dBA level in any direction from the facility fence or building exterior or as required by local or State ordinances. Seller shall comply with all ordinances and regulations that may apply to the BESS installation as determined by the local building codes. Results of noise studies shall be provided for major equipment such as HVAC and PCS units.

Noise produced by the Project and any associated subsystems shall be designed and furnished such that the ambient noise level in the BESS control room, or any typically occupied area with applicable standards in a building shall not exceed 50 dBA.

3.6.1 Compliance Measurements

Seller shall make audible noise measurements before and after commissioning of the Project to verify compliance with the requirements. Seller, immediately upon notification, shall correct any noncompliance. The corrections may include replacement of equipment that is causing noncompliance. Seller shall make these corrections at no cost to Owner. If equipment and facilities must be removed from service, this period will be counted as outages towards the availability guarantee period. The measurements shall be made at three or more selected locations outside the building or facility fence

using a Type 1 sound level meter that complies with the requirements of ANSI S 1.4 “American National Standard Specification for Sound Level Meters.”

3.7 Broadband Interference

Seller shall take necessary precautionary measures to ensure that there will be no missed operation, damage or danger to any equipment or system due to broadband interference and effects. The broadband interference includes:

Radio Interference	
AM Band	535 – 1,605 kiloHertz (kHz)
FM Band	88 – 108 MegaHertz (MHz)
Television Interference	
Low VHF Band	30 - 72, 76 - 88 MHz
High VHF Band	174 - 216 MHz
UHF Band	450 - 512 MHz
UHF Band	470 - 806 MHz
Microwave Communication	5.8 – 7.2 GigaHertz (GHz) 10.7-11.7 GHz 22.5-23.6 GHz
Wireless Communication	
Cellular Phone	750 - 790 MHz
804 - 894 MHz	
Supervisory Control and Data Acquisition (SCADA)	941 - 960 MHz
Personal Communication Systems	1.80 - 2.00 GHz

Interference to any radio service that requires a license, FCC licensees, military radio frequencies or medical devices is prohibited.

3.7.1 Radio Interference

Seller shall ensure that the Project does not degrade radio reception. The radio interference level along the perimeter of the property shall not exceed 100 microvolts per meter ($\mu\text{V}/\text{m}$) between 0.5 kHz and 30 MHz along a contour of 1,500 feet surrounding the energized Project equipment. This contour ends 500 feet from the energized lines where it tapers to a constant 100 feet from the outermost phase of the distribution lines.

3.7.2 Television Interference

Seller shall ensure that the Project and related equipment does not generate any discharge sources that could degrade television reception. Seller shall take all necessary action to ensure that television reception is not adversely affected.

3.7.3 Wireless Communication Interference

Seller shall ensure that there are no discharge sources from the Project and related equipment that could cause interference with wireless communication systems. Seller shall take all necessary action to ensure that cellular and PCS communication is not adversely affected.

3.7.4 Microwave Interference

Seller shall furnish information concerning any potential interference sources and levels that might emanate from the Project and related equipment that could adversely affect microwave communication. Seller shall take all necessary action to ensure that any microwave system is not adversely affected.

3.7.5 Compliance Measurements

Seller shall make measurements before and after commissioning of the Project for the purpose of verifying compliance with the requirements listed above. Seller, immediately upon notification, shall correct any noncompliance. The corrections may include replacement of equipment that is causing noncompliance. Seller shall make these corrections at no cost to Owner. If equipment and facilities have to be removed from service, this period will be counted as outages towards the availability guarantee period.

A reasonable effort shall be made as the frequency spectra are being obtained to determine the source(s) of the interference at various frequencies. Seller shall perform measurements in such a way as to identify the source of the interference being measured across the frequency range in order to determine if the Project complies with this Technical Specification.

All broadcast signals, radio noise, television interference and broadband interference measurements shall be made with instruments that comply with ANSI C63.2, "American National Standard for Electromagnetic Noise and Field Strength Instrumentation, 10 Hz to 40 GHz - Specification." IEEE Standard 430, "IEEE Standard Procedures for the Measurement of Radio Noise from Overhead Power Lines and Substations" defines the measurement procedures that shall be used.

Radio signal strength shall be measured using instruments with average detectors. Radio noise measurement shall be in quasi-peak levels for AM band and peak levels for FM band. Measurements shall include at least three complete frequency scans at selected locations around the perimeter of the property line. The average values for these measurements shall be reported for each location and radio station frequencies including 1.0 MHz.

- 1) AM broadcast radio signals from 535 to 1,605 kHz above 100 μ V/m shall be measured using a calibrated loop antenna with an instrument that has either an average or root mean square (rms) detector at three selected locations along the 1,500-foot contour line around the BESS and at one or more locations down the distribution lines along the constant 100-foot contour line. The measured radio signal strengths shall be reported along with their call letters and their frequency. Signal-to-noise ratios will be calculated for each measured radio signal. The antenna shall be oriented for maximum pick up of the broadcast signals.
- 2) Radio noise shall be measured from 500 kHz to 30 MHz using a calibrated loop antenna with an instrument that has both an average (or rms) and a quasi-peak (QP) detector at three selected locations along the 1,500-foot contour line around the Project and at one or more locations down

the distribution lines along the constant 100-foot contour line. The antenna shall be oriented for maximum pick up of the noise.

- 3) Television and FM broadcast signal strengths, over the frequency ranges specified above, shall be measured using calibrated broadband antennas appropriate for the frequencies being measured and with an instrument that has an average (or rms) detector at three selected locations along the 1,500-foot contour line around the Project and at one or more locations down the distribution lines along the constant 100-foot contour line. The measured radio and television signal strengths shall be reported along with their call letters and their frequency. Signal-to-noise ratios shall be calculated for each measured FM radio and TV signal. The antenna(s) shall be oriented for maximum pick up of the broadcast signals.

VHF and UHF broadband interference shall be measured over the frequency range of 30 to 2,000 MHz using calibrated broadband antennas appropriate for the frequency range with an instrument that has both an average (or rms) and a QP detector at three selected locations along the 1,500-foot contour line around the Project and at one or more locations down the distribution lines along the constant 100-foot contour line. The antenna shall be oriented for maximum pick up of the noise.

4.0 DESIGN, FABRICATION AND CONSTRUCTION REQUIREMENTS

4.1 General

Seller shall supply the complete permitting, design, engineering, procurement, installation, construction, commissioning, start-up, and performance verification of the Project and LGIA systems for the commercial operation of the Project.

The Project design and construction shall comply with all current local, state, and federal regulations, codes, and applicable standards. The Project fire protection system shall also comply with Owner's insurance requirements.

All equipment supplied shall be designed to ensure satisfactory operation under the specified site temperature conditions and other atmospheric and environmental conditions prevailing at the site.

All equipment, components, and materials shall be new and free of defects in material or workmanship.

Seller shall verify all information provided by Owner, Owner's Seller, and third-party suppliers prior to incorporating the information into Seller's design.

4.2 Building, Structures and Systems

Seller's scope includes but is not limited to providing the following:

- All site preparation including any necessary civil work.
- Site Storm Water Pollution Prevention Plan (SWPPP).
- The BESS will be fully contained in weatherproof, environmentally conditioned enclosure(s) or building.
- Supports and foundations for all buildings, enclosures, structures, transformers, switchgear, conduit, and overhead cabling.

- Battery cells/modules, battery management system, racks, bus bars, and all necessary electrical and battery equipment necessary for a fully functioning BESS to be housed in modular containers or in a dedicated building. The BESS must be appropriately sized for all necessary augmentation to maintain rated capacity through the required Design Life of the facility based on the use cases and conditions contained in these Technical Specifications.
- All Project Balance of Plant components.
- DC system with voltage sources and panel boards for communications networks and relay protection equipment.
- An uninterruptible power supply (UPS) system for Project control and protection systems and communication equipment to provide orderly shutdown in the event of loss of all auxiliary power.
- Power conversion systems.
- Project related medium voltage (MV) terminations, duct banks and cable routing and collection bus connections including but not limited to AC panel boards, circuit protection, and backup distribution sources with necessary isolation/step-down transformers.

The BESS building/enclosures or components within them shall adequately contain both normal and failure conditions of its constituents with respect to toxic or hazardous substances. Appropriate alarms shall annunciate locally and remotely when hazards are exposed including corrosive or toxic electrolyte/electrodes or fumes and secondary containment means shall be provided if such hazards occur.

Seller shall provide comprehensive safety data sheets (formerly called MSDS) in the new Global Harmonized System (GHS) format as a written chemical inventory of every hazardous chemical in the Project to which employees are exposed. Further, Seller shall be responsible for:

1. Developing and maintaining a hazard communication program detailing the plans in place for safe handling and storage of all chemicals used in normal operations and repair of the Project.
2. Maintaining proper SDS labels and warning signs associated with these same chemicals.
3. Training Owner employees on Project chemical hazards and use of necessary personal protection equipment and precautions as part of the turnover exercise.

Should any of the components within the Project require an operating environment less severe than the site environment, the Project shall provide appropriate conditioning of the enclosed space.

All portions of the Project must be sufficiently hospitable to installation, inspection, and service personnel to not restrict the performance of those duties. The Project is to be automated with no operator presence required.

Seller shall provide a description of any processes special to the de-commissioning of the Project. Seller shall include descriptions for configuration to begin disassembly, making the energy storage components safe at all times, disconnection and disassembly sequence, and packaging/handling/shipping requirements of the BESS. This is not required for the electrical equipment common to commercial/industrial/utility power systems unless directly related to handling of the energy storage components.

4.2.1 Engineering Services

Seller shall design and engineer the Project in accordance with prudent utility practices, with the professional standards, skill, expertise, and diligence of design and construction of professionals regularly involved in utility-grade, utility-scale, grid-connected BESS projects for electric utilities in the United States. The design must conform to the requirements and conditions of all applicable permits and laws, be in compliance with the operating guidelines, and meet Owner specifications.

Seller is responsible for all engineering for the Project. All design drawings, specifications, and calculations shall be signed by a professional engineer-of-record registered in the state or jurisdiction of the project. Seller shall submit to Owner all completed design drawings, data, and documents for review and comment. These engineered design drawings, data, and documents must be submitted to Owner for review and comment before construction is to begin.

Seller is responsible for ensuring that all components are installed above the 100-year flood plain (battery system, PCS, SCADA system, Security System, control building, transformers, etc.).

Any third-party study or independent engineering reviews (such as the geotechnical study) shall be provided to Owner.

4.2.2 Construction Services

Prior to beginning construction, Seller shall provide a comprehensive onsite construction management plan in accordance with all applicable laws and policies and Health, Safety, and Environmental Plans of Seller and if work is performed on Owner property, meet all safety program requirements of Owner including Appendix A Contractor Health Safety and Environmental Requirements, Appendix A Contractor Safety Plan Requirements, and all changes to applicable law and Owner policies. No later than 30 days prior to initial site mobilization, Seller shall prepare and submit such Plans to Owner. Seller shall also provide Owner with an evaluation and appropriate documentation of the safety record for any licensed Subcontractor that will be performing work on the Project. Seller and subcontractors must register with and be approved by ISNetworkworld or equivalent. The comprehensive onsite construction management plan will clearly establish Health, Safety, and Environmental goals for the Project.

Seller shall assemble, construct, and install with its own labor forces and/or with Subcontractors labor, tools, and equipment necessary to complete the Project, including but not limited to the following Works:

- Site preparation, site grading, site improvements, stormwater management facilities and removal of excess debris.
- DC cabling and junction boxes.
- AC trenching and cabling.
- Inverters, switchgear, and transformers and accompanying supports and/or concrete pads.
- Perimeter security fencing (described in Sections 6.13.3 and 6.3 Project Security).
- Security lighting.
- Installation of the monitoring system and revenue grade metering.

Seller shall provide all utilities necessary during construction, including but not limited to electricity, portable water, sewer/toilets, fuel and communications. Seller shall be responsible for all costs associated with construction power. Seller shall be responsible for removal of all trash and construction debris. Seller shall be responsible to provide its own job trailers, and other temporary facilities for its employees.

4.2.3 Quality Assurance/Quality Control Requirements

Seller shall submit a Quality Assurance/Quality Control (QA/QC) Plan for the proposed project delivery. The QA/QC Plan shall define the systems and procedures which will be used by Seller to ensure that the Project will comply with the requirements detailed in this Technical Specification in addition to any other standards and policies determined by Owner.

Seller shall submit to Owner a copy of its QA/QC Plan for review not later than 45 days after contract execution for Owner review and comment. The Project shall be managed in accordance with the program.

The QA/QC Plan shall include, but is not limited to, such procedures and systems as the following:

- Road construction and compaction.
- Reinforcing steel and conduit placement.
- Concrete placement and testing.
- All wire insulation testing—Megger testing or very low frequency testing.
- Factory testing of batteries, PCS and transformers by the manufacturer.
- Fuse tests.
- Terminations pull testing
- All visual inspections
- Grounding continuity testing
- Earth-ground resistivity testing
- BESS inspection and manufacturer documentation of factory test per the manufacturer's existing program
- Metering and instrumentation calibration testing
- SCADA indication, control and operator interface verification
- Step-up transformer testing
- Weld testing for transformer support including other anchorage
- Weld testing for racking supports
- Inverter phase rotation and matching with utility
- Protective relay settings
- Verification of security camera system operations, including device points, sequences, and communications
- Other Seller-prescribed procedures

All onsite QA/QC testing procedures shall be witnessed and documented by a qualified representative of Seller. Owner shall observe and witness QA/QC as necessary and at its discretion. A qualified engineer of Seller shall date and sign documentation indicating completion and acceptance of each onsite QA/QC test procedure.

4.3 Storage of Materials and Equipment

Prior to the arrival of equipment and materials at the Site, Seller shall install a fenced, secured area and provide security for the storage of such equipment and materials. Seller shall notify Owner of the location and layout of intended staging areas, parking areas, storage areas, office areas, workshops, and other temporary facilities. Temporary construction roads and staging areas not converted to permanent roads (if any) shall be restored in accordance with all permit requirements.

Seller shall be responsible for receiving, protecting, moving and storing all material at the Site in a secure manner and a manner that maintains temperature control for battery cells and modules required under warranties. Climate controlled facilities should be constructed before battery modules arrive on site as well as other OEM recommended requirements to guarantee temperature controls are maintained for cells so that warranties are not violated.

4.4 Equipment

As described in detail throughout this document, Seller shall purchase and furnish to the Site all material required to complete the Project, including but not limited to, the following material:

- Miscellaneous steel
- Components (nuts, bolts, clamps, etc.)
- BESS
- PCS
- DC cabling
- AC cabling
- Electrical switchgear
- Transformers
- Remotely accessible data acquisition system
- All materials related to drainage and access roads required by the civil engineering plan
- All electrical conduit and junction boxes
- Concrete equipment pads
- Fencing, gates, lighting, security cameras, and security camera recording equipment
- Communications infrastructure

Each item of equipment to be supplied by Seller shall be subject to inspection and testing during and upon completion of its fabrication and installation as per Owner's LGIA requirements for distribution systems (34.5 kV and below).

Installed equipment and materials shall be new, of good quality and suitable grade for the intended purpose, and not a lower grade or quality than specified in the design and engineering plans or in manufacturers' recommendations. Utility-grade equipment shall be used. Commercial- or residential-grade equipment shall not be acceptable. No equipment shall utilize polychlorinated biphenyls (PCBs).

Seller shall provide a Spill Prevention Control and Countermeasures plan and provide secondary containment where required and to prevent accidental discharge of chemicals. Seller shall provide a list of all major equipment to be purchased, constructed, and installed as part of the Project. The list shall identify both the items and quantities.

4.5 Power Conversion System (PCS)

The PCS is the interface between the DC battery system and the AC system and provides for charging and discharging of the battery and may consist of one or more parallel units. The PCS shall be designed to have Design Life as listed in Table 1.

4.5.1 PCS Requirements

The PCS shall be a smart static device (charger and inverter) using solid-state electronic switch arrays in a self-commutated circuit topology. Line-commutated systems or systems that require the presence of utility voltage or current to develop an AC output are not acceptable. Only commercially proven switch technology and circuit designs are acceptable.

The PCS, in conjunction with the BESS Master Controller, shall be capable of completely automatic unattended operation, including self-protection, synchronizing and paralleling with the utility, and disconnect functions.

The control of the PCS shall be integrated with the overall BESS Master Controller. A proven and established combined instrumentation and control system shall be provided for the BESS SCADA System. Each SCADA system shall feed into a central controller that shall be the primary interface with the Owner's controls and shall be compatible with the utility's existing SCADA system.

The PCS also shall include all necessary self-protective features and self-diagnostic features to protect itself from damage in the event of component failure or from parameters beyond safe range due to internal or external causes. The self-protective features shall not allow the PCS to be operated in a manner that may be unsafe or damaging. Faults due to malfunctions within the PCS, including commutation failures, shall be cleared by the PCS overcurrent protection device(s).

One purpose of the Project is to assist Owner in responding to abnormal utility system conditions. Therefore, Seller shall design the PCS, including its controls, power supplies and connections to sensors, to be immune from utility system voltage and/or frequency transients and similar events. Further, the PCS shall be capable of operating continuously at rated output under the normal voltage and frequency ranges and providing full output for the required operating modes specified.

All PCS components shall be designed to withstand the stresses associated with steady state operation, transient operation and overload conditions as implied by this Technical Specification. Seller shall be responsible to demonstrate that all relevant aspects of overvoltage stresses have been considered.

The PCS shall be housed in a separate room or enclosure within the BESS structure, with provisions to prevent moisture condensation and entrance of rodents, insects, and/or similar material into air intake/exhaust ports or any required structure penetration.

The PCS system shall include provisions for disconnection on both the AC and DC terminal, for maintenance work. Conductor separation must be clearly visible; flags or indicators are not acceptable. These disconnects shall be capable of being locked open for maintenance work. PCS capacitors shall be provided with bleeder resistors or other such means of discharging capacitors to less than 50 V within one minute of de-energization.

An interlock system shall be provided for access to the PCS room or enclosures if live parts are exposed when opened. A visible disconnect switch or draw-out breaker and grounding devices shall be provided for maintenance of the PCS equipment. The interlock system shall prevent access to the PCS equipment until the AC and DC circuit breakers or disconnect switches are open and the PCS bus is grounded.

4.5.2 Interference and Harmonic Suppression

The PCS shall not produce Electromagnetic Interference that will cause interference with instrumentation, communication, or similar electronic equipment within the Project or on Owner's system. The PCS shall be designed in accordance with the applicable IEEE standards to suppress Electromagnetic Interference effects.

The BESS must meet the harmonic specifications of IEEE 519 and Owner's power quality standards. Harmonic suppression may be included with the PCS or at the Project AC system level. However, Seller shall design the Project electrical system to preclude unacceptable harmonic levels in the Project auxiliary power system.

Seller shall perform studies to determine required AC harmonic filter types and ratings if filters are required to meet the harmonic specifications. In addition, these studies shall be used to demonstrate that the AC filters do not cause any resonance with Owner's power system and that the harmonic distortion limits can be met by the filters designed by Seller. Seller shall design the Project to be completely compatible with Owner's existing capacitor banks and their associated controls. Owner will not be required to change or modify the existing system to accommodate the Project. However, actual compliance will be based on field measurements after commissioning.

4.5.3 PCS Cooling System

The purpose of the PCS cooling system is to remove the heat produced by the PCS operation and transfer this heat to the outside ambient air or to be used as auxiliary heat for the building or enclosures as appropriate.

Either water cooled or air-cooled systems are allowed. However, the final rejection of waste heat shall be to the outside ambient air. No discharge of cooling system water shall be allowed. The cooling system shall be furnished complete with all necessary equipment and facilities, including, but not limited to, interconnecting piping, ductwork, circulating pumps, blowers, heaters, make-up reservoirs, heat exchangers, filters, water treatment plants, instrumentation, automatic controls, alarms and control power.

The cooling system shall be designed such that the failure of any single component of the cooling system will allow the Project to continue to operate at full capacity. All joints and gaskets are designed for high reliability and to comply with seismic requirements.

The cooling circuit for water cooling systems shall be a closed loop de-ionized water or water/glycol mixture recirculating system. Each loop and each branch shall have manual valves to isolate it from the rest of the system without disrupting the operating loop. If a water/glycol system is proposed, Seller shall prepare a Spill Prevention Control and Countermeasures plan and provide secondary containment for accidental discharges of the mixture.

The high purity (high resistivity) water (if used) in the closed loop system shall be circulated through the heat producing electrical equipment at a constant flow rate. A purifying loop to maintain the high purity in the closed system shall be provided.

Seller shall determine the source of the water supply for cooling system make-up water and obtain water service if required.

Non-recirculating (once-through) or recirculating air systems may be proposed, depending on the requirements of the PCS selected by Seller. If a recirculated air system is used, a heat exchanger shall be provided. If a non-recirculated (once-through) air system is used, a two-stage air filtering system shall be provided. The air handling systems shall include filtering which is adequate to keep dust from the interior of the PCS system.

Since the energy to heat or cool the building or enclosures and Project efficiency will be used in the life cycle cost evaluation, Seller is encouraged to provide the most efficient HVAC systems, including auxiliary heat recovery subsystems that are practical.

4.6 Step-Up Transformers

Transformers shall meet transformer efficiency standards. A transformer shall be used by Seller to match the secondary voltage of the PCS to the distribution system. The intermediate output(s) may be at any Seller determined AC voltage.

The transformer may be configured with any Seller specified winding configuration. However, it should be noted that the LGIA requires a grounding transformer to provide a source for ground fault current if the step-up transformer winding configuration does not provide a grounding source on the high side of the transformer. If a grounding transformer is required due to the Seller provided step-up transformer design, the grounding transformer shall be designed, provided and installed by Seller.

Transformers shall be rated for inverter source operation and the environment in which they will operate. The transformer shall be supplied with a no-load tap changer with high-voltage taps capable of operating at 2.5 percent above and below nominal voltage at full rating. The transformer shall be supplied with a disconnect switch on the transformer high-voltage side to isolate the transformer once de-energized. The switch/transformer configuration shall be designed for loop feed. Transformers shall be either dry-type, or oil filled, FR3 or equivalent is not acceptable. Enclosure finish shall be a top powder coat that is designed for a 20-year service life. Seller shall provide and install step-up transformers as provided in the Agreement. Owner shall reserve the right to attend factory witness testing of step-up transformers.

For interconnection to the Transmission Provider's system Seller shall provide equipment and installation in compliance with the requirements of the Large Generator Interconnection Agreement and Owner's Standards and Specifications.

The transformer may be used to aid in harmonic cancellation. If the transformers are a liquid-filled type, Seller shall provide an adequate oil containment system, subject to Owner's acceptance. PCBs shall not be used. Seller shall provide a SPCC if transformers are liquid-filled type.

4.7 Revenue Meter

Seller shall provide design inputs to a revenue metering system. Design shall be consistent with requirements as per LGIA.

The metering system design shall adhere to the requirements of Transmission Provider's revenue metering specifications. A bi-directional revenue grade meter shall be installed at each location specified above to measure the energy (kWh) generated by the Project and each generation source. The revenue grade meter shall be American National Standards Institute C12.20 0.2 percent Class Underwriters Laboratories, Inc. (UL) listed, ISO9001 certified, which is accepted by all authorities requiring revenue grade. The meter must have a display for easy reading of current power generation and lifetime generation and shall be compliant with Western Renewable Energy Generation Information System certification requirements for Renewable Energy Credit sales or trading. The Transmission Provider will procure, install, test and own all revenue metering equipment. Seller shall coordinate with the Transmission Provider for the installation.

