

Large Generator Interconnection  
Qualifying Facility  
**Facilities Study Report**

**FINAL**

Completed for

**(“Interconnection Customer”)  
TCS-27**

Proposed Point of Interconnection

**Terminal-Goggin-Grow 138 kV transmission line**

**August 25, 2021**

---

---

**TABLE OF CONTENTS**

---

1.0	DESCRIPTION OF THE PROJECT .....	1
2.0	STUDY SCOPE AND OBJECTIVES.....	1
3.0	STUDY ASSUMPTIONS .....	1
4.0	PROPOSED POINT OF INTERCONNECTION .....	2
5.0	SCOPE OF WORK .....	3
5.1	Generating Facility Modifications .....	3
5.1.1	INTERCONNECTION CUSTOMER TO BE RESPONSIBLE FOR.....	3
5.1.2	TRANSMISSION PROVIDER TO BE RESPONSIBLE FOR .....	7
5.2	Point of Interconnection .....	8
5.2.1	TRANSMISSION PROVIDER TO BE RESPONSIBLE FOR .....	8
5.3	Other.....	9
5.3.1	TRANSMISSION PROVIDER TO BE RESPONSIBLE FOR .....	9
6.0	COST ESTIMATE .....	9
7.0	SCHEDULE.....	11
8.0	APPENDICES.....	12
8.1	APPENDIX 1: HIGHER PRIORITY REQUESTS AND CONTINGENT FACILITIES.....	13
8.2	APPENDIX 2: PROPERTY REQUIREMENTS .....	14

## **1.0 DESCRIPTION OF THE PROJECT**

(“Interconnection Customer”) proposed interconnecting 60 megawatts (“MW”) of new generation to PacifiCorp’s (“Transmission Provider”) Terminal-Goggin-Grow 138 kV transmission line located in Salt Lake County, Utah. The project (“Project”) will consist of twenty-four (24) 2500 KVA SMA Sunny Central 2500-EV-US solar inverters for a total output of 60 MW at the POI. The Interconnection Request also consists of 30 MW of battery storage with no capability to charge from the Transmission Provider’s grid. The requested commercial operation date is December 31, 2021.

Interconnection Customer will operate this generator as a Qualifying Facility as defined by the Public Utility Regulatory Policies Act of 1978 (PURPA).

The Transmission Provider has assigned the project “TCS-27.”

## **2.0 STUDY SCOPE AND OBJECTIVES**

The objective of the facilities study is to:

- complete a facilities analysis, which shall specify and estimate the cost of equipment, engineering, procurement, and construction required to address issues as outlined in the system impact study, and
- provide a scope of work and an estimated cost and schedule for completing the scope of work.

## **3.0 STUDY ASSUMPTIONS**

- All active higher priority transmission service and/or generator interconnection requests will be considered in this study and are listed in Appendix 1. If any of these requests are withdrawn, the Transmission Provider reserves the right to restudy this request, as the results and conclusions contained within this study could significantly change.
- For study purposes there are two separate queues:
  - Transmission Service Queue: to the extent practical, all network upgrades that are required to accommodate active transmission service requests will be modeled in this study.
  - Generation Interconnection Queue: Interconnection Facilities associated with higher queue interconnection requests will be modeled in this study.
- The Interconnection Customer’s request for interconnection service in and of itself does not convey transmission service. Only a Network Customer may make a request to designate a generating resource as a Network Resource. Because the queue of higher priority transmission service requests may be different when a Network Customer requests network resource designation for this Generating Facility, the available capacity or transmission modifications, if any, necessary to deliver 100% of the Project output to network load may be significantly different. Therefore, the Interconnection Customer should regard the results of this study as informational rather than final.
- This study assumes the Project will be integrated into Transmission Provider’s system at the agreed upon and/or proposed point of interconnection.

- The Interconnection Customer will construct and own any facilities required between the Point of Interconnection and the Project unless specifically identified by the Transmission Provider.
- Under normal conditions, the Transmission Provider does not dispatch or otherwise directly control or regulate the output of generating facilities. Therefore, the need for transmission modifications, if any, which are required to deliver 100% of Project output to the Network Customer's network load will be evaluated (i.e., no displacement of other resources in the same area).
- Line reconductor or fiber underbuild required on existing poles will be assumed to follow the most direct path on the Transmission Provider's system. If during detailed design the path must be modified it may result in additional cost and timing delays for the Interconnection Customer's project.
- Generator tripping may be required for certain outages