4.8 Project Switchgear

Switchgear shall be in a National Electrical Manufacturers Association (NEMA) 4 lockable enclosure if located outdoors. Switchgear shall include an auxiliary compartment containing all instrument transformers associated with the protective relays shown in the one-line diagram(s). The protective relay system shall be specified, designed, and installed in accordance with interconnecting utility's requirements. Switchgear monitoring and communication hardware shall be included to meet the requirements of Section 4.7 Revenue Meter and Section 7.0 Supervisory Control and Data Acquisition, and the metering requirements of Owner. Relay current transformers shall be C400 accuracy class at a minimum unless a higher class is required due to saturation current per IEEE C37.110.

Medium-voltage protective device selection and relaying should be based on the use of Schweitzer Electric Laboratories (SEL) relays or approved other, as required and specified in the LGIA.

In general, the interconnection design and components should meet the requirements of the Transmission Provider and the LGIA (including the necessity of a grounding transformer if required).

MV switchgear shall be arc resistant type.

4.9 Protection Requirements and Relay Settings

A complete protective relaying system shall be provided for the PCS and transformer(s) as stated below:

- Inverters equipped with internal relays with 27, 59, 81U/O and voltage-controlled overcurrent 51C functions shall be provided with one utility grade relay with 27, 59, 81 U/O and 51C functions as secondary protection. Otherwise, two utility grade relays and one Owner-designated interrupting device shall be installed to meet the protection requirements.
- Protective relays shall be hardwired to the device they are tripping.
- Interconnection interrupting devices shall have DC trip coils and tripping energy shall be derived from Seller supplied battery separate from the BESS main batteries.

- Owner will review Seller’s relay settings and their calibration and test results of those relays to satisfy Transmission Provider’s protection practices.
- Seller shall provide phase and neutral overcurrent protection for the PCS transformer(s).
- Protective relays shall have backup power of 125 V_{DC} system supplied by station batteries.
- Relay settings files are to be included following the completion of the IFC design package.

Seller shall use microprocessor type protection equipment compatible with Transmission Provider’s relay protection schemes to the extent possible.

The protective relaying and metering shall be integrated with the Project control system and communications channel to the Transmission Provider’s SCADA system. However, integration into the Project control system shall not circumvent normal protective relaying functions nor shall any protective relay or revenue metering values be used for control within the project control system. The control system for the BESS and PV systems may use metering values from the revenue meters through a DNP 3.0 link if desired. These values may only be used for indication within the project control system. Metering, separate from revenue metering and protective relays, may be installed for any control purposes at Seller’s discretion.

4.10 Points List

The points list shall be included as a deliverable in spreadsheet form. The Master Points List is to include all equipment connections to stakeholder devices including, but not limited to:

- BESS equipment
- Utility
- IEDs
- Reliability entity (ISO)
- Transformer monitoring and control
- BOP SCADA

4.11 Auxiliary Power

Primary AC station service shall be provided from the low voltage side of the Project PCS transformer bus. If required by Seller’s design, back-up station service shall be provided by a Seller specified means. All facilities required to provide primary and back-up station service to the Project and building, including auxiliary power transformers, transfer switches, protection and distribution panels shall be Seller’s responsibility.

In the event of a loss of the Auxiliary Power connections to Project, primary and/or backup station service may or may not be available. Back-up UPS to power Project controls, pumps and auxiliaries in the event of a total failure of the primary and back-up station service feeds shall be provided for orderly shutdown. The UPS shall be separate from the BESS main battery system and sized for an orderly shutdown of the Project for a loss of station service with the UPS at 80% rated capacity. The UPS shall be housed in a separate location from the BESS main battery to facilitate ease of maintenance.

All auxiliary DC station service requirements for the BESS shall be designed, engineered, furnished and installed by Seller. 125 V_{DC} shall be used for protective relay power.

4.12 Civil/Structural

Seller shall design all systems and site improvements in accordance with applicable codes and standards. Seller shall design necessary road improvements to meet state and local transportation codes and meet or exceed requirements presented by construction equipment, delivery vehicles, and operation and maintenance traffic. All BESS and PV equipment, building or enclosure foundations and structures shall be engineered by or under the direct supervision of a qualified professional engineer or architect registered in the state of the project as applicable. All final (Issued for Construction) drawings, specifications and calculations shall be wet-stamped by Civil/Structural Engineer or Architect registered in the state of the project as applicable. All stormwater calculations and design documents shall be overseen, signed and sealed by a Civil Engineer or Landscape Architect familiar with local codes and requirements, and registered in the state or jurisdiction of the project. All design shall be in accordance with seismic design requirements as specified elsewhere in this Technical Specification, and by the Seller provided geotechnical study.

Seller shall gain access to the site from existing public and private roads. Existing roads shall not be blocked or restricted without prior approval of Owner and local agencies. Seller shall be responsible for damage to public roadways resulting from the work performed. Seller shall also be responsible for the facilities access road's preparation/interconnection with the main road.

Seller shall perform required Site preparation, to include earthworks, SWPPP, and erosion control. Seller shall attempt to minimize earthwork and vegetation disruption for the installation of the Project to the extent it is compliant with the use permits; however, vegetation should be controlled to minimize fire danger and provide the ability to operate and maintain the Project. Any land contours that may affect BESS and PV electrical generation should be included in the BESS and PV system performance estimate. If required, Seller shall import engineered fill to slope the Site and prevent accumulation of standing water. Any direct burial cabling shall be protected with adequate bedding materials to ensure long-term cable integrity. Dust control shall be maintained in accordance with state and local requirements until Final Acceptance is achieved. Seller shall provide other Site maintenance as needed during construction.

Existing structures and utilities that are adjacent to or within the limits of the Project area shall be protected against damage. Seller shall be fully responsible to Owner or other property owners for all repairs in the event of removal or damage of any existing structure, equipment or systems that are intended to remain in place.

4.12.1 Geotechnical Analysis

A geotechnical analysis shall be provided by Seller and performed by a qualified geotechnical engineering firm. The results of the analysis shall be used when designing the foundations for the structures on the Site.

At a minimum, the following should be included in the analysis:

- Review publicly available geotechnical information and reports. This may include soils and geologic maps and literature, photographs, hydroelectric reports, groundwater reports, and water well data.
- Coordination and mobilization of the geotechnical services team for subsurface exploration of the Site. This should include working with the local utilities to mark any existing underground utilities (such as cables, gas lines, piping, etc.). This cannot be conducted until Owner has mitigated the prairie dog permitting requirements.

- Study the Site to determine the presence of faults, ground fissures, and other potential geologic hazards that could affect the structural design and construction of the Project.
- Drilling or digging of exploratory borings and pits. The quantity and depth shall be determined by Seller.
- Performance of cone penetration tests. The quantity and depth shall be determined by Seller.
- Laboratory testing of collected soil samples from the borings and test pits. An evaluation of the in-place moisture content and dry density, gradation, plasticity, consolidation characteristics, collapse potential, expansivity, shear strength, compressive strength, resistivity, chloride content, sodium sulfate content, and solubility potential (total salts) should be conducted.
- Analyze the corrosivity of the soil. Include a recommendation for the type of cement to be used in concrete foundations. Also include recommendations for corrosion protection for underground steel, including rigid metal conduit (such as the need for polyvinyl chloride [PVC] coating).

In addition to the above minimum requirements, local jurisdictional regulations may require site specific hydrologic and infiltration testing. Seller should determine specific requirements and coordinate with geotechnical engineering firm to obtain any required testing information, related to proposed stormwater management facility designs.

A detailed report shall be provided outlining the tasks performed and the results of the testing. Included in the report should be any recommendations for the foundation designs, structural support designs, corrosion protection for both underground steel and concrete, pile drive frequency, minimum pile size, and any geologic conditions that may prevent the development of the Project. Specifically, an opinion on the viability of driven piles as the PV racking supports should be provided.

4.12.2 Environmental Loads

All structures on the Site need to be designed using environmental loads as specified in the American Society of Civil Engineers (ASCE) 7 code book *Minimum Design Loads for Buildings and Other Structures* and the applicable state building code if more stringent requirements. These include wind loads (Chapter 6), snow loads (Chapter 7), rain loads (Chapter 8), ice loads (Chapter 10), and earthquake loads (Chapter 11). Each structure on Site shall be grouped in Occupancy Category II as defined in Table 1.1 of ASCE 7. The corresponding importance factor shall be used for each load calculation.

4.12.3 Excavation

Seller shall perform all common and deep excavation necessary for installation of all foundations and utilities. All excavation shall be in accordance with OSHA regulations. Excavation spoils shall be the Seller's responsibility and may be used for backfill or embankment if suitable, per ASTM D 2487 for this application. Unsuitable or excess excavated material shall be properly disposed of.

Seller shall verify that earth materials exposed in excavations are consistent with those assumed for Seller's foundation designs. If earth materials are different than assumed for particular foundation design, Seller shall modify the design and/or treat the earth material (over excavate, replace, etc.) as necessary to provide foundation meeting design requirements including frost depth.

Seller shall be responsible for making all excavations in a safe manner and consistent with the requirements of the Occupational Safety and Health Administration.

Seller shall provide adequate measures to retain excavation side slopes to ensure that structures, equipment, and persons working in or near the excavation are protected.

Seller shall protect all above grade and below grade utilities. Protect below grade liquid systems from frost.

4.12.4 Construction Surveying

Seller shall furnish all labor, equipment, material and services to perform all surveying and staking essential for the completion of the Project in conformance with the plans and specifications.

Seller shall retain qualified survey crews knowledgeable in proper and up-to-date survey techniques and shall use these qualified survey crews when conducting the survey. Such crews shall be under the supervision of a Professional Land Surveyor registered in the state or jurisdiction of the project.

4.12.5 Fills

Earth fill material adjacent to and below structures shall conform to Seller's design requirements for the structure. Seller prepared specifications and drawings shall indicate the types of soil to use for particular fills, compaction, and compaction testing requirements. These same requirements apply to access roads to the Project site.

Fill shall be placed as uniformly as possible on all sides of structural units. Fill placed against green concrete or retaining walls shall be placed in a manner that will prevent damage to the structures and will allow the structures to assume the loads from the fill gradually and uniformly.

4.12.6 Fencing

The entire site shall be enclosed with a permanent fence in accordance with Owner's Standard #9.

4.12.7 Equipment Pads

All equipment pads shall be located such that adequate personnel access is provided to such equipment. A minimum of 4.0 feet (or 1.5 meters) horizontal clearance from obstructions that would otherwise limit access to the equipment on the pad shall be provided around all equipment pads. The pads shall be sized sufficiently to allow safety and adequate working space around the equipment. The inverter stations, switchgear, substation (if applicable), and other buildings shall be elevated above the Federal Emergency Management Agency 100-year flood plain. The slope of the earthwork around the inverter stations and other equipment shall allow safe and ergonomic access to the equipment and provide for adequate drainage and maintenance. Above ground electrical equipment, including transformers, inverters, PV panels and BESS building or enclosures will be protected with bollards painted yellow.

4.12.8 Foundations and Concrete Work

All foundations and supports must be designed in accordance with the applicable state building code using the calculated environmental loads discussed above and soil properties provided in the geotechnical report. In addition, all placed concrete shall at a minimum comply with ACI 301 and ACI 117 publications. Form materials and required steel reinforcement shall comply with local regulations and site specifications. At a minimum, reinforcing bars shall comply with ASTM A 615 or ASTM A 706 for Low-Alloy-Steel Reinforcing bars.

4.12.9 Corrosion Protection

Corrosion protection shall be utilized on the structures of the Project. The type and amount shall depend on the selected materials of construction and conditions at the Site. A study of these conditions along with recommendations from the geotechnical report shall be used to design the corrosion protection.

The corrosion protection study shall be performed by a qualified corrosion expert and documented with references and calculations showing that the foundations, supports, racking, fasteners, and conduit shall meet a Design Life in aboveground and belowground conditions, as specified in Table 1. If galvanized materials are used, field-applied zinc coatings shall meet American Society for Testing and Materials (ASTM) A780, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings. This standard contains minimum requirements for the material, surface preparation, and application process. For example, repairs to damage due to vibratory pile driving shall conform to ASTM A780.

It is required that all holes in structural members requiring galvanization shall have the holes drilled before the galvanization is applied. Should holes be drilled in the field, galvanizing shall be applied to the exposed steel as specified in ASTM A780. All field welds shall have a field-applied galvanization as specified in ASTM A780. For example, if torque tubes with a 3.0-mil (0.003-inch) hot-dip galvanization are to be welded in the field, a field-applied coating, such as hot stick repair, shall meet or exceed the original 3.0-mil coating thickness of the torque tube per ASTM A780 requirements.

Only steel bolts with pre-applied corrosion inhibitors or stainless-steel bolts and fasteners shall be allowed in the entire mounting structure.

4.12.10 Erosion Control & NPDES Coverage

Seller shall submit a site-specific Erosion and Sedimentation Control Plan. If required by local regulations, this plan is to be reviewed and approved by the local jurisdiction prior to construction. The erosion and sedimentation control plan will be consistent with and incorporate applicable elements of the SWPPP in addition to local regulations. All areas of temporary soil disturbance are to be graded, if necessary, and re-vegetated in a timely manner to limit erosion as required by the local jurisdiction. In addition to the Erosion and Sedimentation Control Plans, depending on state regulation the site may need to apply for coverage under the National Pollutant Discharge Elimination System (NPDES). This coverage is normally issued by the state environmental agency and is normally required for any site disturbing 1 acre or more. Seller to investigate and apply for any permit authorizations related to earth disturbing activities.

4.12.11 Grading and Drainage

The grading and drainage plan shall be designed and installed in accordance with local code and permit requirements. The grading and drainage plan will be consistent with and incorporate applicable elements of the SWPPP and the erosion control plan. All structures required for the drainage plan, if any, shall comply with state standard specifications for drainage facilities. Grading and drainage will be designed to efficiently convey water away from the site, prevent ponding and point source discharge, promote sheet flow of water, and limit long-term maintenance of the Project site. Stormwater Management facility designs if required shall meet all state and local design requirements for Water Quality, Volume and Rate reduction as deemed appropriate for the site.

4.12.12 Dust Control

Seller shall apply dust control materials, at Seller's expense, to minimize raising dust from construction operations and traffic, including but not limited to haul routes, using only dust control mixtures approved by the local jurisdictions.

4.12.13 Site Finish Grade

Seller shall leave the Site in a clean condition upon completion of the work. Efforts shall be made to restore area to a clean condition as soon as practical. Seller shall remove all trash, debris, and stockpiles. The Site access roads shall be returned to a condition that meets the original specification by repairing road damage such as ruts, gouges, and weather damage that may have occurred during construction.

The Site finish grade within the equipment footprint and in areas required for operation and maintenance of the Project shall be fully stabilized in a manner that meets or exceeds local jurisdiction requirements. Provisions of the SWPPP for final storm water drainage shall be implemented.

Seller shall seed and mulch all areas of the Project Site that have been disturbed beyond the permanent portion of the Site and access road, per the SWPPP.

4.12.14 Construction Signage

Seller shall provide temporary signage for local traffic control in accordance with state department of transportation and/or local city requirements and in accordance with Owner's standards.

4.12.15 Human Access

Seller shall make access to all equipment safe and reasonably ergonomic for maintenance staff. For example, if an inverter pad is elevated, the earthwork surrounding the concrete pad shall have a safe approach slope.

The Project shall include a separate room or enclosure to serve as a storage area for tools, spare parts and similar items. Seller shall provide appropriate shelving and lockable cabinets. It shall also include an area for a desk and a file cabinet to store BESS manuals, documents and drawings.

4.13 Mechanical

All mechanical design shall be in accordance with the International Mechanical Code and the International Fire Code, the additional documents incorporated by reference and the additional requirements herein. All mechanical design shall be performed by or done under the direction of a Professional Engineer registered in the state. All Life Safety requirements shall meet all national, state, and local codes, as well as agree with the local Authority Having Jurisdiction.

In accordance with State and Local Laws, all final (Issued for Construction) drawings, specifications, and calculations shall be wet stamped by a Registered Mechanical Engineer in the state where the project is located.

The BESS components shall be fully contained in weatherproof, environmentally-conditioned enclosures or building. The BESS shall have complete and failsafe battery and PCS thermal management systems.

Seller shall provide heating, ventilation and/or space conditioning for the BESS components, as required, to meet the equipment manufacturers' recommendations over the range of site conditions and over the full operating range. Seller shall provide documentation and design calculations supporting the adequacy of the BESS heating, ventilation and/or space conditioning.

Ventilation and space conditioning equipment controls shall be interlocked with the fire protection and suppression systems to operate appropriately in the event of fire.

Ventilation system fans shall be provided with non-return, motor operated dampers. Forced ventilation air streams shall not impinge directly on electrical equipment. Inlet and outlet enclosure dampers shall be of a design that prevents wind driven water and dust intrusion. If required, ventilation systems shall be provided with an interlocked and automatic temperature control system, including appropriate alarming, for each Project building or enclosure.

Space site ambient temperature conditioning as required for the Project enclosure equipment provided shall be provided as complete systems with all accessory items required for proper operation. Consideration shall be given primarily to requirements for efficient conditioning of the installed BESS and PV equipment except in normally occupied areas such as the control room. Normally occupied areas or areas requiring access for local operation shall consider operator comfort in addition to requirements for equipment conditioning. Space air conditioning equipment shall be designed for the loss of one unit without derating of the Project. Where heating or cooling is provided, the equipment shall have a minimum EER, IEER, SEER rating in accordance with the Energy Codes. Space air conditioning shall be provided with an automatic temperature control system, including appropriate alarming, for each Project operational enclosure.

4.13.1 HVAC / Thermal Management

The following is a general summary of the HVAC Requirements for each Project Operational Enclosure.

4.13.1.1 Project Specific Requirements to Determine Equipment Sizing, Quantities & Configuration:

Each Mechanical system and option indicated in this section is dependent on project and enclosure specific requirements. The required information will determine the size, quantity and configuration of the Mechanical Equipment. The required information is noted as follows:

- Location of the Storage Facility – Climate Zone, Outdoor Max and Min Ambient Temperatures
- Storage Building / Container Assembly and Dimensions
- Space Temperature / Humidity Requirements for the Battery Storage Rooms
- Battery Rack Configuration
- Battery Heat Dissipation (BOL – Beginning of Life) & (EOL - End of Life)
- Location of Transformers, PCS (Indoor / Outdoor) – For Indoor – Heat Dissipation
- Available Clearances for Mechanical Equipment (Installation and Servicing)
- Available Clearances for Ductwork
- Fire Protection System(s) Configuration and Control Sequencing

4.13.1.2 Battery Energy Storage Building:

Battery Room(s):

- Provide 3-phase Air-Cooled AC-unit(s) dedicated for each defined array of batteries within each Battery Room. Each AC-unit Supply Air ductwork is to be installed in a manner that directs the supply air via supply air diffusers on to the batteries per the battery manufacturer's recommendations. Each AC-unit is to also have Return Air ductwork that is to be installed above the Supply Air ductwork. Each AC-unit is to be provided with an Air-side Economizer.
- Provide Exhaust Air Fan(s) dedicated to the space to provide ventilation of the space to meet or exceed code compliance of minimum 1 cfm/sq.ft. The Exhaust Air Fan(s) will include 100% stand-by fans. Each Exhaust Air Fan is to be Explosion Proof / Spark Proof. Make up-air to the Exhaust air fans to be provided by the AC-units during normal operations.
- Provide isolation dampers in the ductwork as required in coordination with the requirements of the Fire Protection System(s) Configuration and Control Sequence.

Control Room(s):

- Provide Air-Cooled AC-unit(s) dedicated for each Control Room. Unit shall be ducted to the space with supply air and return air ductwork. Each AC-unit is to meet minimum outside air requirements for the occupied Control Room space. Each unit is to be provided with an Air-side Economizer.

CO2 Room(s):

- Provide One (1) Exhaust Air Fan dedicated to each space to provide ventilation of the space. The Exhaust Air Fan will be ducted into the space with air inlets at the ceiling and extended to the floor level. Each Exhaust Air Fan is to be Explosion Proof / Spark Proof. Make up-air to the Exhaust air fans to be provided by a Passive Air Intake.

Fire Pump Room(s):

- Provide One (1) Exhaust Air Fan dedicated to each space to provide ventilation of the space. The Exhaust Air Fan will be ducted into the space with air inlets at the ceiling and extended to the floor level. Each Exhaust Air Fan is to be Explosion Proof / Spark Proof. Make up-air to the Exhaust air fans to be provided by a Passive Air Intake.

Provide the BMCS and Control Facilities for the Following Typical Systems:

- Battery Room AC-Unit and Ventilation Systems
- Control Room AC-Unit Ventilation Systems
- CO2 Room Ventilation Systems
- Fire Pump Room Ventilation Systems

4.13.1.3 Battery Energy Storage Container(s):

Three (3) options for Mechanical Equipment configurations have been listed. These options are not listed in order of preference.

- Option #1 – AC-units and Fans on top of Storage Container Enclosure:

- Provide Air-Cooled AC-unit(s) dedicated for the defined array of batteries within the Storage Container. The Air-Cooled AC-units are to be install on top of the Storage Container. Each AC-unit Supply Air ductwork is to be installed in a manner that directs the supply air via supply air diffusers on to the batteries per the battery manufacturer’s recommendations. Each AC-unit is to also have Return Air ductwork ducted into the Container. Each AC-unit is to be provided with an Air-side Economizer.
 - Provide Two (2) Exhaust Air Fan(s). Each exhaust Air Fan is to be installed on top of the Storage Container. Each exhaust fan is to meet or exceed code compliance of minimum 1 cfm/sq.ft. The first exhaust fan will be the base exhaust fan. The second exhaust fan will be a 100% stand-by. Each Exhaust Air Fan is to be Explosion Proof / Spark Proof. Make up-air to the Exhaust air fans to be provided by the AC-units during normal operations.
 - Provide isolation dampers in the ductwork as required in coordination with the requirements of the Fire Protection System(s) Configuration and Control Sequence.
- Option #2 – AC-units on Ground, Fans on Roof of Storage Container Enclosure:
 - Provide Air-Cooled AC-unit(s) dedicated for the defined array of batteries within the Storage Container. The Air-Cooled AC-units are to be install on the Ground near the Storage Container. Each AC-unit Supply Air ductwork is to be installed in a manner that directs the supply air via supply air diffusers on to the batteries per the battery manufacturer’s recommendations. Each AC-unit is to also have Return Air ductwork ducted into the Container. Each AC-unit is to be provided with an Air-side Economizer.
 - Provide Two (2) Exhaust Air Fan(s). Each exhaust Air Fan is to be installed on top of the Storage Container. Each exhaust fan is to meet or exceed code compliance of minimum 1 cfm/sq.ft. The first exhaust fan will be the base exhaust fan. The second exhaust fan will be a 100% stand-by. Each Exhaust Air Fan is to be Explosion Proof / Spark Proof. Make up-air to the Exhaust air fans to be provided by the AC-units during normal operations.
 - Provide isolation dampers in the ductwork as required in coordination with the requirements of the Fire Protection System(s) Configuration and Control Sequence.
- Option #3 – AC-units Mounted to Side of Storage Container, Fans on Roof of Storage Container Enclosure:
 - Provide Air-Cooled AC-unit(s) dedicated for the defined array of batteries within the Storage Container. The Air-Cooled AC-units (Multiple smaller wall mounted units) are to be install on each side of the Storage Container. Each AC-unit Supply Air ductwork tap into the container is to be installed in a manner that directs the supply air via a supply air diffuser on to the batteries per the battery manufacturer’s recommendations. Each AC-unit is to also have Return Air ductwork duct tap into the Container. Each AC-unit is to be provided with an Air-side Economizer.
 - Provide Two (2) Exhaust Air Fan(s). Each exhaust Air Fan is to be installed on top of the Storage Container. Each exhaust fan is to meet or exceed code compliance of minimum 1 cfm/sq.ft. The first exhaust fan will be the base exhaust fan. The second exhaust fan will be a 100% stand-by. Each Exhaust Air Fan is to be Explosion Proof / Spark Proof. Make up-air to the Exhaust air fans to be provided by the AC-units during normal operations.

- Provide isolation dampers in the ductwork as required in coordination with the requirements of the Fire Protection System(s) Configuration and Control Sequence.
- Provide a BMCS and Control Facilities for the Following Typical Systems:
 - Battery Room AC-Unit and Ventilation Systems

4.13.1.4 Quality Assurance for Air-Cooled AC-units:

- Packaged air-cooled condenser units shall be certified in accordance with ANSI/AHRI Standard 340/360 performance rating of commercial and industrial unitary air-conditioning and heat pump equipment.
- Unit shall be certified in accordance with UL Standard 1995/CSA C22.2 No. 236, Safety Standard for Heating and Cooling Equipment.
- Unit and refrigeration system shall comply with ASHRAE 15, Safety Standard for Mechanical Refrigeration.
- Unit Energy Efficiency Ratio (EER) shall be equal to or greater than prescribed by ASHRAE 90.1, Energy Efficient Design of New Buildings.
- Unit shall be safety certified by ETL and ETL US listed. Unit nameplate shall include the ETL/ETL Canada label.

4.13.1.5 Additional Thermal Management Coordination Items:

- Provide a CFD (Computational Fluid Dynamics) Analysis of the Proposed Installation.
- Provide supplemental steel supports where required for all rooftop installations.
- Provide concrete equipment pads where required for equipment placed on the ground/floor.
- Coordinate all structural equipment weights, unit supports and pads.
- Coordinate all Electrical Requirements with the Electrical Seller.
- Coordinate all Fire Alarm Requirements with the Fire Alarm Seller.

4.14 Safety and Project Security

4.14.1 Fire Protection and Suppression

Seller shall design and install a fire protection system that will provide fire detection and fire suppression systems for the buildings and/or enclosures, and equipment that comprise the Project as necessary. The design shall be performed by a licensed Fire Protection Engineer in the state where the project is located, and all design documents shall be signed and sealed by that Engineer.

The fire protection systems shall conform to all national, state, and local codes and standards including, as well as incorporating and implementing the recommendations of the following:

- National Fire Protection Association (NFPA) 850 Recommended Practice for Fire Protection for Electric Generating Plants and High Voltage Direct Current Converter Stations (for transformers and general areas and overall interface with the power station)
- National Fire Protection Association (NFPA) 855 Standard for the Installation of Stationary Energy Storage Systems
- National Fire Protection Association (NFPA) 10 Standard for Portable Fire Extinguishers
- National Fire Protection Association (NFPA) 13 Standard for the Installation of Sprinkler systems

- National Fire Protection Association (NFPA)15 Standard for Water Spray Fixed Systems for Fire Protection

The fire protection systems shall also comply with when required, as well as incorporating and implementing the recommendations of the following when not fully required by the owner, AHJ, Insurance agent:

- FM Global Property Loss Prevention Data Sheet 2-0, Installation Guidelines for Automatic Sprinklers
- FM Global Property Loss Prevention Data Sheet 2-1, Corrosion in Automatic Sprinkler Systems.
- FM Global Property Loss Prevention Data Sheet 2-8, Earthquake Protection for Water-Based Fire Protection Systems.
- FM Global Property Loss Prevention Data Sheet 2-10r, Dry Pipe, Deluge, Pre-action Valves and Accessories.
- FM Global Property Loss Prevention Data Sheet 2-81, Fire Protection System Inspection, Testing, and Maintenance.
- FM Global Property Loss Prevention Data Sheet 4-1n, Fixed Water Spray Systems for Fire Protection
- FM Global Property Loss Prevention Data Sheet 4-4n, Standpipe and Hose Systems.
- FM Global Property Loss Prevention Data Sheet 4-5, Portable Extinguishers
- FM Global Property Loss Prevention Data Sheet 4-9, Halocarbon and Inert Gas (Clean Agent) Fire Extinguishing Systems.
- FM Global Property Loss Prevention Data Sheet 5-33, Electrical Energy Storage Systems
- FM Global Property Loss Prevention Data Sheet 5-40, Fire Alarm Systems.
- FM Global Property Loss Prevention Data Sheet 5-48, Automatic Fire Detection.
- FM Global Property Loss Prevention Data Sheet 5-49, Gas and Vapor Detectors and Analysis Systems

All fire suppression, detection, and alarm systems shall be designed and installed in accordance with the applicable NFPA codes and standards. All equipment shall be UL listed and/or FM approved, were FM compliance is required by the owner. Seller shall provide a main fire alarm control panel in the control room that shall monitor all fire suppression, fire detection, and fire alarm systems. Additional local fire panels shall be provided as required.

The fire protection system design and associated alarms shall take into account that the Project will be unattended at most times.

Designing engineer and Seller shall calculate and consider the heat content of the battery cell materials, based off the data collected in the UL 9540A testing, in designing an appropriate fire protection system.

Separate fire protection and barrier systems may be used in the battery, PCS and control areas.

All buildings and enclosures shall be designed in accordance to the applicable state and local building, mechanical, fire, and energy conservation codes. Where a building is not provided, life safety and egress requirements shall still be applied and considered in the overall equipment arrangement.

Within 30 days of Effective Date, Seller shall submit its proposed fire detection and suppression philosophy and basic design elements with calculations to Owner and appropriate third parties having jurisdiction. Seller is responsible for obtaining system design approval, installation inspection, and testing as required by Owner and third parties with jurisdiction

4.14.1.1 Fire Separation

Design engineer/ Seller shall provide adequate separation between the BESS and the other buildings, structures, equipment, and systems located on the site. Separation shall be provided by either spatial separation, fire walls/barriers, or exposure protection system such as water spray systems. Separation and exposure protection requirements shall be determined in accordance with the local building codes, FM Data Sheets 1-20 and 5-33, and applicable NFPA standards, including the latest edition NFPA-855, all based off the testing data from UL 9540A

Structures housing the batteries may be divided into multiple battery rooms, separated by two (2) - three (3) hour fire barriers based on referenced codes, in order to limit the potential impact of a fire. The maximum size of a battery room shall be on the order of 3,000 square feet. This area limitation is a guideline and should be adjusted as practical for economic and design efficiencies.

When multiple outdoor battery enclosures are utilized, they shall be separated from each other in accordance with FM Data Sheet 5-33, by either 20 feet or masonry fire barriers, and NFPA-855.

Transformers shall be located and installed in accordance with the location and separation requirements of NFPA 850 and FM Data Sheet 5-4. Transformers shall be provided with a means to contain their oil content without exposing adjacent transformers, buildings, enclosures, or other equipment and structures. Seller shall provide the required spatial separation between the adjacent equipment and buildings or shall provide rated fire separation barriers/walls.

4.14.1.2 Fire Suppression Systems

Fire suppression systems shall be provided for all buildings and enclosures as required. Battery areas shall be provided with a multi- phase fire suppression approach. One such approach is, 1) Clean agent fire suppression system per NFPA 2001 for initial fire control; and 2) double interlocked pre-action sprinkler system per NFPA 13. Both systems will be activated by means of the associated fire detection system. Each battery room shall be provided with an independent fire suppression system. In the engineers selection of systems, they are responsible to provide documentation to the owner, Seller, local Fire Dept, plan reviewer, etc., that states that the designed system is designed to fight the different fire hazards, and fires that can be experienced, such as an electrical (non-thermal runaway fire), thermal run away fire, explosion mitigation or prevention, etc. Hazards to be identified by a licensed fire protection engineer in accordance with local, industry, and the latest NFPA standards on battery protection, list of hazards and protection system to be provided to owner and AHJ prior to design for approval.

Where separate battery enclosures are utilized, either outdoors or indoors, the clean agent system discharge can be limited to the battery enclosure with the fire. Where separate battery enclosures are installed indoors, the pre-action sprinkler system shall be extended into the individual enclosures in addition to general building coverage, this method of protection must be approved by the local fire, AHJ

and owner prior to design, care should be given to any impacts to the insurance rates of sites protected with

Outdoor battery enclosures are not required to be provided with a pre-action sprinkler system when they are adequately separated from adjacent battery enclosures. Only clean agent fire suppression need be provided for the enclosure. For this case, final water fire suppression will be provided manually by means of fire hoses.

The required concentration of clean agent shall be determined by the manufacture of the battery units via the required UL 9540A testing and must be based on fire suppression test results for the specific battery chemicals being utilized. The clean agent concentration shall comply with the latest NFPA-2001 requirements, including the design concentration factor as outlined in NFPA-2001-2018 section 5.4 and shall allow personnel occupancy of the room/enclosure for at least five minutes without any adverse health effects.

The clean agent system(s) shall be designed using a main gas supply bank. Seller shall determine if an installed reserve bank is required based on the relative availability of the clean agent being utilized, and to comply with local codes and NFPA-2001. As a minimum, Seller shall provide on-site storage of clean agent reserve cylinders for the largest single clean agent system and the means for quickly replacing the used cylinders with the uninstalled reserve cylinders, it is highly recommended that the

Abort switches shall be provided for each clean agent system installed in a building, or a min of one (1) abort switch for each container of batteries installed outside. The abort switches must be in the hazard area located close to all exit doors and be within distance of doors as stated in NFPA-2001 All required warning signs shall be provided and installed by Seller as required by NFPA 2001.

All door, windows, vents, or opening of any kind that could allow for air flow in or out of the hazard area must be placed on self-closing, so that upon detection of an issue they can close, any openings that cannot be closed must be accounted for with extra agent as outlined in NFPA-2001. All HVAC units are to be shut down at the same time, and all duct work leading from the space to the outside to be closed with airtight dampers, in the event the system cannot be shut-down or the ducts and vents not shut, additional agent must be provided to comply with NFPA-2001.

The water density for the design of the pre-action sprinkler system shall be determined by Seller based on the battery technology being used, guidance of NFPA 855.

The pre-action valve is to be UL listed and FM approved for use. It is recommended to use a Double interlock Pre-action valve be used, to reduce the risk of false alarms, accidental water flow into the pipe, and water leaks from piping. Systems to be either Electric-Electric activation, that uses one of the following activations and detection methods, cross zoned smoke detectors, cross zoned heat detectors, or a min of two (2) concentration levels for automatic air sampling systems, levels to be determined by designing engineer/Seller in compliance with NFPA and FM requirements based off testing from UL 9540A. Systems can be Electric-Pneumatic activation, where the electronic follows the requirements outlined above. All Pre-action systems to be provided with electronic accelerator.

Where the AHJ, Fire Dept or other code enforcement do not allow for the use of double interlock valves to be used a single interlock system can be used, with either pilot line or electric actuation can be used, with electronic being recommended. All single interlock valves to be provided with an electronic accelerator.

The pre-action sprinkler system piping shall be supervised using nitrogen bottles, or a nitrogen generator that complies with the requirements of NFPA-13 and is FM approved. The loss of pressure in the piping shall be alarmed on the local control panel and main fire alarm control panel in the control room. All valves and components to be housed in a controlled dedicated area/room, it is to be heated to protect from freezing, be protected from physical damage from items such as cars, trucks, lifts, etc. All information required by the local fire dept, including drawings, specifications, life safety plans and other required details by the AHJ and Fire Dept that are coordinated by the installing Seller and the fire dept and AHJ. Valves and valve room to be remotely located away from the battery units to a min distance outlined in the UL 9540A testing, NFPA-855, and local requirements, to protect the valves and components from damage from a unit on fire, such as explosion and fire damage that could compromise a system.

4.14.1.3 Fire Detection and Alarm Systems

Designing Engineer/Seller, and installing Seller shall design, furnish and install a fire detection and alarm system throughout the Project, including detection systems associated with the clean agent systems for each battery area, and the other rooms and areas identified in this Technical Specification. All fire detection and alarm system equipment shall be UL listed/ FM approved and shall comply with NFPA 70 and NFPA 72. Detector locations shall be subject to Authority Having Jurisdiction approval.

Installing Seller shall be responsible for the design, furnishing, installing, programing, and testing of a complete intelligent, addressable, supervised, manual and automatic, non-coded, and state-of-the-art fire detection and alarm system. System shall include all electrical relays, interface modules, control transformers, fire protection and detection conduit and tubing, and other miscellaneous electrical equipment and instrumentation, including all local devices as required to ensure proper operation of the fire protection systems, as specified herein and as required by the applicable codes and standards. Detection system shall also provide for the detection of carbon monoxide (CO), hydrogen (H₂) gasses, and other combustible or explosive gasses based on the UL 9540A testing, that may be released in all battery rooms/areas.

Fire Detection and alarm system shall consist of the following:

- Fire detection and alarm systems associated with the required fire suppression systems in the battery areas and all other building areas, rooms, and enclosures.
- Monitoring and supervision of clean agent systems.
- Manual pull stations throughout building and enclosures, including along paths of egress and at all entrances and exits from energy storage containers
- Audible and visual alarms throughout building and enclosures.
- Red strobe beacons outside each battery room or enclosure for indication, located above any paths of entrance or exit to the space that fire has been detected in the room/enclosure.

Seller shall be responsible for providing duct smoke detectors installed in the building/enclosure HVAC systems. All alarms from the duct smoke detectors shall be brought to the Fire Alarm System Control Panel.

Seller shall be responsible to provide local audible and visible alarms and manual pull stations.

Seller shall furnish and install automatic and manual fire detection systems, alarm and signaling systems, including but not limited to: air sampling type smoke detectors (VESDA or equal), spot type smoke detectors, pull stations, horns, strobes, etc. Seller shall be responsible for the installation and connection of all detection devices. The number of detectors to be provided for fire detection in a certain area or room and the corresponding location of these detectors shall be determined by Seller and based upon the manufacturer's recommendations and NFPA 72 requirements.

All detection, tripping and isolation circuits shall be electrically supervised for continuity. Discontinuities shall be indicated by a "trouble" indicator and alarm at the respective local control panel and at the Main Fire Alarm Control Panel. Pathways shall be Class A with a pathway survivability of Level 0.

Each battery room/area shall be provided with two zones (Zones 1 and 2) of air sampling type smoke detection, VESDA or equal, with each zone providing full coverage of the battery room/area being protected. This detection system shall control the release of the clean agent system into the battery room. Rooms and areas that do not have batteries shall be provided with spot type smoke detectors.

The air sampling smoke detectors shall provide programmability of four smoke density alarm thresholds within the systems sensitivity measurement range. Setting of time delays for each of the four alarm thresholds shall also be programmable. Relay outputs shall be provided for remote indication of alarm conditions on the local system panel.

Alarm levels shall be:

- Alert
- Pre-Alarm
- Fire 1
- Fire 2

System shall be designed for resistance to unwanted alarms while still achieving maximum sensitivity.

A time delay of 30 seconds for room evacuation shall be provided prior to the release of the clean agent into large battery rooms. The time delay shall be adjusted downward for smaller battery enclosures. The time delay shall start at the time that the system has alarmed and received all permissions for clean agent discharge.

Activation of the clean agent extinguishing system for each battery room/area shall be via crossed-zoned smoke detection: room aspirating smoke detection systems (both Zone 1 and Zone 2 at Fire 1 alarm level). This shall also release water into the pre-action sprinkler system piping.

Fire alarm control panels shall be wall mounted type, requiring access from the front only. Panels shall be provided with internal battery backup power.

Panel shall provide for HVAC system shutdown for the room being served based on the following:

- Duct smoke detector detects smoke.
- Spot smoke detector detects smoke.
- Aspirating smoke detector reaches Fire 1 alarm level (either zone).

4.14.1.4 Portable Fire Extinguishers

Seller shall furnish, locate, and install portable fire extinguishers in the building and enclosures in accordance with NFPA 10, and as required by the local Authorities Having Jurisdiction. Quantities, type, and sizes of extinguishers shall be determined by Seller in accordance with NFPA 10 requirements.

Portable hand-held fire extinguishers shall be provided at required locations.

4.14.1.5 Testing

All testing shall be performed in accordance with the applicable NFPA code/standard and related electrical specifications, local requirements, and the additional requirements as contained herein.

All testing shall be properly documented in accordance with the applicable NFPA codes/standards, verifying proper testing and test results, and will be submitted to Owner and the Authority Having Jurisdiction for approval.

The piping distribution systems for the clean agent systems shall be inspected and tested to determine that they are in compliance with the design and installation documents. As a minimum, the inspection and testing shall be as identified in NFPA 2001 for Installation Acceptance.

Pressure and flow testing, and enclosure integrity testing for clean agent systems shall be performed as required by NFPA 2001.

All fire detection systems shall be fully tested after installation in accordance with NFPA 70, NFPA 72, and NFPA 2001, such that alarms are received on the Fire Alarm Control Panel and transmitted to the remote monitoring location. As a minimum, each switch, control, alarm, etc., shall be operated or caused to alarm to verify proper function and operation. Actual operation of valves and detectors should be used to initiate alarms, signals, and trips (no simulated signals).

4.14.1.6 Operation and Maintenance of Fire Protection Systems

Fire suppression and fire detection systems shall be operated and maintained in accordance with the requirements of this Technical Specification and the appropriate NFPA standard. Water based fire suppression systems shall be maintained in accordance with NFPA 25.

4.14.2 Project Security

Seller shall provide a security system for the Project. The security system around the perimeter shall include a 7-foot-high chain link fence with 1-foot top guard (total 8-foot high) of three strands of nine-gauge barbed wire. The perimeter fence shall include two locked gates: one with a width of 20 feet for vehicles and one pedestrian entrance with a width of four feet. During construction, Seller shall utilize temporary fencing as necessary to maintain security and prevent the movement of livestock. The entire site shall be enclosed with a permanent fence in accordance with Owner design standards.

Perimeter signage shall be provided by Owner and installed by Seller in accordance with Owner standards. Signage shall be installed every 65 feet along the perimeter fence and on all gates. Signage shall be installed five feet above ground level.

Signage that will be provided by Owner will include the following:

Warning! Hazardous Voltage Inside Keep Out

English SI# 7999852

Spanish SI# 7999854

No Trespassing

SI# 8252306

Mounting Hardware

SI# 7999092

Seller shall be responsible for security during construction.

Seller shall contract with AVTEC SYSTEMS INTEGRATOR, A DIVISION OF CACHE VALLEY ELECTRIC, (Security Sub-Contractor), to provide and install the necessary security equipment. Contact:

Avtec – System Integrator
Michael Petric
(801) 908-4191
michael.petric@cve.com

This equipment may include, but is not limited to:

- LED Spot or LED flood lights.
- Security cameras located such that they are capable of adequate identification of intruders covering the perimeter of the Site. Cameras shall be placed at a height that permits line-of-sight access to the property.
- Cameras with a control and detection system that assists in the detection and identification of intruders.
- Network - Digital Video Recorders used to record video that could be used for evidence in the event of theft or vandalism.
- Seller shall negotiate with third party vendor to identify the scope of work that will be performed by Seller, to ensure that a complete and operational security system as described by third party vendor is provided. Third party vendor shall provide to Seller the security system design, which will indicate the location of cameras, DVRs, security lighting and any security communications equipment, based on third party vendor's overall System design. The work that may be provided by third party may include the furnishing and installation of wiring, cabling, labor, tools, equipment, and ancillary materials required for a complete and operational security system. At minimum, it is expected the Security Sub-Seller will provide the following equipment: cameras, network DVRs, and any specialized security communications equipment.
- Seller shall be responsible for the furnishing and installation of all necessary conduits, 120-V_{ac} power extensions for all Security related equipment.

- Seller shall provide a free-standing weather-proof enclosure with adequate space required for Security Control Equipment as specified by the third party.
- Installation of telephone lines, and/or cellular modem(s), and/or local area network for the interconnectivity of all related Security System Equipment.
- Seller shall provide fiber optic cable for Security System Communications. Fiber optic cable shall consist of a minimum of six fiber strands between each required camera location.
- The system shall be complete, tested, and fully operational. Prior to construction, Seller shall provide the following:
 - Descriptive statement and single-line block diagram to show how all related equipment will interface and operate as a complete system.
 - Product data: manufacturer's technical data sheets on each product to be used.
 - Drawings, including plans, elevations, equipment mounting heights, and dimensions required to show devices' locations and demonstrate accessibility compliance in accordance with referenced documents.
 - Detailed schematic wiring diagrams for all system devices; wiring information shall include cable type, conductor routings, quantities, and connection details at devices.
 - Manufacturer's user's manuals for operations, administration, installation, and maintenance.

4.14.2.1 Security System Installation

All system components and appurtenances shall be installed in accordance with the manufacturer's specifications, referenced practices, guidelines, and applicable codes. All necessary interconnections, services, and adjustments shall be furnished as required for a complete and operable system as specified. Control signal, communications, and data transmission line grounding shall be installed as necessary to preclude ground loops, noise, and surges from adversely affecting system operation.

All security system wiring shall be installed in dedicated conduit throughout. Cable shall not be pulled into conduits or placed in raceways, compartments, outlet boxes, junction boxes, or similar fittings with other wiring. All low-voltage wiring outside the control console, cabinets, and similar enclosures shall be plenum rated where required by code.

All wiring conductors connected to terminal strips shall be individually numbered and each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with the name and number of the device as identified and shown on the drawings.

4.14.2.2 Security System Components

Security system components may consist of LED spot or LED flood lights, cameras, alarms, network video recorders, communication lines, and all wiring required for all the components. The security system shall be sufficient to monitor and deter any theft or vandalism onsite. The security component supplier shall provide detailed specifications of each component.

Seller shall coordinate with Owner's SCADA design/instrumentation and control engineer to ensure sufficient bandwidth is available on the network to accommodate the proposed security system. Owner

may elect to reduce the equipment needs based on the location of the Site and subsequent security requirements.

Surveillance cameras and pan/tilt/zoom (P/T/Z) drives shall meet the following minimum requirements. Surveillance cameras and P/T/Z drives shall be provided by Seller. Alternative solutions providing higher upgradeability and compatibility with future products are acceptable at no additional cost, subject to Owner's approval.

The P/T/Z unit shall meet the following design and performance specifications:

- The unit shall be microprocessor controlled with network / IP based programming via standard WEB based interface.
- Each pan/tilt drive unit shall operate as an independent unit with exclusive programming and setup data contained on each unit's nonvolatile memory.
- The unit shall be capable of 360-degree continuous pan rotation with a vertical unobstructed tilt of +36 to -85 degrees.
 - Manual Control Speeds of: 0.1 degree to 40 degree per second (Pan), and 0.1 degree to 30 degree per second (Tilt)
 - Preset Speeds of: 100 degree per second (Pan) and 30 degree per second (Tilt)
- The unit shall pan and tilt under manual control.
- The unit shall be capable of 16 learned tours and 256 configurable preset locations for Alarm Call-up configuration.

The camera shall meet the following specifications:

- The sensor type shall be 1/2-.8-inch Type Exmor CMOS Sensor.
- The camera shall provide a minimum of 1080p (1920x1080) resolution, at 30 images per second (ips).
- Camera shall provide a minimum of two simultaneous video streams: Dual H.264 or H.264 and Scalable MJPEG.
- Camera shall allow for control and monitoring of video via IPv4 and IPv6 Networks.

The motorized lens shall meet the following design and performance specifications:

- The camera shall provide 16:9 Aspect Ratio and shall provide a 30X optical zoom and 12X Digital Zoom.
- The lens shall provide horizontal angle of view of 59.5 degrees (wide) to 2.1 degrees (telephoto).
- The lens shall feature an automatic focus with manual override.
- A step-down power transformer shall be provided for each camera. Transformers shall be rated 120/24 V_{AC} and shall have an adequate volt-ampere rating for the load at 40 degrees C ambient air temperature. Individual Fuse Distribution shall be provided.

The camera and lens housings shall be weatherproof and part of an Integrated Optics Cartridge (IOC). The IOC shall accommodate specified camera and lens combinations. IOC shall be dry nitrogen filled to 10 psig, to protect Camera Sensor / Lens optics from condensation and corrosion.

Camera assembly shall be provided with integrated IR Illumination. IR Illumination Transmitters shall be integrated to the Pan / Tilt Assembly Housing so as to provide IR Illumination for areas being viewed by the camera.

- IR Illumination shall be provided for distances up to and including 330 feet from each camera location.

Video Wiring System

Description: 100-ohm, four-pair UTP, covered with a black PVC jacket.

- Comply with ICEA S-90-661 for mechanical properties.
- Comply with TIA/EIA-568-B.1 for performance specifications.
- Comply with TIA/EIA-568-B.2, Category 6.
- Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
 - Communications, Direct Burial Rated: Type F/UTP, complying with NFPA 262.
 - General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher. All terminations shall use TIA/EIA 568B wire termination color coding.

Power and/or Auxiliary Input/Output cable shall be multi-conductor twisted shielded cables selected for use with the specific equipment to be controlled for installation in concealed conduit system. Cables shall have outer jacket of PVC and shall be suitable for direct burial installation.

All cables and conductors that serve as control, sensor, low voltage power, or data conductors shall have surge protection circuits installed at each end that meet the IEEE C37.90.1 surge withstand capability test. Fuses shall not be used for surge protection.

If fiber is to be used for the communication backbone and copper is to be used for each camera connection, then Fiber to copper convertors are to be provided for each camera location. These convertors need to be capable or at least 1GB connectivity.

Network Video Recorder and Multiplexor

The network video recorder (NVR) and multiplexer shall be provided as one integrated unit. The NVR shall be provided by Seller.

The NVR shall provide for live and playback viewing while the system continues to record new images. It shall be capable of time division, multiplexing multiple cameras and storing their digitized and compressed images on integral hard disk drives, and search and retrieval either locally at the unit or from a remote work station using a graphical user interface. It shall have Ethernet connectivity.

The NVR shall record video on an internal hard disk drive(s). It shall support multiple internal and external hard disk drives of minimum one (1) Terabyte, or large enough to store up to one month of the camera recordings (whichever is greater). Minimum redundancy level RAID 5 is required with a hot swappable drive.

The NVR shall support archiving of images on an external archiving device. It shall support recording on portable / removable storage media.

The NVR viewing software shall provide the following displays as a minimum in live and playback mode: full-screen, sequencing, quad, 9-way, or 12-way. It shall allow the user to rearrange cameras in any multi-screen display, in both live and playback modes. The display options shall include but not limited to:

- Camera tilting
- Title display, per monitor
- Time and date, per monitor

4.14.2.3 Security Software

Seller shall provide a minimum of two software and database management licenses. Seller shall provide two copies of the software on CDs for backup and a complete user manual. Software shall be Windows compatible. Seller shall provide free software upgrades during the warranty period of the system as a minimum. In addition, camera licensing is required with one (1) license per camera.

4.15 Cybersecurity Requirements

General Security Criteria

1. Please confirm you have and maintain security controls to protect the Company's networks, systems, software, Confidential Information, and Data no less rigorous than those set forth in the latest published version of ISO/IEC 27001 – Information Security Management Systems–Requirements and ISO/IEC 27002 – Code of Practice for International Security Management.
2. If providing a web portal or web service, please confirm that web services use HTTPS/TLS version 1.2 or later for all content.
3. Please confirm you encrypt all Company data while at rest as well as when in transit over the network.
4. Please confirm that all Company-related file transfers are encrypted while at rest as well as when in transit over the network.
5. For responses above, please confirm all encryption uses NIST-approved algorithms and key lengths.
6. Please confirm you support federated single-sign-on (SSO) authentication for any Company accounts, whether via web interface or mobile application. You must have the ability to support Azure Active Directory.

7. If you do not support federated single-sign-on (SSO) authentication, please confirm that Accounts provided by you support multi-factor authentication compliant with NIST SP 800 63-3 Authentication Assurance Level 2. Provide documentation that supports compliance and describe supported authentication mechanisms.
8. Please confirm, by provision of supporting documentation, that email sent while under the Contract to the Company by you or by any service: Originates from a domain(s) with a published Domain-based Message Authentication, Reporting and Conformance (DMARC) policy of “reject” and with a published Sender Policy Framework (SPF) policy consisting of valid senders and a “fail” directive (-all). If the optional DMARC “pct” directive is used, "pct" must be set to “100”.
9. Please confirm, by provision of supporting documentation, that email sent while under the Contract to the Company by you or by any service passes a Domain-based Message Authentication, Reporting and Conformance (DMARC) authentication check.
10. Please confirm, by provision of supporting documentation, that email sent while under the Contract to the Company by you or by any service is signed by a DomainKeys Identified Mail (DKIM) 2048 bit key.
11. Please confirm, by provision of supporting documentation, that email sent while under the Contract to the Company by you or by any service supports Transport Layer Security (TLS).
12. Please describe your process to disclose known vulnerabilities to the Company related to products or services provided as they pertain to the proposed service.
13. Please describe methods supplied to the Company to verify software integrity and authenticity for any software or patches provided by you as they pertain to the proposed service.
14. Please describe your process for security event monitoring and notification/alert/response plans, including response to security incidents affecting the Company.
15. Please confirm you will notify the Company of a security incident as soon as practicable, but no later than 48 hours after discovery.
16. Please confirm you will coordinate responses to security incidents with the Company that pose a security risk to the Company.
17. Please confirm that all rights to any data provided by the Company shall remain exclusive property of the Company.

18. Please confirm you will not share data with third parties for unrelated commercial purposes, such as advertising or advertising-related purposes.
19. If remote access of any type will be required as part of the service, please fully describe your requirements for remote access.
20. If remote access of any type will be required as part of the service, confirm your ability to conform to Company requirements for intermediate host methods for remote access, such as Citrix or Virtual Desktop,
21. If remote access of any type will be required as part of the service, and if a virtual private network is required, please confirm your ability to terminate in a demilitarized zone network (DMZ). Note that direct virtual private network connectivity to Company corporate networks is always prohibited.
22. If remote access of any type will be required as part of the service, confirm that you will notify the Company when remote or on-site access is no longer needed by your representatives, where applicable.
23. Please list facilities proposed in bid located outside the continental United States.
24. Please list any support staff used during the term of this contract located outside the continental United States.
25. Please confirm you will disclose third parties upon which you depend to deliver the Company offering (such as third-party software, implementation, hosting, for example).
26. Please describe your methods to securely ship and deliver products to the Company as they pertain to the proposed service.

For Hosted or Cloud Services:

27. If your service is comprised in whole or in part of a cloud-based or hosted services solution, please confirm you currently undergo, or are willing to undergo, annual Statement on Standards for Attestation Engagements (SSAE) Service Organization Control (SOC) 2 Type 2 audits (“Audit”) for your enterprise or covering the scope of services for the term of the contract with the Company, as appropriate. Note that a datacenter audit alone will not be sufficient. You may include an audit for datacenter/colocation provider for informational purposes.
28. If your service is comprised in whole or in part of a cloud-based or hosted services solution, please confirm that your administrative access complies with NIST SP 800 63-3 Digital Identity at Authentication Assurance Level 2 or higher, where compromise of one factor does

not contribute to compromise of the other factor. Provide compliance documentation and describe supported authentication mechanisms.

4.16 Drainage Systems

Sanitary drainage, roof (storm) drainage, and floor and equipment drainage systems shall be provided, as required, to service all project buildings. All systems shall be gravity drainage systems with all pipe uniformly sloped in the direction of flow. Minimum slopes for all drainage systems shall conform to the requirements of the applicable Plumbing Code.

All plumbing fixtures and washing facilities shall be drained to the sanitary system. Floor drains in toilets, washrooms, and showers, if included, shall also be drained to the sanitary system. All such drains shall be routed independently from all other drainage systems to the Project Sewage Treatment Facility or to the local sanitary sewer system. Connection to the local sewage line is Seller's responsibility.

All plumbing fixtures and sanitary drainage related floor drains shall be trapped and vented to the outside in compliance with the applicable plumbing code.

All roof drains shall be provided with dome strainers, integral expansion joints, flashing collars, and underdeck clamps. All horizontal roof drainage piping shall be insulated and jacketed to prevent sweating.

Floor and equipment drains shall be connected to a common drainage system. Drainage from areas wherein chemicals can enter the drainage system shall be neutralized before combining with ordinary floor and equipment drains. Drainage from areas containing oil shall be processed through oil separators prior to discharge.

Equipment drains shall be sized on the basis of the largest drainage rate from equipment to be drained. Equipment drains shall be provided for all equipment with continuous drips or subject to frequent flushing. Equipment drains shall also be located at each fire protection system alarm valve station.

All station floor drains shall be a minimum of 4 inches in size. All areas containing concentrations of oil shall be provided with dikes, trenches, and/or drains sized to contain the maximum anticipated spill.

Any section of drainage system which cannot be drained by gravity to its disposal facilities shall be provided with pumps. Pumps for the sanitary drainage system shall be duplex sewage ejectors of the non-clog type, submersible, vertical submerged type or pneumatic type. Sewage pumps shall be installed in cast iron basins. Pumps for the roof and floor and equipment drain systems shall be duplex sump pumps of the vertical, submersible type installed in concrete pits or cast-iron basins.

4.17 Toxic Materials

If a significant amount of a toxic substance can be emitted from the equipment during a failure, fire or emergency/protective operation, an alarm system to alert personnel shall be included in the equipment. The toxic nature of the substances as well as treatment for exposure to it shall be included in the Operation and Maintenance (O&M) manual. Sellers shall provide battery safety data sheets and test data with the bid.

Coordination and approval from the local fire protection agency is required prior to acceptance by Owner.

4.18 Spare Parts and Equipment

Seller shall evaluate its design with regard to failure rates, effects and BESS reliability. Seller shall provide a recommended spare parts list, including prices and availability, as part of his proposal. Spare parts that are readily available from stock and available within sufficient time to meet the required availability shall be considered off-the-shelf items and not required as spare parts in stock at the site. These parts shall be listed and so noted on the spare parts list. Seller shall also identify spare parts that Seller recommends should be stocked locally to ensure prompt repair due to any failure that can be reasonably expected, considering the length of time required to obtain replacement parts. Owner will determine the need for and purchase separately all spare parts.

All spare parts for equipment covered by this Technical Specification shall comply in all aspects with the requirements of this Technical Specification. This includes documentation identical in kind and format to that required for the original equipment or material. Each of the spare parts shall be fully identified by reference to the spares list, part number, cost, and manufacturer drawing number.

If Seller, his suppliers, or sub suppliers cease manufacture of any of the spare parts, or if for any reason any spare part will become unavailable at any time during the Design Life of the facility, as specified in Table 1, Seller shall notify Owner in writing at least 180 days prior to the unavailability of such spare parts. Seller shall provide Owner the opportunity to purchase sufficient stock of spare parts to support the system for its expected life.

The initial complement of equipment shall include a supply of chemicals as may be needed to neutralize small electrolyte spills.

Seller shall provide, receive, store locally, distribute and restock spare parts, materials, test equipment, instruments, tools, and consumables required for start-up and operation of the systems and equipment within its scope until Substantial Completion.

4.19 Project Access

4.19.1 Construction Access

Seller shall abide by all load limits established by the applicable state department of transportation.

Seller shall be responsible for providing, operating, and maintaining equipment, services, and personnel with traffic control and protective devices, meeting the requirements of the *Manual of Uniform Traffic Code Devices* as required, allowing traffic flow on haul routes and onsite access roads in a safe manner. Seller shall be responsible for any costs to comply.

Seller is responsible for construction of temporary access around areas of excavation and other construction activity, if necessary and as required.

4.19.2 Site Access

The Site access road shall be designed and installed by Seller. This design shall be based on sufficient soils and subsurface investigation by a qualified professional engineer licensed in the jurisdiction of the project to ensure that the constructed road will meet its intended purpose. The Design Life of the access road shall be 30 years (assuming annual maintenance). The Site access road shall be a gravel compacted road (unless local regulations specify otherwise) sufficient to satisfy the loading requirements of the equipment vendors and to provide all-weather access for operation and maintenance of the BESS. Site

access roadway design shall comply with local permit requirements and be appropriately graded for drainage.

Temporary construction roads and staging areas not connected to permanent roads (if any) shall be restored by Seller in accordance with permit requirements.

4.19.3 Onsite Roads

Seller shall provide a minimum setback of 20 feet between the perimeter fence line and any equipment or as directed by local authorities if more distance is required. This setback space may be used as a perimeter road.

For interior service roads as necessary, Seller shall allow a minimum road width of 10 feet between BESS containers and PCS/MVT equipment. Road surfacing shall meet local fire and emergency vehicle access requirements.

Roads shall have a minimum 75-foot inside radius, unless otherwise instructed by state or local requirements. A smaller turning radius may be approved with written approval from Owner.

4.20 Signage and Labeling

Permanent naming placards should be placed on all equipment, including inverters, combiner boxes, transformers etc. Naming on placards and/or tags shall match drawing naming convention. Security signage shall be in accordance with Owner requirements and meet current Industry Standards.

All cables shall be labelled to meet applicable codes and standards. All cables shall have a label affixed to the outer jacket with a Brady or equivalent cable marker at each termination of a type accepted by Owner before installation. Labelling will match the point to point drawings. Seller is required to place arc flash labels on all inverters, combiner boxes, and other equipment requiring such. A method for ensuring labeling is complete must be included in Seller's QC Inspection Point Program.

4.21 Surge and Lightning Protection

Seller shall provide a lightning risk assessment performed to Industry Standards by a certified lightning protection professional, as outlined in Section 4.21.2 External Lightning Protection System (LPS). The results of this assessment shall be the basis for determining the requirements and extent of the facility LPS and a surge protection system that provides protection of the batteries, DC power circuit, PCS, measurement control and communications systems, and other major electrical equipment including transformers.

4.21.1 Surge Protection

A staged, comprehensive surge protection system, inclusive of Types 1, 2, and 3 surge protective devices (SPDs), shall be incorporated as determined by the lightning risk assessment (A-3.7.1 Electrical Engineering) or as required by the PCS manufacturers in all relevant pieces of electrical equipment. Protection shall be provided within the inverter on both the DC and AC sides as required by inverter manufacturer. Additionally, surge protection shall be provided in combiner boxes, and measurement control and communication systems as determined by the lightning risk assessment study. Type 3 surge protection installed within that equipment shall be mounted on DIN rails and must have finger safe replaceable modules that can be exchanged without the use of tools. SPDs shall be applied on all power circuits (AC and DC) and all communications and control circuits in a coordinated, staged manner. The

operating status of the power SPDs shall include visual indication and shall be able to be remotely monitored by a set of integral contacts.

In addition to the performance requirements indicated above, all SPDs shall be compliant to the respective domestic or international standards, including, but not limited to, the following standards and guidelines:

- UL Standard 1449 3rd edition.
- IEEE Guideline C62.41.1-2002
- IEEE Guideline C62.41.2-2002
- IEEE Standard C62.42-2005
- IEEE Standard C62.45-2002
- IEEE Standard 1100-2005

4.21.1.1 SPDs Applied on AC Power Circuits

SPDs applied on AC systems must meet all the requirements listed above in this general section and must be specifically designed for and compliant to UL 1449 3rd edition. SPDs must be selected for the system voltage where they are to be applied. SPDs are to have a short-circuit current rating (SCCR) higher than the short circuit availability where they are installed, therefore not requiring external fusing. SCCR of 200,000 A is ideal.

4.21.1.2 SPDs for Measurement, Control, Instrumentation, and Communications Circuits

All critical non-power circuits are to be protected with appropriate DIN rail-mounted pluggable surge protection for the system they are applied. Surge protection bases are to permit signal continuity even if the SPD module is removed from the base.

4.21.2 External Lightning Protection System (LPS)

Based on the findings of the lightning risk assessment and/or the discretion of Owner, an external LPS may be required to be installed. If so, Seller shall provide an LPS to protect the overall Project from direct lightning strikes to any portion of it, including, but not limited to, inverters, outside cabinets, and buildings housing electrical equipment. The LPS shall consist of air terminals of proper height and spacing (using the rolling sphere method), properly rated and properly designed and placed down-conductors to assure safety of personnel during discharges, and a properly designed and installed ground system.

The systems shall be designed in accordance with the latest globally recognized standards for such designs, which are IEC 62305-1 and IEC 62305-3, or NFPA 780.

Grounding systems shall be in compliance with IEEE Standard 142-2007, IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems.

Designs are to be provided by a recognized expert LPS design firm, supplier, or professional engineer licensed in the state of the project and are to be submitted to Owner. All components of the LPS shall be in compliance with the selected system design standard chosen.

4.22 Design Package

4.22.1 Engineering Design Package

Based on the review of the Project Site and infrastructure, Seller shall design (or have designed by consulting engineers) a Project (including all layout, civil, electrical, and structural components) that will meet the required performance and that is capable of being operated in a safe, normal, reliable, and continuous manner as required by the Contract at all operating conditions and modes specified above. The system design shall comply with all applicable laws and regulations and applicable permits. Studies prepared by Seller's third-party consultants shall be provided to Owner for review.

The Engineering Design Package shall include all items:

- Studies related to the Project, such as the geotechnical engineering report and the lightning protection study.
- Schematic and preliminary designs.
- Design calculations.
- All drawings including mechanical, fire protection, HVAC, electrical, structural, civil, and construction drawings Site plans, schematic single lines, index and detail drawings.
- Project schedule.
- Product and manufacturer description information.
- Bill of Materials.
- Equipment details, descriptions, and specifications.
- Instrumentation and electrical lists, including preliminary circuit schedules.
- Layout and arrangement of equipment.

The Engineering Design Package shall be provided prior to commencement of construction.

4.22.2 Maintainability

Maintenance features shall be provided to optimize maintenance work. This shall include adequate space inside Project enclosures, adequate space around and inside DC racks removable panels in electromechanical enclosures, and positioning of equipment access to allow removal of equipment, and other features that facilitate material handling. Required maintenance activities during normal operations and how it impacts system SOC and performance must be appropriately considered.

4.22.3 Operability and Safety

The Project shall be designed for primary operation via its own autonomous control. The secondary operation shall be via remote dispatch centers and the Project shall also have the capability to operate via local panels for normal startup, operation, shutdown, and emergency shutdown capability for all BESS related equipment. BESS, balance of plant equipment, power conversion, instrumentation, controls and monitoring devices shall be designed for ease of operation and maintenance. Attention shall be given to adequate lighting, access, and ventilation of operational spaces.

The BESS and supporting equipment shall be operable from remote dispatch centers under all normal conditions including automatic startup and shutdowns as a load following mode of operation.

Where redundant equipment is supplied, the idle device shall be capable of immediately backing up the operating device. The switchover shall be accomplished automatically through a system local panel, or the BESS SCADA system.

“Single point of failure contingency” shall be incorporated into the Project design such that the loss of any single process device, instrument or switch shall not interrupt BESS availability to the grid. For example, all circuit breaker position switches shall employ two sets of contacts where those contacts are used for operational interlocks.

The target Minimum Availability of the BESS is stated in Table 5 and should meet or exceed this amount during periods of expected tasking. This includes expected maintenance outages. Seller shall provide their calculation of the BESS availability and the fraction of the power and energy available during various types of service.

5.0 BESS FACILITY INFORMATION

The major equipment items shall include a battery, four-quadrant bi-directional PCS, MV step-up transformer, and local and remote control/monitoring equipment. Additional equipment shall include battery monitoring system, harmonic filters, HVAC system, fire suppression system, auxiliary cooling systems, wiring, connectors, protective devices, grounding, junction boxes, enclosures, instrumentation, foundations, temporary supplemental power supply connections, and all other items needed for a fully functional, utility interactive BESS, installed to meet the requirements set forth in this Technical Specification.

The BESS shall be designed to produce low-cost power capacity, with low-cost energy storage as a significant secondary factor. Costs include initial cost as well as overall BESS efficiency, cell life, disposal and replacement cost, maintenance costs and other contributors to life-cycle energy cost. The BESS shall also be designed to have high reliability, Design Life as listed in Table 1, and designed for unattended operation with 24-hour remote monitoring and control by Operator in addition to Owner’s SCADA system.

The failure of any single system component, except the main step-up transformer, should not affect the performance requirements described in [Section 5.1](#). Seller shall provide a system with all necessary component redundancy, diversity and margins to ensure rapid return to service in the event of any major component failure.

5.1 BESS Technical Objectives

The BESS shall be “Utility Grade.” This means that all equipment shall be expected to last through the Design Life with only typical routine maintenance and planned consumable goods. The energy storage modules will change in chemistry and can be addressed with a mix of replacement and augmentation.

5.1.1 Project Objectives

The overall objective of this Project is to meet the use cases called out in section 2.0 and optimize the priority of the system operation for revenue and grid requirements as shown in Table 1 below.

TABLE 1: BESS PROPOSED BASE CASE PERFORMANCE REQUIREMENTS

Rated Continuous Discharge Power (MW)	Project Specific
Duration (hr)	4.0
Power Factor range (leading to lagging)	+/- 0.9
Output Voltage Range (pu)	0.95 pu – 1.05 p
Output Frequency Range (Hz)	60 /59.0 Hz – 60.5Hz
Rated Continuous Charge Power (MW)	Project Specific
Maximum Charge Power (MW)	Project Specific
Expected number of daily full charge / discharge cycles	0-3 daily
Maximum Inactive Period	4 weeks
Battery Modules Minimum Component Life (years)	15
PCS Minimum Design Life (years)	20
BESS Minimum Design Life (years)	20
Minimum Availability (%)	95%

5.2 BESS Availability

For all BTA bids, as a part of their RFP bid response, Seller is required to provide Appendix A-10 Plant Performance Guarantee/Warranties. Seller shall design, engineer, and furnish equipment with the objective of producing a BESS system that will meet or exceed stated guaranteed energy availability performance, measured at the point of interconnection, based on expected equipment availability and degradation consistent with Seller’s bid and these specifications.

5.2.1 BESS Definitions

For the purposes of calculating outages, the BESS is defined as all equipment within Seller’s scope of supply and shall apply under all operating scenarios. The following definitions shall be used for describing the availability and reliability of the BESS:

- Accountable BESS outages are outages caused or necessitated by the BESS equipment that result in reduced capacity or loss of essential function of the BESS system. These outages may be initiated by failure of components, loss of battery capacity, the operation of protective devices, alarms or by manual action. Such outages include:
 - “Forced Outage” means NERC Event Types U1, U2 and U3, as described in the Appendix E-2 PPA, Exhibit J, and specifically excludes any Maintenance Outage or Planned Outage.
 - “Maintenance Outage” means NERC Event Type MO, as described in the Appendix E-2 PPA Exhibit J, and specifically includes any outage involving ten percent (10%) of the Net Output of the Facility that is not a Forced Outage or a Planned Outage.
 - “Planned Outage” means NERC Event Type PO, as described in the Appendix E-2 PPA Exhibit J, and specifically excludes any Maintenance Outage or Forced Outage.
- Accountable BESS outage duration is the elapsed time of accountable BESS outages from the instant the BESS experiences reduced capacity or is out of service to the instant it is returned to service or full capacity. If the BESS is out of service but determined by Owner to be available for service even if Owner elects not to return the equipment to service, such time will be discounted from the outage duration.

- Availability is the percentage of real time, measured cumulatively from the data historian, that the BESS is available during the availability guarantee period. The availability guarantee period for the project shall be proposed by the Seller in their submission of Appendix A-10 Plant Performance Guarantee/Warranties. Availability shall be calculated as follows:
 - $[1 - (\sum \text{accountable BESS outage durations in hours} / \text{guarantee period in hours})] \times 100$
- The capacity of the BESS is the maximum alternating current (AC) power transfer level expressed in both MW and megawatt hours (MWh) at the point of interconnection. The BESS shall be in an accountable outage if either the maximum required output (MW) or the required duration at maximum output (MWh) cannot be met.

5.2.2 Acceptance

Title and ownership shall pass to Owner upon written acceptance of the BESS system for operation. Maintenance responsibility shall remain with Seller until the system meets the criteria of the availability guarantee period set forth in Section 5.2.3 - Availability Guarantee. Final acceptance of the BESS will not be granted until all provisions of the Technical Specification have been met, the availability guarantee period has been successfully completed, all training is complete, and all required documentation has been received.

5.2.3 Availability Guarantee

Seller is required to provide the completed Appendix A-10 Plant Performance Guarantee/Warranties as a part of the RFP response, which may include an availability guarantee. The availability guarantee period for the Project, during which the performance of the Project will be observed to determine fulfillment of the above requirements, will start at Substantial Completion and it will continue for a period proposed by Seller in their submittal of Appendix A-10 Plant Performance Guarantee/Warranties. For the purposes of calculating outages, the Project is defined as all equipment within Seller's scope of supply.

Seller shall install the necessary communication equipment to monitor the Project remotely and respond to alarms and outages. Outage reports will be provided by Seller and verified by Owner.

During the availability guarantee period, operation records will be collected of the number and duration of outages and the total energy delivered. Such records will be obtained from the information gathered and stored by the Project control system supplied by Seller as described elsewhere in these Technical Specifications.

Seller shall prepare a response plan for maintenance and repair of the Project during the availability guarantee period. The response plan shall address the method of detection of required maintenance or repair as well as the method of accomplishing such actions. If subcontractors are used, the plan shall list specific subcontractors Seller proposes and the level of training provided to them.

If actual availability is below the specified level proposed in Seller's submittal of Appendix A-10 Plant Performance Guarantee/Warranties, Seller shall, at no cost to Owner, analyze the situation and provide corrections and modifications to meet the availability requirements in addition to liquidated damages. The availability guarantee period shall then continue until the later of 1) [18] consecutive months of operation at or above the availability requirement or 2) the term of the availability guarantee, as defined in Section 5.1 - BESS Technical Objectives, is achieved. Seller's commitment to provide the maintenance services and repair or replacement of parts during the availability guarantee period shall not be restricted by the terms and conditions of original manufacturer's warranties on individual components of the Project.

Seller shall test performance according to Section 8.5, Acceptance and Performance Testing. Seller has verified the required availability of the BESS, all defective and spare parts have been replaced, all training is complete and all final documentation including as-built drawings has been received.

5.3 BESS Performance Guarantee

Seller is required to provide the completed Appendix A-10 Plant Performance Guarantee/Warranties as a part of the RFP response. Seller shall state in their proposal, the specific factors used in determining the performance guarantee, including the number and type of events assumed in estimating module life. Seller shall also provide a description of how the performance and life of individual modules relates to the performance and life of the entire battery.

In addition, Seller shall provide a detailed description of any environmental or planned maintenance requirements on which the performance guarantee is based. Information provided shall include the frequency of such planned maintenance actions and estimated person-hours to complete each task. Alternatively, Seller may retain planned maintenance responsibility for the battery portion of the BESS until the capacity guarantee has been met.

Seller shall also furnish a curve or table and data showing how certain required parameters impact the number of discharges or the total energy delivered and the degradation rate. The table shall demonstrate that the installed capacity and energy proposed by Seller are available throughout the entire BESS life cycle. The initial installed capacity and energy, and annual performance degradation rates shall be provided.

Owner expects to perform a rated capacity discharge test once per year to determine compliance with this requirement. This test will be conducted at rated frequency and voltage at the point of interconnection within the specified normal range.

5.4 BESS Life Expectancy Warranty

The guaranteed life expectancy shall be based on the system studies performed by Seller and the outage information and operating descriptions contained in this Technical Specification. Seller shall warrant that the BESS will perform in accordance with the guaranteed life expectancy represented in Table 1.

Minimum equipment and EPC warranties are as follows:

Scope of Supply	Minimum Term	Warranty
Batteries		Time and materials
Inverters	10 years	Time and materials
Transformers		
EPC		
Balance of System	5 years	

All equipment warranties shall be negotiated so that they can be assigned to Owner upon project acceptance.

5.4.1 Degradation

A report detailing the annual expected BESS degradation will be required to show system capacity over the lifetime of the BESS site. This report will include:

- Battery module capacity
- Charge and discharge limits
- Battery module expected degradation based on use case
- Proposed augmentation needed to maintain POI power level (to be performed at Owner's discretion)

In addition, an annual report will describe commercial operation year performance prior as described in Section 5.6.

5.4.2 Augmentation

It is typical for augmentation to be assessed at relevant time intervals based on battery degradation to keep battery performance above Owner set minimum capacity for the lifetime of the project. For this RFP, Owner does not require Seller to include costs for augmentation in Seller's RFP response. However, it is required for Seller to provide the battery degradation parameters for Owner to assess.

5.5 BESS Power and Energy Ratings

The BESS shall be nominally rated based on project specifics at a power factor determined by the requirements of the utility, with four quadrant (full power circle) operation, AC power output and 4 hours duration or as required to meet the operating scenarios as described in this specification. The requirements for VAR support shall be as described below. This power shall be measured at the Revenue Metering Point on the high side of the step-up transformer and as well as on the low side of the step-up transformer for Owner's monitoring purposes. Losses and power consumed by all required BESS auxiliary systems, including the HVAC, shall be subtracted from the gross power measured to determine the net power delivered.

The rated capacity at the end of useful life shall apply to the normal voltage and frequency operating range as specified in Section 3.4 - Electrical Design Parameters. In addition, the BESS shall be capable of providing adequate energy to prevent load shedding under N-1 conditions on Owner's system and operating scenarios described in Section 5.6 - BESS Operation.

5.5.1 Overload Capability

Seller shall provide, a curve showing the inherent overload capability (if any) of the proposed BESS as a function of time. It is not a requirement to design specific overload capability into the BESS.

5.6 BESS Operation

For all BTA bids, as a part of their RFP bid response, Seller is required to provide a completed Appendix K General Services Contract-Operations & Maintenance Services for Project.

Whether Seller is awarded the O&M contract or not, the BESS will require 24-hour control and oversight. All equipment warranties shall be negotiated so that they can be assigned to Owner upon project acceptance.

The BESS shall be capable of operating in a completely automatic mode, as selected by Owner's system operations or through a local system interface and shall be capable of four quadrant (full power circle)

operation to provide for peak power limiting operations, potential hybrid renewable energy plant smoothing, charge/discharge operations, VAR support, and other operating support, as described in this Technical Specification. The BESS controls shall also allow for manual (local and remote) setting of all operating states and modes.

The BESS shall be designed to provide continuous control of real and reactive power over its entire operating range. The BESS shall appear to the power system to be a continuous control device and one that does not exhibit a step change in its net output characteristic during start-up or as it varies over its operating range. However, nothing in this section shall prohibit the use of mechanically or electronically switched devices for VAR support.

Seller shall specify, for the type of battery proposed, the method used to determine the point where further discharge is no longer practical or safe and the battery must be recharged before further use. Examples of common methodology are discharge cutoff voltage or the maximum amp-hour capacity that can be reliably discharged. Throughout this Technical Specification, the term discharge limit shall be used to mean Seller specified methodology.

The BESS operating functions shall be programmed in a higher-level programming language and made available to Owner so that software modifications can be made or new functions can be added if the need arises at some point in the future. Any required supporting software such as compilers and linkers shall also be made available to Owner.

The operating functions described below will be limited and confirmed with the battery vendor by the charge and discharge limit to prevent damage to the battery. Termination of any operating scenario by the discharge limit, without reaching rated capacity discharge, will be deemed a failure for the purposes of calculating availability.

A detailed annual report shall be provided by the Seller on the anniversary of commercial date of operations including the degradation of the BESS for the commercial date prior. This report shall be used for commercial and warranty purposes during the operational phase.

The following sections discuss common inverter control functions that shall be implemented in the BESS as part of the local and remote automatic BESS controls.

5.6.1 Real Power Controls

- Direct Charge/Discharge Storage - This is a basic function that can be used to discharge or recharge the BESS to a specified state of charge (SOC) and at a specified rate.
- No-Grid-Charging Mode – System should accommodate programming times and conditions under which grid charging will not be active.
- RPS: Real Power Smoothing - This is a real power control mode function for the BESS that could monitor the potential hybrid renewable energy plant real time power output for fluctuations. Although this functionality is a lesser priority, the BESS should be capable of responding to smooth out the renewable systems fluctuations and mitigate any power quality issues due to renewable systems output variability. The BESS response shall be capable of smoothing the net power output from the combined renewable systems and BESS while also preserving the BESS available stored energy.

5.6.2 Reactive Power Controls

If reactive power is for the Facility, it will be based on the point of interconnection agreement and the BESS services agreement identified by PacifiCorp Transmission. Below are examples of what may be required under this section:

- Direct Voltage Control – In this function the BESS shall output VARs to control the POI voltage to a specified setpoint voltage and a specified droop, and with a specified maximum and minimum kVAR range which shall not be exceeded. The BESS shall be normally operated with voltage control enabled.
- Watt-Var Function – In this function the BESS shall actively control its reactive power output as a function of the real power output. The reactive power output follows a user defined Watt-Var or P-Q curve. The Watt-Var curve is a piece-wise linear user defined curve entered as X,Y point pairs where the x-axis is the power output and the y-axis is the corresponding VAR output.
- Function CV: Constant VARs – This function allows the BESS to produce a constant VAR output at a specified level.
- Fixed Power Factor Function – This function allows the BESS to produce or absorb power with a user entered constant power factor. The power factor range is +/- 0.00 to 1.00.
- Watt Power Factor Function – In this function the BESS actively controls the BESS power factor as a function of the real power output of the BESS. This function utilizes a piece-wise linear curve defined by X, Y point pairs, to determine the power factor of the BESS output at any BESS real power output.

5.6.3 Miscellaneous and Support Functions

- Scheduling Function – This function is used to perform the real and reactive control functions via a time-based schedule and/or a load-based schedule. The Schedule function can define when different X-Y curves become active and what the ramp rate will be when transitioning between scheduled functions. When more than one function is active for Real Power or Reactive Power control then the schedule shall define a priority order for the functions.
- Event Logging and Reporting Function – this function shall be used to record any protection events triggered by the inverters including but not limited to i.e. over current, over voltage, over temperature, sequence of event reporting (SER), etc.
- Status Monitoring Function – this function shall include voltages, SOC, Inverter Status, Usable Energy, BESS rack and module temperature, Present Operating Mode, Inverter Active and Reactive Power output, power factor, present line frequency, Connect/Disconnect Status, Operating Time, Connected Time, and possibly other BESS information.
- Function Connect/Disconnect – This function shall be implemented by two sets of commands, one being a virtual command and the other being a physical command. The virtual Disconnect command sets the real and reactive output of the BESS to zero. A physical Disconnect provides galvanic isolation between the inverter and the grid. Additional details regarding Shutdown, Disconnect, and Operate modes are provided in the Sections 5.6.7, 5.6.8, and 5.6.9 below.
- LHVRT Function – This function shall be used to specify the low and high voltage ride through characteristics of the BESS. This function will be used to specify the trip, suspend and normal operation ride through voltage characteristics as per IEEE P1547, protection coordination studies, and Owner policies.

- LHFRT Function – This function shall be used to specify the low and high frequency ride through characteristics of the BESS. This function will be used to specify the trip, suspend and normal operation ride through frequency characteristics as per IEEE P1547, protection coordination studies, and Owner policies.
- Local/Remote Mode Function – This function when in Local Mode shall block commands by offsite sources to enable safe local maintenance and diagnostics and provide a means for secure on-site management. This function shall also allow the return to remote control.
- Automatic/Manual Mode – This function shall enable and disable the BESS from performing any of the automated control functions for real and reactive power. When switching from automatic to manual mode the BESS real and reactive outputs shall ramp down to zero at a specified ramp rate.

5.6.4 VAR Support

The BESS may be required to provide VAR support for voltage regulation under steady state and contingency operating conditions as described below. The BESS shall be capable of up to full rated output, when operating within the normal sustained voltage and frequency ranges specified in Section 3.3, Electrical Design Parameters, or as determined by Seller’s system studies. The voltage regulator controls shall not be affected by changes in system frequency. The voltage regulator controls shall include Owner selectable setpoint and droop characteristic and shall be capable of setting by Owner’s SCADA system or by a local control interface.

Nothing in this section shall be construed as limiting the ability of the BESS to operate in other modes as described in these Technical Specifications. The VAR output of the BESS may be limited based on remaining inverter capacity used for real power output unless supplemented as described above. The final VAR requirements will be provided to the successful Seller at a later date.

5.6.5 Charging

Seller shall specify charging requirements.

Seller shall design the charging system to ramp up from zero to the maximum capacity at an Owner selectable ramp rate as described elsewhere in these Technical Specifications to avoid shocking the system and allow generation to follow load easily. Seller shall provide a curve showing how demand from Owner’s system varies with time throughout the charging cycle. The BESS control system shall allow Owner’s dispatcher to initiate remotely Seller-specified/programmed charge cycle. The maximum demand required by the charging cycle shall be Owner selectable but shall not exceed Seller specified charge rate. Seller shall provide data showing how the recharge period varies as maximum demand decreases.

Seller shall also specify restrictions, if any, on operation of the BESS during any portion of the charge cycle. Seller shall provide a curve or table and data showing the state of charge of the battery as a function of time.

Automatic or programmed charge cycles shall be implemented to prevent SOC going below the battery vendor specified SOC limits whenever possible.

5.6.5.1 Charge Rate

There will be times when the BESS may be directed use overload charging capability (if any) exceeding the normal maximum charging rate for a short duration. Seller shall provide, a curve showing the inherent

overload capability (if any) of the proposed BESS as a function of time. It is not a requirement to design specific overload capability into the BESS. Overload charging will not be allowed if the batteries are charged above the Seller specified maximum charge level. When the BESS is nearing the Seller specified maximum charge level, the BESS charging shall ramp down linearly to zero at an Owner selectable ramp rate.

Seller shall provide adequate energy storage capacity and level of charge to accommodate the number of charge/discharge occurrences and total energy requirements described elsewhere in this Technical Specification.

5.6.6 Shutdown

The shutdown state shall be defined as battery DC contactor/breakers and PCS AC breaker open; non-critical power supplies de-energized; control system power may remain energized. This mode includes both normal shutdown and system trips requiring reset.

The control system shall initiate shutdown under the following conditions and remain in the shutdown state until a reset signal, either local or remote, is initiated:

- Emergency trip operation.
- AC circuit breaker trips (either main or PCS breaker) that isolate the BESS.
- Door interlock - initiate shutdown when the door to the PCS is opened. A “defeat” feature shall allow for maintenance. Interlocks shall be self-resetting.
- Smoke/fire alarm.
- Fire Suppression operation.
- Control logic trouble.
- DC ground fault - field adjustable setting.
- Failure to restart from disconnect state after automatic restart attempts.
- Remote disable (no reset required).

5.6.7 Disconnect

The disconnect state shall be defined as balance of plant (BOP) DC contactors/breakers and battery DC contactors/breakers and PCS AC breaker open; non-critical power and control system power energized.

Some faults or failures are expected to be transient in nature. The control system shall open contactors upon fault occurrence and may be manually started-up after an operational Seller determined manual reset or operational procedures agreed upon with the Owner. The control system shall go to the disconnect state under the following conditions:

- Synchronization Error - The PCS is unable to synchronize with the utility grid.
- Grid transient conditions (i.e., line switching or reclosure action).
- Utility voltage out of emergency operating range as defined in this Technical Specification.

- Utility line frequency out of emergency operating range as defined in this Technical Specification (field adjustable in 0.1 Hertz increments).
- Over-temperature on the battery, PCS, controls or other equipment.
- Excess explosive gas level.
- Owner and grid operator requested outages.

5.6.8 Start Operate

The Operate state shall be defined as all contactors/breakers closed and power available to flow to or from the BESS, PCS and transformer system to the utility system. Normal operation shall include all operating scenarios as described herein and discharge and charge modes. It also may include additional modes and sequences deemed necessary by Seller.

The BESS shall operate normally and automatically, with no faults detected or critical alarms as defined in Section 7.0.

5.6.9 Specific Operational Requirements

The BESS must not be damaged if there is no power available from Owner for a period of up to 168 hours with the BESS discharged to its lower operational limit. If the system proposed by Seller cannot meet this requirement, or if there are advantages to Owner to specify a shorter duration, Seller shall specify the maximum period that can be sustained without damage. The design shall include provisions for connecting a mobile generator to charge the batteries if the 168-hour requirement cannot be met.

Seller will indicate any required rest (neither charging nor discharging of the BESS) periods, their duration and what event they must follow or precede.

The BESS shall have appropriate functionality to accept an emergency disconnect input. Once the emergency disconnect is activated, the BESS project must immediately cease operation.

During manual operation of the BESS project, the system must indicate which, if any, autonomous functions are disabled.

Owner may impose rest intervals, such as charging off-peak and discharging on-peak. If no other tasking is done, this will create a rest period between each half cycle. This shall not adversely affect BESS performance and shall be included in capacity calculations. Provide the maximum rest period allowed (days, weeks, months).

If another condition requires special action for a string or the battery bank, describe this condition, how often it occurs, what event triggers the need for it, what it takes to correct it, whether the string/BESS remains available during this period to be approved by the Owner on a case-by-case basis. Examples are some type of reconditioning (holding at 100 percent DOD) or charge equalization (holding at 100 percent SOC).

The cells within a battery shall either be self-balancing, or their periodic balancing be handled automatically by battery module management electronics. Similarly, the modules within a string shall either be self-balancing or periodic balancing handled automatically by string/bank management electronics.

The BESS SCADA system shall store historic performance data metrics which describe the quality of system performance for each function over the last 168 hours minimum. Seller to ensure interface with Owner to offload reports at an agreed interval. Historical performance data metrics shall be stored for long term (2 years at minimum) for performance analysis and warranties.

The design must include prudent provisions for technology improvement. Battery modules shall allow for upgrade or replacement with higher performance cells to the extent practical. Where such changes are made to a battery module, all modules in that battery string must also be upgraded before the upgraded modules are placed into service.

5.6.10 Large Generation Interconnection Agreement Requirements

This section is intended to supplement but not replace any interconnection requirements determined by the Transmission Provider through the large generation interconnection process.

The main bus of the Project switchgear is to be connected to the POI. Protective relaying will need to comply with previously determined design from the Cluster Study.

The BESS project shall at all times monitor voltage at POI. If POI voltage deviates from the trigger voltage, the BESS project shall respond instantaneously with appropriate reactive power to ensure POI voltage is within the limits.

The BESS monitoring system shall always monitor system SOC and provide a mechanism to regulate SOC to ensure recovery of SOC after discharge events.

Design, procurement, installation and testing of the communications with the Owner's facilities shall be the responsibility of the seller in accordance with Owner's standards.

The BESS control system shall be configured to adhere to the communication systems requirements outlined by Owner and as further outlined in the Integrated Automation Equipment in section 6.1 of this document.

5.7 BESS Electrical Systems

Seller's scope of supply will end at the POI as defined in the Interconnection Agreement and as defined in the Points List. The electrical auxiliary power system shall be sized so that in no case it limits unit output power relative to the specified nominal capacities detailed in Table 1. Any revisions to the existing electrical power system installation (e.g., protective relaying) shall be designed for Owner coordination, safe operation and maintenance.

Load flow, dynamic stability, harmonic interaction, short circuit, voltage droop, coordination, grounding system safety and other studies shall be performed to properly determine equipment capacity, performance, withstand requirements, transformer impedances, etc. Seller shall submit design criteria, harmonic profile, short circuit characteristics, and calculations associated with these studies to Owner for review. Owner will provide data on existing Owner equipment and electric grid as necessary and will be available to facilitate Seller's performance of these studies.

Electrical systems shall not inhibit the BESS from complying with Frequency Ride Through (FRT)/ Voltage Ride Through (VRT) requirements per Owner's requirements listed in the Technical Specification.

Areas of the BESS enclosures subject to explosive concentrations of gases due to faulty systems, failure of ventilation, etc., shall be classified as hazardous locations in accordance with the latest NFPA criteria. Accordingly, electrical equipment in those areas shall be provided with the appropriate enclosures for the installed locations.

Electrical system design shall be performed under the supervision of a professional engineer. Specifications and drawings shall be sealed if required for submittal to regulatory agencies.

Electrical systems shall be equipped with protective relaying to trip circuit breakers for de-energizing and isolation of equipment in the event of electrical faults. Seller supplied relaying protection will include primary and back-up relaying and overlapping zones of protection. Seller protection relaying is to be coordinated with Owner's existing relaying. Areas of Seller supplied relaying will include, but not be limited to, MPTs, MV system, and DC/UPS systems. Protection relaying shall comply with Owner's requirements.

5.7.1 BESS AC System

The BESS AC system shall be connected to the main step-up transformer and connected to Seller switchgear as required.

The high side of the main step-up transformer bus connection shall be considered the BESS point of connection insofar as determining rated power, efficiency, VAR supply/consumption, harmonics and similar electrical parameters

Seller shall design the BESS for the maximum overall (charge/discharge) efficiency, including parasitic loads.

The BESS shall be designed for "0" MVAR exchange at the point of the BESS interconnection when operating in standby mode.

The BESS low side main circuit breaker must be open, or inverters blocked before closing the MV breaker(s) or switch(es). The BESS low side main circuit breaker or PCS shall be used for synchronization of the BESS to the MV collection system.

Seller shall design and install underground conduit, power cable and wiring from the BESS equipment to the main step-up transformer, MV switchgear, and instrument transformers.

Seller's protection system shall be capable of interrupting maximum fault currents (as determined by equipment and system studies) in any portion of Seller's scope of supply.

Seller shall, in close coordination with Owner, design, engineer, furnish and install all appropriate hardware (relay protection, SCADA, BESS controls, metering, etc.) and software.

5.8 BESS Enclosure

If a building is proposed, Seller shall design, engineer, and provide the building suitable for use to house the BESS and all indoor components. Seller shall provide on-site inspection, coordination with required building inspectors, and design review of the building required to accommodate the BESS commensurate with the BESS Design Life represented in Table 1, including but not limited to seismic events, wind loads or other controlling criteria.

The BESS building or enclosure, including PCS and Control Room shall be designed with the appropriate insulation to meet local building codes and ensure an energy efficient operation of the HVAC and/or ventilation system.

Limited geotechnical data is available for the Project location and included as a part of the specification. This data is provided for information only and may be used for bidding purposes. Seller shall provide all assumptions used as the basis for their bid.

The building or enclosure design shall consider materials on the basis of being maintenance free with a maximum durability and minimum cost for replacement and repair. Structural systems shall be engineered for ductile modes of failure to the extent possible.

5.8.1 Building Design

See Section 4.11.2 for Environmental loads that shall apply to the building.

- Structural Framing: Design primary and secondary structural members and exterior covering materials for applicable loads in accordance with the Metal Building Manufacturers Association's (MBMA) "Design Practice Manual"
- Structural Steel: For design of structural steel members, comply with the requirements of the American Institute of Steel Construction's (AISC) "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" for design requirements and allowable stresses.
- Light Gauge Steel: For design of light gauge steel members, comply with requirements of the American Iron and Steel Institute's (AISC) "Specifications for the Design of Cold Formed Steel Structural Members" and "Design of Light Gauge Steel Diaphragms" for design requirements and allowable stresses.
- Welded Connections: Comply with requirements of the American Welding Society's (AWS) "Standard Code for Arc and Gas Welding in Building Construction" for Welding procedures.

Basic Design Loads: Include live load, wind load and seismic load, in addition to the dead load. All loads shall be based on the site-specific conditions and latest IBC, state and local codes.

- Live Load with Snow Load shall be based be in accordance with IBC and the state local code.
- Wind Load: Wind load shall be based be in accordance with IBC and the state local code.
- Seismic Load: Seismic load applied shall be in accordance with IBC and the state local code,

- **Auxiliary Loads:** Include dynamic live loads such as those generated by suspended ceilings, sprinkler systems, electrical or mechanical systems or any suspended HVAC units, and exterior frames and doors.

Design: Each member shall be designed to withstand stresses resulting from the combination of loads that produce the maximum allowable stresses in that member as prescribed in MBMA's "Design Practices Manual".

5.8.2 Shipping Container or Metal Enclosure

If containers are proposed, it shall be in accordance with the International Standard ISO 1496-1 or similar standards.

5.9 Other BESS Facility Design Requirements

5.9.1 Hydrogen Mitigation

If applicable for the battery chemistry proposed, Seller shall calculate the maximum hydrogen emission rates for the battery and design a fully redundant forced-air ventilation/fan system accordingly to satisfy all codes and standards. These calculations shall be included in the proposal and shall include the safety margins used.

Seller shall provide and install hydrogen detectors and configure their control logic such that the hydrogen detection system alarms at one percent hydrogen concentration. Additional alarms and logic shall be provided to stop battery charging if the hydrogen concentration exceeds a safe level.

Any enclosures into which hydrogen may propagate during normal or abnormal operations shall be protected against accumulation of a flammable or explosive mixture of hydrogen and air, and against ignition by an external spark of any such mixture that may nevertheless occur.

If flooded electrolyte cells are used, Seller shall install flash arresters on the cells.

5.9.2 Emission Mitigation

As relevant to the type of cell proposed, Seller shall design the BESS and produce calculations which demonstrate that the cells, method of charging, HVAC and overall system design are such as to comply with the OSHA requirements for any and all emissions that may be present under all conditions, for example: thermal runaway.

5.9.3 Electrolyte Spill Containment

The BESS design shall mitigate electrolyte spills that are credible for the types of cells used. The design shall include features that contain electrolyte spills (to be emptied by contracted chemical disposal company in the event of a spill) and prevent discharge to local sewers or the surrounding site soils. The design shall address containment of water from the fire protection system, as applicable. Seller shall provide a Spill Prevention Control and Countermeasures plan and provide secondary containment where required.

The O&M manual shall address procedures to cleanup electrolyte spills, as applicable.

5.9.4 Painting / Logos

Seller shall paint the entire exterior of the building or enclosure with a finish coat in a color approved by Owner. The paint shall be suitable for application to the exterior material of the building or enclosure and the environmental conditions applicable to the site. Owner may supply image(s) of company logo for display on buildings or enclosures, after painting. Upon completion of painting, remove surplus material, rubbish, and debris resulting from this Work and leave the building and enclosures and Site in a neat, clean and acceptable condition.

All builders' hardware shall be suitable for the required functions. Hardware shall be of a durable grade consistent with the life expectancy of the facility and appropriate Federal specifications. Exit and fire door hardware shall conform to UL specifications. Installation of exits shall conform to NFPA No. 80.

6.0 SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA)

The BESS SCADA system will supervise and monitor BESS operations. The BESS SCADA System shall be compatible with the Owner's historian database and applicable protocols. The BESS SCADA system shall incorporate an RTU to send data to the Owner's historian.

SCADA pricing should include hardware and software (including all software subscriptions for first year of the project) for the Design Life of the Project. The monitoring system shall provide energy generation data, historical data, meteorological data, and all other applicable data to record operational history. The system shall be configured to sample data at a rate of once per second, with 1-to-10-minute average intervals and shall be configured to update the server at least once every 15 minutes. The system shall be configured to sample and store the 1-to-10-minute averaged interval data for a period of 24 months based on Owner preferences.

The monitoring system shall be capable of issuing alarms and notices to instantly alert the proper personnel in a timely manner, both locally and via Owner SCADA system, to potential system problems and outages. The monitoring system shall specify a module-level monitoring system capable of detecting that an abnormal module condition exists or may exist. Abnormal module conditions shall include all types of module failures that are commonly known to occur for the type of module used. At a minimum, the module monitoring system shall identify three alarm states as follows:

- The monitoring/alarm system or procedures shall alert Owner when the number of failed or inadequately performing modules or other Seller determined conditions indicates that preventative maintenance should be performed to keep the BESS at the specified performance levels. Maintenance required to correct problems identified may be performed at the earliest convenience.
- The monitoring/alarm system or procedures shall alert Owner when the number of failed or inadequately performing modules or other Seller determined conditions indicate that the BESS is in imminent danger of failing to meet specified performance levels or potential safety hazards exist. Maintenance should be scheduled as soon as possible.
- The monitoring/alarm system or procedures shall alert Owner when the BESS can no longer meet the specified performance criteria or safety hazards exist. Immediate corrective action is required to return the BESS to specified performance levels or correct safety hazards.

Seller shall include, in the Operation and Maintenance Manual, the recommended corrective action and maintenance procedures for each alarm level or observed condition provided. In all cases, the monitoring/alarm system or procedures will record data on the number and general location of failed cells, to expedite maintenance and module replacement. This recorded data shall be stored in non-volatile memory. Seller shall design the system so that the data can be retrieved remotely from Owners Transmission Provider Grid Operations either through the SCADA system or through other suitable means. Such monitoring/alarm system shall be part of the control system and alarmed to Owner's SCADA system. Additionally, the design of the system shall include an alarm journal of recorded alarms during a time period specified by owner/operator to pull historical alarms, filter by level, and sequence of events/alarms

The metering and monitoring system shall comply with the accuracy requirements and general standards set forth in IEC 61724 which shall have an accuracy of better than two percent of the reading.

All electronics shall be enclosed in a NEMA 4 enclosure or in a control room within the building. This system may be housed in the same enclosure as the security equipment. The data shall be collected at hardwired locations and transmitted. Seller shall test the installed communications system to demonstrate its ability to meet the requirements of its intended use. Testing shall be done when the final system interconnections have been made.

Seller shall furnish and install all materials and equipment necessary to complete the SCADA installation. The monitoring system shall be configured for automatic reporting of generation statistics required by Owner. The data shall be collected at the hardware locations and transmitted via a SCADA system to be provided and installed by Seller. Points to be monitored by the SCADA system shall include, at a minimum:

- Inverters
 - AC voltage
 - DC voltage
 - AC current
 - DC current
 - kiloWatts (kW)
 - kiloVARs (kVAR)
 - kiloWatt-hours (kWh)
- Metering
 - Monitor and store data from the Project meter on an interval between 5 and 20 seconds
- Transformers
- Video security and surveillance monitoring buildings or shelters
- Project switchgear

All monitored project electrical generation equipment (e.g., inverters, transformers, switchgear) shall be monitored to capture real time AC and DC electrical characteristics, including:

- Voltage
- Current
- Power
- Frequency
- Power factor

All monitored project electrical generation equipment (e.g., inverters, transformers, switchgear) shall be monitored to capture all diagnostic information, including:

- Temperatures
- Alarms

- Status indicators
- Fault states
- Communication Status

6.1 Integrated Automation Equipment

A proven and established instrumentation and control system shall be provided for the BESS. The Owner's control systems will supervise and monitor the BESS SCADA system while the BESS SCADA and Controller will act as the master.

6.1.1 Network Devices

6.1.1.1 Network Servers

Seller shall supply and install an Owner-approved and commercially-proven hardware and software package from vendors to implement the BESS SCADA System. The BESS SCADA System shall include one or more servers providing data gathering, operator interface, alarming, historian and other functions necessary to fully monitor and automate the BESS. The BESS SCADA System shall include hardware and software maintenance, including all software updates and subscriptions, for a minimum of 20 years. The BESS SCADA System shall be configured to sample data at a rate of once per second, with 1-to-10-minute average intervals and shall be configured to update the server at least once every 15 minutes. The BESS SCADA System shall be configured to sample and store the 1-to-10-minute averaged interval data for a minimum of 24 months. No EOL hardware to be used at time of installation.

The BESS SCADA System shall include a networked GPS synchronized clock capable of providing time synchronization signal to other devices in the BESS SCADA System using IRIG-B via coaxial cable.

All hardware and software shall support and implement standard, open protocols and datasets as specified in the MESA-ESS and MESA-DEVICE standards. No proprietary protocols shall be utilized. The BESS SCADA System shall retrieve data from all capable devices within the BESS and interconnect substation. The BESS SCADA System shall be capable of interfacing with Owner's external historian database protocol systems with full MESA-ESS Level 3 compliance.

All servers and functionality shall be implemented with redundant hardware and software in a hot standby architecture. Virtualized systems may be utilized to provide redundancy.

All hardware shall support redundant hot-swappable power supplies, hot-swappable solid-state drives, and RAID. All software shall be installed on a commercially available operating system with regularly provided security and reliability updates.

6.1.1.2 Routers, Switches, and Modems

Seller shall supply network hardware as necessary to connect all servers, relays, meters, and other equipment capable of communicating with the BESS SCADA System and Owner's corporate SCADA via external networks. All hardware shall be implemented using ruggedized industrial models unless housed in climate-controlled cabinets.

Seller shall supply one or more network switches as necessary to the BESS SCADA System network. Switches shall meet or exceed IEEE 1613 (Class 2). Switches shall support modern security functionality,

including VLAN, SNMPv3, RSTP, MAC-based port security, traffic prioritization, port mirroring, PTP time synchronization and pass through, user-based accounts, and dual power supplies.

Seller shall supply one or more network routers as necessary to connect the BESS SCADA System network to Owner's existing SCADA system via external networks. Router shall meet or exceed IEEE 1613 (Class 2). Router shall support stateful firewall with NAT, IPsec Virtual Private Networking, AES256, RADIUS centralized password management, multi-level passwords, SSH/SSL encryption, MAC-based port security, VLAN and SNMPv3, external user access logging for auditing purposes.

Seller shall supply modems as necessary to support the requirements of Owner and/or telecom utility to connect Owner's external network. Seller shall work with Owner to determine the number of internet connections needed and minimum bandwidth requirements. Seller shall work with Owner to determine a list of acceptable internet providers.

6.1.1.3 Operator Workstations

Seller shall supply two operator workstations. Each workstation shall consist of one monitor, keyboard, mouse, and PC for display of the operator interface. All components of the workstation shall be utility grade off the shelf components and capable of operating in the BESS environment. Each workstation shall include all software necessary to access the BESS SCADA System and all functionality of the installed equipment with licensing for a minimum of five years.

Remote operation workstation shall be included for the remote operations of the BESS site. This can be achieved via remote access VPN tunneling or SSL.

6.1.2 **Control and Monitoring Network**

6.1.2.1 Supervisory Control

Seller shall supply BESS controllers compliant with the communication methods, protocols and datasets provided in the MESA-ESS and MESA-Device standards. Any operational function of the BESS shall be capable of being controlled through the BESS SCADA System HMI via either local or remote operator workstations. Function parameters of any operating function shall be capable of being modified remotely or locally.

The control system shall be configurable and capable of hardware, firmware or software upgrades to provide additional operating functions in the future, if needed. Seller shall provide 10 percent additional or spare hardware capacity to add to or reconfigure the modes of operation via software applications, replacement firmware, expansion of the operating system memory or additional input/output and/or logic.

The control system shall have the necessary hardware and software such that it is compliant with the latest Owner standards and NERC CIP reliability standards for control system security requirements.

6.1.2.2 Integration Panels

Seller shall supply one or more integration panels within the BESS to install the PLCs, RTUs and other devices necessary to provide the required functionality of the BESS SCADA System. Each integration panel shall match the design of other panels as specified in this document, including power source, fuses, terminal blocks and other equipment necessary to the function of the BESS SCADA System. In the event

that there is loss of Auxiliary power, UPS shall be included in the design and installation inside the panels containing essential control and network hardware.

The integration panels shall provide operators with the ability to cut out active alarms via panel mounted test switches. The integration panel shall allow operators to connect to the facility network via standard Ethernet port for control or diagnostic purposes.

6.1.2.3 Interoperability

The BESS System shall communicate with Owner's corporate SCADA system via the communication methods, protocols and datasets provided in the MESA-ESS standard. Parameters to be communicated to Owner will include, but not be limited to: SOC, actual and contractual Up Reserve and Down Reserve capability when the BESS is responding under its frequency response, status of frequency response, power output in MW, energy output in MWh, available energy capacity in MWh, circuit breaker status, physical availability in percentage, voltage at Revenue Metering Point, and other telemetered information that Owner may require for system operations.

In the event of loss of communication between Owner and the BESS SCADA System, a provision must be made for the BESS systems to institute Owner's desired behavior in such circumstance, including but not limited to maintaining the previously communicated operating behavior, accepting a curtailment command from a local terminal, or a safe and linear shutdown.

6.1.3 Local Control

The BESS local controls and indication requirements shall be designed in close coordination and with an approval from Owner. The BESS shall include a local control panel or console within the BESS control room. The local control panel may consist of manual control switches, with redundant control actions initiated by digital signals through a local control console. Emergency trip push buttons shall be manually operated and not require action from the digital control, as described elsewhere in these Technical Specifications. As a minimum, the following operator controls shall be located on the local control panel:

- Trip/reset for the MV circuit breakers connected to the main step-up transformer.
- Trip/reset for the PCS circuit breaker.
- Trip/reset for the DC circuit breaker/contactors.
- PCS on/off.
- BMS on/off
- Reset toggle or push-button. When reset is initiated, the control system shall resume control and proceed to the appropriate operating mode.
- Reset cut-out selector switch to disable remote or local reset signals.
- A selector switch to manually set the operating state (i.e., shutdown, disconnect and operate) and to have the control systems set the operating state automatically.
- A selector switch to manually set the operating mode (i.e., VAR control, discharge and charge) and to have the control system set the operating mode automatically.
- An emergency trip pushbutton shall be located near the control panel and be suitably protected to prevent accidental operation.

6.1.3.1 Remote Control

All functionality available through the Local Control Units shall be available via the BESS SCADA System for remote operation via Owner's SCADA connection and remote operations center.

6.1.3.2 Application-Specific Control Panels

Where appropriate, additional control panels shall be provided to control specific functionality and applications of BESS equipment. All functionality available at these panels shall be available remotely via the BESS SCADA System.

6.1.4 Integrated Automation Controls

The BESS SCADA System shall consist of established manufacturers' components such as balance of plant instruments, equipment and integral controls, process input/output equipment and companion PID "loop" controllers, equipment specific controllers, communication processors and various other necessary devices. The integrated BESS SCADA System electronic components taken together shall form the interconnecting means and functions required to; control, monitor, alarm protect, interlock, diagnose, maintain, and safely operate BESS facilities installed under an assigned project scope of work.

The installed BESS SCADA System equipment shall perform the requirements of supervisory and discrete control, equipment protection and process interlocking, component diagnostic, upset analysis, maintenance guidance, and alarm/data logging or archiving functions. Seller selected BESS SCADA System hardware and software provided shall meet all desired modes and conditions of operation, assuring a safe, environmentally compliant, and economic operation of distributed energy storage capabilities described in the scope of work.

BESS related systems startup, manual operation, shutdown, response to upsets, and other operating conditions shall be performed by: 1) intervention by an operator in any specific BESS local control point; or 2) remotely from a central or dispatch center via HMI operator positions with necessary software for that BESS facility. Once desired and stable functional BESS mode has been achieved, autonomous and selected supervisory modes shall automatically maintain, within tolerance, that selected mode until override, or manual intervention by the central or dispatch operators is enabled.

Supervisory, monitoring and mode management required BESS functions shall be gained by means of both local and/or remote operator HMI interface workstations. Functions and logic of control, protection, and interlock of BESS components and support systems shall be distributed to independent-microprocessor based controllers or unit programmable controllers as feasible to minimize a single point of failure.

Likewise, interface and networking equipment between the BESS SCADA System and the separate process control and instrumentation packages of individual equipment shall be redundant for both communication functions and control power source. The intent of the Project is that the BESS SCADA System as a Supervisory and Control System HMI be designed and implemented for intuitive and understandable human interactions, high reliability, including critical system redundant BESS and PV control and sensing elements for specific BESS systems, to enable the desired degree of safe and automated operation.

HMI interaction and autonomous control of some independent auxiliary BESS systems may be as self-contained as practical. These independent systems may be controlled through integrated distributed controllers with local control panels incorporating a self-contained HMI. Alerts, alarms and process data along with auxiliary system diagnostic information shall be sent to the BESS System. Independent auxiliary BESS system controls shall be developed upon a common architecture, with data communications protocol compatible with the BESS SCADA System. Simplicity of operator interaction and ease of maintenance should be the design criteria.

The fundamental BESS SCADA System control logic and related functions shall be segregated to the extent that failure of one or more modes of operation does not result in the failure of other functions. The BESS SCADA System controller shall be designed with regard for redundancy in critical “control loop” functions so that no single component fault will cause the failure of process-controlled equipment in any one system or cause the BESS diagnostics and protection systems to malfunction.

BESS SCADA System indication, control and alarm element redundancy shall be provided for all events or upsets in critical “control loop” functions that may directly cause a self-protection system to activate. Redundancy in the BESS SCADA System controller architecture shall be configured such that selected standby process equipment shall alarm and start automatically upon failure of the primary system. Specific standby components shall have self-initiated automatic start capability field wired to function in parallel with fundamental BESS SCADA System control logic.

6.1.4.1 Control of Fire-Suppression Systems

Fire panel shall communicate with Owner’s SCADA via a standard protocol as listed in this Technical Specification. The minimum remote monitoring requirements shall be as follows:

- System State
- Fire/Smoke Detector Status
- Fire System Trouble
- Countdown to discharge
- Discharge Completed
- Manual Release Request
- Abort
- Alarms/Warnings

6.1.4.2 Control of HVAC Systems

HVAC system shall communicate with Owner’s SCADA via a standard protocol as listed in specifications. The minimum remote monitoring requirements shall be as follows:

- System State
- Area Temperatures
- Manual Control
- Alarms/Warnings

6.1.4.3 Control of Electrical Systems

BESS auxiliary electrical power shall communicate with Owner's SCADA via a standard protocol as listed elsewhere in this Technical Specification. The minimum remote monitoring requirements shall be as follows:

- Availability of normal and backup power sources.

6.2 **Instrumentation**

All metering, sensors, transducers and test points in the BESS shall be easily and safely accessible for calibration, maintenance and troubleshooting by Owner. Seller shall provide and install current and voltage test switches for each protective relay and for each set of metering within a CT circuit.

Seller shall provide a complete metering system for the BESS, including any required current and voltage transformers, to measure all required parameters at the Revenue Metering Point. The metering system shall be utility grade, revenue class accuracy in all components. The metering system shall be capable of measuring all required quantities, including but not limited to, BESS MVA in/out, BESS MW in/out, MWh in/out, MVAR in/out, MVARh in/out, voltage, frequency and harmonic content. Bi-directional quantities shall be measured and recorded independently. Metering of net quantities is not acceptable.

Seller shall furnish and install a complete metering system, including any required current and voltage transformers, for the AC station service. The metering system shall be utility grade, revenue class accuracy in all components. The metering system shall measure all BESS AC auxiliary station service loads, whether served from the primary or back-up AC station service system.

As a minimum, the BESS shall include instrumentation to measure and report locally and to Owner's SCADA, as applicable to the system proposed, the following:

- Battery voltage and current at sufficient points to monitor the condition of the battery.
- Cell temperature at sufficient points to represent the battery temperature.
- Charging system trouble alarms.
- Battery ground faults, including fault location.
- Temperatures in PCS, battery rooms or other critical cabinetry.
- Hydrogen detectors.
- Smoke detection.
- Fire suppression equipment.
- Battery leakage current-to-ground.
- Other sensors and equipment, as needed to provide for monitoring and alarms as determined by Seller.

As a minimum, the following meters shall be installed on the BESS local control panel and/or be displayed on the local control console. Meters shall be digital displays and shall be no less than 1.0-inch high. These metering signals shall also be supplied to Owner's SCADA system.

- Battery voltage overall and in each string
- Battery current overall and in each string
- PCS DC power overall and from each PCS
- PCS AC power (real, MW) overall and from each PCS
- BESS net AC power (real, MW)
- BESS net AC power (apparent, MVA)
- BESS net AC power (reactive, megaVARs)
- PCS Transformer High Side Voltage (each phase)
- BESS net AC Amperes (each phase)

As a minimum, the following indicator lights or similar displays shall be installed on the local control panel or console.

- PCS breakers status
- Status of all contactors and motor-operated disconnect switches (if applicable)

At a minimum, the following alarm functions shall have indicator lights or similar displays on the local control panel or console, as applicable:

- PCS breaker trouble alarms (to be determined)
- Grid voltage present
- Battery, PCS or other equipment over temperature
- Battery ground fault (DC ground current exceeds trip level)
- Smoke/Fire detection
- Fire Suppression Activation
- Excess hydrogen level detected
- Synchronization Error Shutdown
- Control logic trouble
- Blown fuse
- Building door(s) and/or gate open
- Battery under voltage
- Module under voltage
- String under voltage

At a minimum, alarms from the battery monitoring/alarm system, if automatic, shall be displayed locally at the control panel or console and Owner's SCADA system.

The BESS control and instrumentation systems shall include provisions for determining and storing in non-volatile memory, the sequence of abnormal events, trips and/or alarms that cause the BESS to go to a

disconnect or shut down state. In addition, the BESS shall include a dynamic system monitor or fault recorder to record the BESS output and waveform, and other Seller and specified parameters, for all events where the BESS is required to operate as described elsewhere in these Technical Specifications. Waveform recording shall be triggered automatically by Seller and Owner specified means and shall record a sufficient amount of pre-event data to analyze the event.

The BESS shall transmit all the above meter quantities and alarm/status indicators to Owner's SCADA system as described elsewhere in these Technical Specifications. Seller shall provide all transducers, interposing relays, or other equipment required to interface to Owner's SCADA system. Seller shall engineer and install wiring from the BESS equipment to the interface enclosure located in the control room. Such wiring shall be placed in conduits or wireway and shall be designed for ease of installation of future wiring by Owner.

6.3 BESS + Wind or Solar Controls

The control panel or console shall also include meters, indicators and display, as described in Section 7.2 - Instrumentation.

The control system shall include the capability to adjust all the \pm VAR supply criteria and discharge power levels for automatic operation. Seller shall include the capability to adjust voltage/current/time profiles for battery charging and battery end-of-discharge voltage, and/or program temperature corrections/adjustments to such parameters.

The control system shall provide for the automatic operation of fans, HVAC, automatic watering system and similar ancillary equipment.

As applicable to the design/layout of the BESS and Wind/PV plant (Wind or PV plant), there shall be one or more Emergency Trip push-button(s) strategically located within the battery compartment(s). The push-button(s) shall be suitably protected to prevent accidental operation. Operation of the push-button(s) shall turn off the PCS and open the DC contactor. There shall be a similar push-button(s) in the immediate proximity of the PCS that, when operated, shall turn off the PCS and open the PCS DC contactor and AC breaker.

If deemed convenient for maintenance, Seller may duplicate relevant control panel or console functions on the PCS.

Only balanced three-phase control of the BESS and Wind/PV systems is intended under this Technical Specification. It is not the intent to utilize the BESS and Wind/PV systems to correct for system unbalances. However, the BESS and Wind/PV systems shall be designed to operate in the presence of all unbalances that may exist on Owner's POI.

The BESS and PV control system shall be designed to provide for automatic, unattended operation of the BESS and PV systems. However, the control system design also shall provide for local manual operation and remote operation or dispatch of the BESS and Wind/PV systems from Owner's SCADA system.

All local and remote control and monitoring system components shall be housed in the separate control room in the BESS building or enclosure. The control room shall be insulated to meet local, State and national building codes and shall be furnished with redundant HVAC units.

The control system shall be designed such that the failure of any single component of the control system will allow the BESS and Wind/PV system to continue to operate at full capacity.

The control system shall be of digital design, shall be fully redundant using a hot standby design. The design shall be such as to prevent externally supplied, control panel or local signals from causing the BESS and Wind/PV systems to operate in an unsafe manner or in a manner that may damage the BESS, Wind/PV system, its equipment, or the connected utility system equipment. The BESS and PV systems shall include provisions for an orderly and safe shutdown, even in the absence of utility power.

One purpose of the BESS and Wind/PV systems is to assist Owner in responding to abnormal utility system conditions. Therefore, Seller shall design the control system, including its power supplies and connections to sensors, to be immune from utility voltage and/or frequency excursions, transients and similar events. The control system shall meet or exceed the surge withstand capability requirements of IEEE C37.90.

The control system also shall provide for setting the operating mode from a local control panel and by signals from Owner's SCADA system. Initiation and continued operation in any of the modes shall be as allowed by the state of charge of the battery, as well as the set operating state (i.e., shutdown, disconnect and operate).

All software provided by Seller shall recognize and automatically adjust for daylight savings time. The BESS and Wind/PV control system shall be designed to allow for software upgrades without taking the BESS and/or Wind/PV systems out of service.

7.0 TESTING AND START-UP

7.1 General

Seller shall furnish all supervision, technical personnel, labor, normal and special test instruments, tools, equipment, spare parts and consumables and materials required to perform the electrical, instrumentation and mechanical checkout and testing of components and equipment to verify the initial operation of the systems and equipment in Seller's scope.

Seller shall perform and successfully complete Commissioning Tests on systems and equipment in Seller's scope of supply to demonstrate the safety, operability and reliability of the systems and equipment within specified design limits according to the contract, engineering drawings, documents and specifications. All normal and necessary tests shall be conducted using written test procedures.

For each test scope, the Seller shall provide a manual describing the test to perform and criteria for success or failure. This shall require Owner review and approval. The Seller shall be required to provide a certificate for successful completion of each test scope.

Seller shall coordinate with Owner for all tests where the BESS is to be connected to Owner's power system. No such tests shall be performed unless permission by Owner has been granted. The tests must be performed in a fashion to minimize unanticipated disturbances on the power system. These tests may have to be performed during the night or low load periods for certain types of tests.

7.2 Tests

Seller shall be responsible for preparing test plans and testing the equipment and systems within their scope. The tests shall include, but are not limited to:

- Grounding System Testing
- Megger Tests
- High Pot Tests (or VLF)
- Functional Tests of all Controls, Protection Relays and Interlocks
- Functional tests of all Safety Devices and Alarms
- AC/DC Motor Tests
- Battery and UPS Test
- PCS Test
- Switchgear Test
- Control Circuit Checkout
- Instrument and Loop Calibration
- Fire protection test
- All manufacturer recommended equipment tests

Additional required procedures include, but are not limited to:

- Start-up Program Organizational Procedure
- Safety Tagging Procedure
- Confined Space Entry Procedure

7.3 Factory Testing of the Battery Modules

Seller shall test and submit test data for the modules designated for use on this project. At a minimum, the following tests shall be performed.

- Energy and Power Capacity
- Heat Generated
- Efficiencies
- Maximum hydrogen release rates
- As applicable, maximum noxious and toxic material release rates

Seller shall provide a test plan for all required module tests. Test data for production lots other than those being supplied for this project are not acceptable.

7.4 Factory Testing of the PCS

Seller shall develop and submit a factory test plan. As a minimum, sufficient tests shall be conducted to demonstrate that all controls, protective functions and instrumentation perform as designed and follows

this specification. Successful tests performed on scale models or analog simulators will be deemed to meet the intent of this paragraph. The tests shall demonstrate that the PCS is capable of synchronizing with - and operating in parallel with - the utility connection.

Factory testing shall include a burn-in test. For this test, the PCS shall be operated at a site ambient temperature of 120° F for eight hours. Alternately, the burn-in test may be performed separately on each component or subassembly of the PCS.

7.5 Acceptance and Performance Testing

Prior to BESS final commissioning, a Control System Acceptance Test developed by Seller and mutually agreed upon by Owner and the control system integrator will be performed by Seller. Software and simulated BESS conditions will mimic the performance functions with data logging of the results using scaled values. To the maximum degree possible the verification can be done during the factory validation test of the control system. On site verification should still be performed. Seller and Owner are expected to participate and will require a four-week notice or shorter if agreed on by both parties before the testing is performed.

Seller shall be responsible for demonstrating that all systems in Seller's scope of work meet the design requirements in accordance with the required performance functions.

Following commissioning and startup, the Provisional Acceptance Tests listed in Table 9 shall be conducted at the Worksite to demonstrate compliance with the required performance guarantees.

All measurement instruments and systems used in Provisional Acceptance Tests and Final Acceptance Tests shall be calibrated prior to beginning the tests and shall have calibration certificates demonstrating calibration.

TABLE 2: PROVISIONAL PERFORMANCE TESTS

TEST	COMMENTS
BESS Ramp rate tests	The test sequence consists of a ramp from zero output (MW and MVAR) to full MW discharge, then ramp to full MW charging, then ramp back to zero output. The real power MW ramps will be in conjunction with reactive output (MVAR) adjustments to avoid voltage violations on the system
SCADA tests	Verify indication of all metering, alarms and controls for BESS, control building, and connected systems.
Voltage regulation testing	Test the Facility to hold the MV bus voltage as Owner system permits and within the operating conditions of the Existing Facility.
Curtailment interface tests	With the Facility online, verify the response to various real-power set points and ensure the Facility decreases to appropriate levels.
Annunciator tests	Verify proper indication of annunciated alarms and conditions, including reset and acknowledgment of alarms.
RTU tests	Testing to verify the interface between Owners' Facility and the BESS.
BESS Acceptance tests Startup/shut down, including emergency shut down Instrumentation/control systems functions and diagnostics Power in/Power out tests (including a full discharge test and a discharge test of each string summed to the total discharge capability) Ramp power in and out Demonstration of response to variable power commands at various states of charge Verify lead/lag controller/droop response to System frequency changes Verify receipt/response to Owner's Automatic Generation Control signals Verification of analog BESS signals (i.e. status parameters) to Owner	

7.5.1 Function Verification

After the BESS has been installed, Seller will perform comprehensive testing on the entire system to verify compliance with all requirements of this Technical Specification. Owner may, at Owner's discretion, witness these tests.

Special attention shall be given to demonstration of utility interface with Owner's protection and SCADA/EMS control signals, circuits and functions. Testing shall include, as a minimum, measurement of harmonic content and power factor at full and partial power levels for both charge and discharge.

Operation of all control, protective relaying, and instrumentation circuits shall be demonstrated by direct test if feasible or by simulating operating states for all parameters that cannot be directly tested. Automatic, local, and remote operation will be demonstrated.

Seller shall perform any required modifications and repairs identified by the testing, prior to acceptance by Owner.

7.5.2 Performance Verification

The BESS performance verification shall include tests as determined by Seller to verify that the performance criteria specified in these Technical Specifications can be met or exceeded. Accordingly, Seller shall provide a total system performance verification plan to ensure correct BESS response to system disturbances and operating scenarios described in this Technical Specification. The tests shall include, but not be limited to a constant discharge at the rated power and energy requirements listed in Table 5, or to maximum discharge limit.

The total system performance verification plan shall be submitted to Owner for review and approval 60 days prior to BESS performance tests.

Each discharge cycle, as determined by Seller, shall be followed by Seller specified normal charge cycle.

Ramp up/down tests shall be performed to demonstrate the BESS meets the specifications for the different operating modes.

These tests shall demonstrate that the BESS capabilities, efficiencies, response, and features are as proposed by Seller.

Owner will not accept the BESS until all acceptance tests have been successfully completed and all provisions of the contract have been met.

7.5.3 Actual Operating Experience

It may not be possible due to system constraints to test all facets of the BESS function as part of the performance verification tests specified above. The actual operating experience of the BESS and PV system through the availability guarantee period shall be deemed an extension of the performance verification tests.

Actual operating experience will be documented through Seller furnished sequence of event recorders, digital fault recorders and other system monitoring equipment capable of identifying system disturbances and associated BESS performance. Additional information may be provided by monitoring equipment installed by Owner at other locations.

Documented failure or malfunctions of any BESS component during the availability guarantee period shall be deemed as a failure of the system commissioning test. Seller shall, at no cost to Owner, make the necessary repairs, replacements, modification or adjustment to prevent the same failure or malfunction from occurring again. The replacement of certain BESS components in response to a system failure may necessitate, at the discretion of Owner, the duplication of certain performance verification tests which shall be performed at Seller's expense.

7.5.4 Other Compliance Tests

Seller is responsible for obtaining before and after BESS installation measurements to ensure the Project complies with this Technical Specification in the following areas. Owner reserves the right to perform (or request others to perform), at Owner's expense, identical compliance test measurements for the following:

- Broadband frequency signal strength and noise voltage
- Harmonic voltages and currents
- Audible noise measurements

7.6 Commissioning and Startup

Seller shall provide a commissioning and startup plan for the Project.

Seller shall coordinate with Owner to develop an acceptable commissioning plan that includes a checkout and startup procedure. This work will assure: that systems are activated in a manner that is safe for personnel as well as for the equipment, that Seller work is complete and according to the contract documents, and that the systems perform as required by the contract documents and are ready to be turned over to Owner. As the construction and installation of the systems nears completion, Seller and Owner shall prepare punch lists and conduct system walk-downs, sub-system and system checkouts, startups, testing, and turnovers.

The final approved Acceptance Test and Commissioning Procedures shall, at minimum, include the following:

- Safety plan during startup and commissioning.
- Review of all QA/QC testing on the DC and AC sides of inverters.
- Detailed procedure for Project startup, including switching sequencing.
- Confirm testing and energizing inverters in conformance with manufacturer's recommended procedures; note operating voltages; and confirm inverter is performing as expected.
- Testing the system control and monitoring system to verify that it is performing correctly.
- Testing the communication system for offsite monitoring.
- Testing the Project metering and protective relaying to verify they meet utility requirements.
- Detailed procedure for interface and initialization with the grid and completion of all Transmission Provider forms to be provided prior to construction.
- Documentation of successful startup and commissioning procedure.

- Written notification submitted by Seller to Owner that the completion of Acceptance Testing and Commissioning has occurred.

7.7 Synchronization Procedures and Requirements

All testing shall be done in accordance with the LGIA and all the requirements to achieve electrical and mechanical completion of the Project.

7.8 Mechanical and Electrical Completion

Seller shall achieve Backfeed and assure that the Project has been synchronized with the Owner Interconnection Facility (in accordance with Transmission Provider's requirements) before conducting the Capability Verification, Guarantee Design Conditions, and Guaranteed Performance Tests.

Mechanical Completion means:

1. Equipment for the Project has been installed, including with the required connections and controls to discharge and charge the BESS into the system and produce electrical power.
2. All remaining electrical systems have been checked out and are ready for operation.
3. All electrical continuity and ground fault tests and all mechanical tests and calibrations have been completed.
4. All instrumentation is operational and has been calibrated in accordance with manufacturers' standards and guidelines and, where possible, loop checked.

7.9 Power Capacity Test

Prior to starting the energy capacity test, a power capacity test shall be performed. This test shall be performed after several days of continuous, regular use, and is to consist of a measure of the BESS' instantaneous power output capability under normal conditions. The test report shall consist of the following:

- Any agreed upon deviations to the test procedures.
- Instrument calibration sheets/certificates.
- Test data (manual and from the data acquisition system).
- Corrected test data
- Field notes
- Calculations
- Post-test uncertainty analysis
- Conclusions

Detailed test procedure shall be proposed and submitted by Seller for review and approval by Owner.

7.10 Energy Capacity Test

Seller shall submit its proposed plan to comply with the testing procedures 60 days prior to the date that Seller anticipates the commencement of the test. The objective of the Project Energy Capacity Test Procedure is to demonstrate to Owner that the Project has achieved the Energy Performance Guarantee (in MW_{AC}) under project test conditions. The submittal by Seller regarding the Energy Capacity Test Procedure shall, at a minimum, include a listing of test instrumentation, calibration procedures, test duration, type of data collected and collection frequency, test data collection procedures, and test reporting.

Seller shall be authorized in writing by Owner to begin the Energy Capacity Test Procedure, which will be to establish the full power rating of the Project. If the rating falls below the guaranteed output, Seller shall take measures to bring the Project up to the required rating.

If Seller shall complete corrective measures to bring the power rating up to an acceptable level, then retesting may occur following notification to Owner in writing.

Seller shall submit preliminary results of the Energy Capacity Testing within 24 hours of the conclusion of the test. Upon Owner's acceptance of the preliminary test results, Seller shall submit to Owner a detailed test report within 5 business days of the completion of the Energy Capacity Test. The test report shall consist of the following:

- Any agreed upon deviations to the test procedures.
- Instrument calibration sheets/certificates.
- Test data (manual and from the data acquisition system).
- Corrected test data
- Field notes
- Calculations
- Post-test uncertainty analysis
- Conclusions

Detailed test procedure shall be proposed and submitted by Seller for review and approval by Owner.

8.0 MAINTENANCE

8.1 General

Operations and Maintenance requirements will be in compliance with the O&M contract and Seller must meet the technical specifications and requirements of the equipment manufacturers. All equipment and construction documentation to be compiled into O&M manuals. Seller to provide O&M procedures to properly guide the Owner for safe operations of the site.

The Project shall be designed so that regular planned maintenance may be carried out by either Seller (under a separate contract) or by the Owner or by Others. Full Operations and Maintenance manuals for all equipment, the fully integrated facility and site tasks are required by the Seller.

8.2 Period of Performance

O&M period of performance shall be proposed. Minimum period is during construction up to transfer of ownership under BTA. O&M by Seller can extend after transfer of ownership under a separate contract.

8.3 Maintenance Prior to Acceptance

Prior to Final Completion of the Project Seller shall be responsible for maintenance of all components of the Project.

8.4 Maintenance Procedures

O&M procedure periods shall be identified to be consistent with manufacturer specified intervals. The BESS is intended to be unstaffed on a day-to-day basis. Expected O&M intervals for all equipment shall be provided.

All equipment planned maintenance for the period of the O&M Contract shall be identified prior to Commercial Operations date and presented in an O&M Plan, in accordance with Vendor's maintenance requirements.

9.0 TRAINING AND TOOLS

9.1 General

Seller shall provide training for the Project as specified below. Seller shall determine the content and duration for each training session. The suggested class durations in this Technical Specification are meant to illustrate the level of training expected. Performance evaluation testing of all trainees (i.e., a written test) is required for all classes. Seller's minimum requirements for Training are:

- Submit training plan
- Plan shall be reviewed and approved by Owner
- Lesson Plan for each topic shall be provided
 - Learning Objectives
 - Instructor Qualifications
 - Class room training objectives w/safety
 - Field training objectives w/ safety
 - Evaluation: Either test learning or demonstration
- Record keeping
 - Program
 - Each participant
- Certification of Training Completion

9.2 Operator Training

Seller shall provide the necessary training in proper operation of the Project and related equipment. This training shall be conducted after completion of the Project performance verification testing, but before system commissioning. It is anticipated that this session will last one to two days and the Seller will provide an outline and syllabus prior to the session. This session will be limited to a maximum of 20 people. Emphasis shall be placed on safety and hands-on operating experience interspersed with the critical background as necessary, including switching procedures and emergency response training.

9.3 Maintenance Training

Seller shall provide necessary training in maintenance of the Project and related equipment, if maintenance by Owner option is chosen. The maintenance training shall be scheduled after successful completion of the availability guarantee period. It is anticipated that this session will last one to two days and the Seller will provide an outline and syllabus prior to the session. This session will be limited to a maximum of 20 people. The maintenance training shall include, but not be limited to:

- Safety and grounding procedures
- periodicity of inspections and maintenance
- normal maintenance methods
- repairs and replacement
- diagnostic procedures
- equipment calibration
- re-energization
- special tests
- spare parts
- special tools

9.4 Training Schedule

Training schedule shall be agreed upon prior Commercial Operational Date

9.5 Tools and Equipment

Seller shall provide all “special tools and equipment” for maintenance and operation which are not normally or readily available. Seller shall submit a complete list of tools and equipment needed for erection/installation and maintenance and a list of special tools and equipment that will be provided, including prices. Special tools and equipment shall become the property of Owner at the completion of the BESS and PV installation. Owner reserves the right to purchase additional quantities of tools if desired.

9.6 O&M Documentation

Seller shall supply Owner with all manuals and/or handbooks (in printable electronic format) that provide, either in a single manual or handbook or collectively, complete operating and maintenance instructions (including inventories of spare parts and tools and parts lists with ordering instructions) for each major piece of equipment and system of the Project. O&M suggested schedule shall be coordinated among major equipment.

9.7 Turnover Documents Including O&M Manuals

Seller shall provide Owner with three paper copies and one editable electronic copy of all manuals.

Hard copy manuals shall be on standard 8-1/2" x 11" paper. Drawings and schedules which are to be bound into the manual shall also be 8-1/2" x 11" or 11" x 17" folded. Each manual shall be assembled and bound in heavy-duty post binders designed for rough usage. Light duty and ring binders are not acceptable. Binder capacity shall not exceed four inches, nor shall material included exceed the designed binder capacity. If the material to be furnished exceeds this capacity rating, multiple volumes shall be furnished. Binders shall be sized to the material to be contained, and capacity should not be more than approximately one-half inch greater than the thickness of material within the binder. All documents, illustrations, specifications, equipment data sheets, drawings, operating and maintenance instructions shall be in the English language. Use of the English system of units on documents is preferred; if the metric system of units is used, the drawing, data sheet, specification or illustration shall clearly indicate that the metric system of units is used. Each manual shall include a Table of Contents, front cover, side label and laminated index tabs and shall be of a consistent format.

The electronic copy of the manuals shall be organized in folders consistent with tabs in the paper manuals. Electronic copies of installation, operation and maintenance manuals shall be organized from the most general information in the top directory to the most specific information in the lowest level folder. The top-level folders shall include a document containing a directory of the subfolders describing the contents of each and every subfolder. Electronic copies of Installation, Operation and Maintenance manuals shall be organized by project, system, subsystem, equipment and components. Manufacturers' or vendors' electronic manuals shall be delivered as individual files. Seller shall not merge or combine manufacturer and vendor provided files containing manuals.

The manuals to be provided shall include:

9.7.1 Design Manuals

Design manuals shall contain the following items:

- Drawing List, Drawing and Specification Identification System, Units of Measurement and Formats
- System List and Equipment Numbering System
- List of applicable drawings
- System design requirements
- System and equipment descriptions
- Equipment lists itemizing type, performance and technical requirements.
- Overall performance data

9.7.2 Start Up, Operation and Shutdown Manual for the BESS, including comprehensive and complete procedures for checkout, startup and testing of the Project and will include as a minimum the following items:

- BESS start-up and shutdown procedures
- Startup schedule
- Startup organization chart

- Administrative procedures
- Data sheets
- Test procedures for all tests required for Mechanical and Electrical Completion and Final Acceptance.
- Turnover sequences and procedures
- Safety clearance procedure
- Work responsibility matrix

9.7.3 Installation, Operation, and Maintenance Manuals for the Equipment, including information typically supplied for equipment and/or systems such as the following items:

- System or equipment startup and shutdown procedures
- Description / design criteria of each item of equipment
- Nameplate information and shop order numbers for each item of equipment and components thereof
- Operating procedures and instructions for commissioning, startup, normal operation, shut down, standby and emergency conditions and special safety precautions for individual items of equipment or systems
- List of any start-up prerequisites
- Normal range of system variables
- Operating limits and hazards for all equipment and systems including alarm and trip set points for all devices
- Testing and checking requirements
- Effect of loss of normal power
- Tolerance of electrical supply frequency variation
- Final performance and design data sheets, specifications and performance curves for all equipment including test data and test curves
- Preventive maintenance schedule and maintenance instructions for equipment including standard and special safety precautions and special conditions that trigger non-scheduled maintenance
- Dismantling and assembly procedures for equipment with associated tests and checks prior to returning equipment to service
- Detailed assembly drawings to complement assembly procedures mentioned above including parts lists and numbers for replacement ordering
- Cleaning procedures, including frequency, equipment, resources needed, water source, etc.
- Specifications for any gases, chemicals, solvents or lubricants
- Drawing showing space provided for equipment maintenance for equipment and any fixed facilities for maintenance
- Methods for trouble-shooting

- List of maintenance tools furnished with equipment
- Installation instructions, drawings and details
- Vendor drawings as appropriate
- Installation, storage and handling requirements.

The above requirements are a minimum; however, requirements which are clearly not applicable to specific items or components may be deleted, however, any additional information which is necessary for proper operation and care of the equipment shall be included.

10.0 CODES AND STANDARDS

Codes and Standards will comply with the following codes and standards at a minimum.

- Aluminum Association (“AA”)
- American Association of State Highway and Transportation Officials (“AASHTO”)
- American Concrete Institute (“ACI”)
- American Institute of Steel Construction (“AISC”)
- Association of Iron and Steel Engineers (“AISE”)
- American National Standards Institute (“ANSI”)
- American Society of Civil Engineers (“ASCE”)
- American Society of Heating, Refrigeration, and Air Conditioning Engineers (“ASHRAE”)
- American Society of Mechanical Engineers (“ASME”)
- American Society of Nondestructive Testing (“ASNT”)
- American Society of Testing and Materials (“ASTM”)
- American Water Works Association (“AWWA”)
- American Welding Society (“AWS”)
- Applicable state requirements, including State Department of Transportation and Environmental Protection
- Avian Power Line Interaction Committee (“APLIC”)
- Code of Federal Regulations (“CFR”)
- Concrete Reinforcing Steel Institute (“CRSI”)
- Crane Manufacturer Association of America (“CMAA”)
- United States Environmental Protection Agency (“EPA”)
- Federal Aviation Agency, Department of Transportation (“FAA”)
- Federal Energy Regulatory Commission (“FERC”).
- Federal Highway Administration (“FHWA”)
- IAPMO Uniform Plumbing Code

- Illuminating Engineering Society (“IES”)
- Institute of Electrical and Electronic Engineers (“IEEE”)
- Instrumentation Society of America (“ISA”)
- Insulated Cable Engineering Association (“ICEA”)
- International Building Code (“IBC”)
- International Code Council (“ICC”)
- International Electrotechnical Commission (“IEC”)
- Modular Energy Storage Architecture (“MESA”)
- National Electric Code (“NEC”)
- National Electrical Contractors Association (“NECA”)
- National Electric Safety Code (“NESC”)
- National Electrical Manufacturers Association (“NEMA”)
- National Electrical Testing Association (“NETA”)
- National Fire Protection Association (“NFPA”)
- National Safety Council (“NSC”)
- North American Electric Reliability Corporation (NERC)
- Occupational Safety and Health Administration (“OSHA”)
- Post-Tensioning Institute (“PTI”)
- Scientific Apparatus Makers Association (“SAMA”)
- Sheet Metal and Air Conditioning Contractors National Association (“SMACNA”)
- Society for Protective Coatings (“SPC”)
- Telecommunications Industry Association/Electronic Industries Association (“TIA/EIA”)
- Underwriter’s Laboratories (“UL”)
- Uniform Building Code (“UBC”)

11.0 REFERENCE OWNER’S STANDARDS

Appendix “A-7” contains the following Owner standards that apply to this Technical Specification:

- RFP Appendix A-7.01: Attachment 1A Project Document Formatting and Requirements.
- RFP Appendix A-7.02: Attachment 1B – Project Document Deliverables
- RFP Appendix A-7.03: Computer Aided Design (PacifiCorp Energy) General AutoCAD/Drafting Standards (Specification DCAP876).

- RFP Appendix A-7.04.1: EBU PX-S01/S01A Substation Equipment—Power Transformer, All Ratings and Substation Equipment—Transformer-Specific Requirements
- RFP Appendix A-7.04.2: EBU PX-S02 Substation Equipment—Collector Substation Main Power Transformer
- RFP Appendix A-7.04.3: ZS-102 Two-Winding Distribution Transformer Inverter Step-Up Liquid-Immersed (Pad Mounted, Compartmental Type)
- RFP Appendix A-7.05: EBU SI-S04 Electrical Equipment—Insulating Oil
- RFP Appendix A-7.06: EBU SI-S02 Wind, Ice, and Seismic Withstand
- RFP Appendix A-7.07: EBU SI-S03 Contaminated Environment Protection
- RFP Appendix A-7.08: SP-TRF-INST Transformer, Oil-Filled Reactor and 3phase Regulator Installation Procedure
- RFP Appendix A-7.09: TD 051 Sign, Danger
- RFP Appendix A-7.10.1: 6B.5—Fence Application and Construction
- RFP Appendix A-7.10.2: Section 02810 Chain Link Fencing and Gates
- RFP Appendix A-7.10.3: Section 02815 Cantilever Slide Gate
- RFP Appendix A-7.11: 6B.6—Substation Grounding
- RFP Appendix A-7.12: GEN-ENG-RELAY-0001 Protective Relaying Standard
- RFP Appendix A-7.13: GEN-ENG-RELAY-0002 Arc Flash Hazard Standard
- RFP Appendix A-7.14: GEN-ENG-RELAY-0003 Relay Current Transformer (CT) and Potential Transformer (PT) Insulation Integrity Test
- RFP Appendix A-7.15: GEN-ENG-RELAY-1003 Thermal Plant Protective Relay Maintenance and Testing – PRC-005
- RFP Appendix A-7.16: Relay Testing and Commissioning Checklist
- RFP Appendix A-7.17: GPCP-EQPMNT-INST Generation Protection And Control Equipment Installation Procedure
- RFP Appendix A-7.18: GPCP-CT-INST Current Transformer Installation Procedure
- RFP Appendix A-7.19: PCF-CT-INST Current Transformer Installation Form
- RFP Appendix A-7.20: SG-001 Substation High-Voltage Warning Signs
- RFP Appendix A-7.21: EXHIBIT X Specification for Substation Equipment Installation, Testing and Commissioning
- RFP Appendix A-7.22.1: SV 251 Bird and Animal Protection for Miscellaneous Equipment
- RFP Appendix A-7.22.2: SV 001 Bird and Animal Protection – General Information
- RFP Appendix A-7.22.3: SV 002 Bird and Animal Protection – General Installation Instructions
- RFP Appendix A-7.23: Volume 8 Consultant Drafting Procedures and Standards (For Engineering Drawings)

APPENDIX O

PacifiCorp’s Company Alternative (Benchmark Resources)

Proposed 2022AS RFP Company Benchmark Resources

- PacifiCorp intends to submit up to thirty-seven (307) individual Benchmark Resources. Benchmark Resources will be comprised of Market Options and Owned Options. For each of the Market Options, PacifiCorp will have a purchase option to purchase the entire project outright. Market Option resources will not be eligible to be bid into the RFP separately as either PPA or BTA bids.
- These will be new greenfield resources that will be constructed across PacifiCorp’s transmission system.
- To be built on property either currently owned or leased by PacifiCorp, or on property that PacifiCorp will acquire rights to develop.
- Prospective Benchmark Resource sizes and tie-in locations as shown below:

Size (MW)	Technology	Benchmark Option Type	Location (POI)	Interconnection Status	Expected Life	Expected Efficiency	State
80	Wind	Market	BPA- Schultz Switchyard	N/A	30	TBD	WA
100	Solar	Market	Grandview 115kV Substation	N/A	25	TBD	WA
120	Wind	Market	Whitney 138kV Tap	LGIA Signed	30	32-36%	WY
150	Wind	Market	Colstrip Substation	LGIA Signed	30	33-37%	MT
150	Storage	Market	Troutdale Substation	N/A	20	TBD	OR
199	Solar	Market	Diamond Hill Substation	Studied in 2021 Interconnection Cluster	25	27-31%	OR
199	Solar	Market	Fry Substation	Studied in 2021 Interconnection Cluster	25	27-31%	OR
199	Solar	Market	Black Rock Substation	Studied in 2021 Interconnection Cluster	25	28-32%	UT
200	Solar	Market	Yamsay – Klamath 230kV Tap	N/A	25	TBD	OR
199.9	Storage	Market Owned	Clover Substation	Under study in PacifiCorp’s 2022 Interconnection Cluster Submitted on 4/1/22	20	89-92%	UT
200	Storage	Market	Mercer Substation	Under study in PacifiCorp’s 2022 Interconnection Cluster To be studied in 2022 Interconnection Cluster	20	TBD 85-90%	UT
200	Solar	Market	Mercer Substation	Under study in PacifiCorp’s 2021 Interconnection	25	28-32% 27-31%	UT

				<u>Cluster Studied in 2021 Interconnection Cluster</u>			
302	Solar	Market	Clover 345kV Substation	N/A	25	TBD	UT
330	Wind	Market	IPC- Boise Bench-Midpoint #2-230kV	N/A	30	TBD	ID
400	Solar	Market	Summer Lake-Burns 500kV Tap	N/A	25	TBD	OR
600	Wind	Market	Midpoint Substation	N/A	30	TBD	ID
600	Solar	Market	Borah Substation	N/A	25	TBD	ID
800	Wind	Market	Rogerson Substation	N/A	30	TBD	ID
30	Solar	Owned	Gunnison-Sigurd #1 Tap	LGIA Signed	25	27-31%	UT
35	Solar	Owned	Ponderosa Substation	LGIA Signed	25	28-32%	OR
5099	Solar	Owned	Horseshoe - Jensen 138kV Tap	<u>To be studied in 2022 Interconnection Under study in PacifiCorp's 2022 Interconnection Cluster</u>	25	<u>28-32% 27-31%</u>	UT
80	Solar	Owned	Bar Nunn Substation	<u>Submitted LGIA Signed</u>	25	26-30%	WY
100	Wind	<u>Owned Market</u>	Evanston-Anschutz Tap	LGIA Signed	30	31-34%	UT
119 <u>101.2</u>	Solar	Owned	Windstar Substation	<u>Under study in PacifiCorp's 2022 Interconnection Cluster Submitted on 3/4/2022</u>	25	19-23%	WY
160	Solar	Owned	Casper Substation	LGIA Signed; <u>Submitted</u>	25	26-29%	WY
178	Solar	Owned	Emery Substation	LGIA Signed	25	27-31%	UT
199.9	Storage	Owned	Aeolus Substation	<u>Under study in PacifiCorp's 2022 Interconnection Cluster Submitted on 4/1/22</u>	20	88-92%	WY
199.9	Storage	Owned	Anticline Substation	<u>Under study in PacifiCorp's 2022 Interconnection Cluster Submitted on 4/1/22</u>	20	88-92%	WY
199.9	Storage	Owned	Mona Substation	<u>Under study in PacifiCorp's 2022 Interconnection Cluster Submitted on 4/1/22</u>	20	88-92%	UT
199.9	Storage	Owned	Snow Goose Substation	<u>Under study in PacifiCorp's 2022 Interconnection Cluster Submitted on 4/1/22</u>	20	88-92%	OR
266 <u>48.4</u>	Solar	Owned	Shirley Basin Substation	<u>Under study in PacifiCorp's 2022</u>	25	20-24%	WY

				<u>Interconnection Cluster Submitted on 3/4/2022</u>			
450	Wind	Owned	Goshen-Jefferson Tap Goshen-Antelope Tap	To be studied in 2022 Interconnection Cluster	30	33-36%	N/A
4648.4	Solar	Owned	Dunlap Substation	Under study in PacifiCorp's 2022 Interconnection Cluster Submitted on 3/4/2022	25	17-21%	N/A
393	Pumped Storage	Market	Malin Substation	LGIA Signed	50	79-83 70-80%	OR
400	Pumped Storage	Market	New Loco Mountain Substation	LGIA anticipated to be executed in April 2022 Signed	50	70-8079-83%	NMT
500	Pumped Storage	Market	Rocky Reach-Columbia line (BPA or PSE)	BPA Interconnection Study in process	50	70-8079-83%	WA
500	Pumped Storage	Market	Oquirrh Substation	Under study in PacifiCorp's 2022 Interconnection Cluster To be studied in 2022 Interconnection Cluster	50	70-8079-83%	UT
199	Wind	Market	Union Gap – Midway 230kV tap	Under study in PacifiCorp's 2022 Interconnection Cluster	30	28-33%	WA
150-300	Wind	Market	New Loco Mountain Substation	Interconnection request currently being studied	30	33-38%	MT
87	Solar	Market	Mathington Substation	LGIA Signed	25	27-31%	UT
456	Wind	Market	Red Butte – Sigurd #2 345kV tap	Under study in PacifiCorp's 2022 Interconnection Cluster	30	27-32%	UT
153	Wind	Market	Bonneville-Goshen 161kV	Under study in PacifiCorp's 2022 Interconnection Cluster	30	31-36%	ID
206	Wind	Market	Goshen-Antelope 161kV	Under study in PacifiCorp's 2022 Interconnection Cluster	30	31-36%	ID
194	Solar	Owned	Dunlap Substation	Under study in PacifiCorp's 2022 Interconnection Cluster	25	15-19%	WY
96.8	Solar	Owned	Bowler Flats Substation	Under study in PacifiCorp's 2022 Interconnection Cluster	25	22-26%	MT
70	Solar	Owned	Emery-Clawson 138kV	Under study in PacifiCorp's 2022 Interconnection Cluster	25	29-33%	UT
125	Solar	Owned	Huntington – Pinto 345kV	Under study in PacifiCorp's 2022 Interconnection Cluster	25	29-33%	UT
199.9	Storage	Owned	Emery Substation	Under study in PacifiCorp's 2022 Interconnection Cluster	20	88-92%	UT
199.9	Storage	Owned	Emery Substation	Under study in PacifiCorp's 2022 Interconnection Cluster	20	88-92%	UT

<u>199.9</u>	<u>Storage</u>	<u>Owned</u>	<u>Huntington Substation</u>	<u>Under study in PacifiCorp's 2022 Interconnection Cluster</u>	<u>20</u>	<u>88-92%</u>	<u>UT</u>
<u>199.9</u>	<u>Storage</u>	<u>Owned</u>	<u>Huntington Substation</u>	<u>Under study in PacifiCorp's 2022 Interconnection Cluster</u>	<u>20</u>	<u>88-92%</u>	<u>UT</u>

- Benchmark Resource bids will include costs assumptions consistent with the main RFP document Section 6.C, and specifically Table 4, where the Company lists the characteristics which will be used to determine the Net Cost of benchmark bids. These inputs will be provided to the IEs for review and comment.
- PacifiCorp will administer a competitive supply solicitation(s), on a case-by-case basis, for the wind turbines, solar panels, and battery systems required for all Owned Benchmark Resources. Procurement of equipment for Market Benchmark Resources will be conducted by third-party developers in coordination with PacifiCorp.
- PacifiCorp will administer a separate competitive solicitation(s) to secure firm fixed pricing to engineer-procure-construct and commission the balance of plant for Owned Benchmark Resources. Agreements with contractors for engineering, procurement, construction, and commissioning for Market Benchmark Resources will be conducted by third-party developers in coordination with PacifiCorp.
- All projects are expected to be able to be placed in service no later than December 31, 2027 with the exception of long-lead time resources which will be bid with commercial operations dates no later than December 31, 2028.
- All solar generating resources noted above may be bid as collocated battery storage component up to 100% of the nameplate capacity of the solar project and a four (4) hour duration and may be bid separately as standalone solar subject to applicable bid fee requirements.
- Project efficiencies will be evaluated in coordination with experienced third-party engineers for Owned Benchmark Resources, and by third-party developers for Market Benchmark Resources in coordination with PacifiCorp.
- Transmission requirements, operating requirements, and dispatch requirements for Benchmark Resources will be evaluated pursuant to applicable Large Generator Interconnection Agreements and necessary Transmission Service Agreements for each resource.
- The Benchmark Resources will be constructed in compliance with PacifiCorp's specifications and technical standards.
- The Benchmark Resources will also include an operations and maintenance (O&M) building at each site or an addition to an existing PacifiCorp O&M facility.

- Benchmark Resources will include the following pro forma estimates for operations, maintenance and on-going capital expenditures:
 - Wind: 30 years
 - Solar & Solar plus Battery: 25 years
 - Battery: 20 years
 - Pumped Hydro Storage: 40-50 years (or federal license term)
- The Benchmark Resources costs will include allocated development costs, fees, permitting, project management and equipment costs.

APPENDIX S

~~Berkshire Hathaway~~**PacifiCorp** Energy Cyber Security Requirements Applicable to PPAs, Tolling Agreements and BTAs

Cyber security is an evolving issue with growing importance to the electric power industry. PacifiCorp has developed cyber security requirements which are included in Appendix S-1 **PacifiCorp Cyber Security Requirements** and will be required for all bid offerings in the 2022AS RFP for generating and energy storage resources.

~~Cyber security is an evolving issue with growing importance to the electric power industry. Berkshire Hathaway Energy is developing security requirements for PPAs, Tolling Agreements and BTAs, which will be for all bid offerings in the 2022AS RFP for folded into contractual documents prior to the market bid deadline on February 14, 2023.~~

APPENDIX S-1

PacifiCorp Cyber Security Requirements ~~Berkshire Hathaway Energy Cyber Security Attestation~~

As part of the notice of intent to bid process, PacifiCorp asks all bidders to review Appendix S-1 PacifiCorp Cyber Security Requirements and confirm compliance with, or provide a list of exceptions to, the requirements along with bidder's Appendix B-1 Notice of Intent to Bid due December 16, 2022. ~~November 17, 2022.~~

~~————Berkshire Hathaway Energy is developing a cyber security attestations document which will be required of all PPAs, Tolling Agreements and BTA bidders providing a Notice of Intent (NOI) to Bid due on November 17, 2023. Please go to the 2022AS RFP website prior to the NOI deadline to download the attestation:~~

~~<https://www.pacificorp.com/suppliers/rfps.2022-all-source-rfp.html>~~

PacifiCorp Cyber Security Requirements

1. Seller shall maintain security controls to protect the Company's networks, systems, software, Confidential Information, and Data no less rigorous than those set forth in the latest published version of ISO/IEC 27001 – Information Security Management Systems–Requirements and ISO/IEC 27002 – Code of Practice for International Security Management.
2. If providing a web portal or web service, Seller's web services shall use HTTPS/TLS version 1.2 or later for all content.
3. Seller shall encrypt all Company data while at rest as well as when in transit over the network.
4. Seller shall encrypt all Company-related file transfers at rest as well as when in transit over the network.
5. For responses above, Seller shall encrypt using NIST-approved algorithms and key lengths.
6. If Seller product or service allows for PacifiCorp login into Seller's systems, Seller shall support a federated single-sign-on (SSO) authentication for any PacifiCorp accounts, whether via web interface or mobile application. Seller must have the ability to support Azure Active Directory.

7. If Seller product or service allows for PacifiCorp login into systems, and Seller’s product or service does not support federated single-sign-on (SSO) authentication, Seller shall support multi-factor authentication compliant with NIST SP 800 63-3 Authentication Assurance Level 2. Seller will provide documentation that supports compliance and describe supported authentication mechanisms.
8. Seller shall ensure that emails sent by the Seller or by any Seller service while under the Agreement to the Company originates from a domain(s) with a published Domain-based Message Authentication, Reporting and Conformance (DMARC) policy of “reject” and with a published Sender Policy Framework (SPF) policy consisting of valid senders and a “fail” directive (-all). If the optional DMARC “pct” directive is used, “pct” must be set to “100”;
9. Seller shall ensure that email sent to the Company by Seller or by any Seller service while under the Agreement passes a Domain-based Message Authentication, Reporting and Conformance (DMARC) authentication check;
10. Seller shall ensure that email sent to the Company by Seller or by any Seller service while under the Agreement is signed by a DomainKeys Identified Mail (DKIM) 2048 bit key.
11. Seller shall ensure that email sent to the Company by Seller or by any Seller service while under the Agreement supports Transport Layer Security (TLS).
12. Upon request, Seller shall describe the process to disclose known vulnerabilities to the Company related to products or services provided as they pertain to the proposed service.
13. Upon request, Seller shall describe methods supplied to the Company to verify software integrity and authenticity for any software or patches provided by you as they pertain to the proposed service.
14. Upon request, Seller shall describe process for security event monitoring and notification/alert/response plans, including response to security incidents affecting the Company.
15. Seller shall notify the Company of a Security Incident, no later than 48 hours after discovery, to 515-281-2967 and GlobalSecurityOperations@brkenegy.com .
16. Seller shall coordinate responses to security incidents with the Company that pose a security risk to the Company.
17. Seller acknowledges that rights to any data provided by the Company shall remain exclusive property of the Company.

18. Seller shall not share data with third parties for unrelated commercial purposes, such as advertising or advertising-related purposes.
19. If remote access of any type will be required as part of the service, Seller shall fully describe requirements for remote access to the Company.
20. If remote access of any type will be required as part of the service, Seller shall conform to Company requirements for intermediate host methods for remote access, such as Citrix or Virtual Desktop,
21. If remote access of any type will be required as part of the service, and if a virtual private network is required, Seller shall terminate such remote access in a demilitarized zone network (DMZ). Seller shall not establish virtual private network connectivity to Company corporate networks, which shall be considered a prohibited activity.
22. If remote access of any type will be required as part of the service, Seller shall notify the Company when remote or on-site access is no longer needed by Seller representatives, where applicable.
23. Seller shall disclose facilities necessary to the bid product or service that is located outside the continental United States.
24. Seller shall disclose support staff used during the term of this Agreement located outside the continental United States.
25. Seller shall disclose third parties codependent upon to deliver the Company offering (such as third-party software, implementation, hosting, for example).
26. Seller shall describe methods to securely ship and deliver products to the Company as they pertain to the proposed service.

For Hosted or Cloud Services:

27. If Seller's service is comprised in whole or in part of a cloud-based or hosted services solution, Seller shall undergo, or commit to undergo in a future state, annual Statement on Standards for Attestation Engagements (SSAE) Service Organization Control (SOC) 2 Type 2 audits for the enterprise or covering the applicable scope of services for the term of the Agreement with the Company, as appropriate. Note that a datacenter audit alone will not be sufficient. Seller shall include an audit for datacenter/colocation provider for informational purposes.

28. If Seller's service is comprised in whole or in part of a cloud-based or hosted services solution, Seller's administrative access shall comply with NIST SP 800 63-3 Digital Identity at Authentication Assurance Level 2 or higher, where compromise of one factor does not contribute to compromise of the other factor. Seller shall have the ability to provide compliance documentation and describe supported authentication mechanisms.

PacifiCorp Cyber Security Requirements

Bidder to Check One:

 Bidder Agrees to PacifiCorp’s Cyber Security Requirements

 Bidder Has Provided a List of Exceptions to PacifiCorp’s Cyber Security Requirements

List of Exceptions, if any:

Acknowledged by:

Signature: _____

Bidder Name: _____

Title: _____

Date: _____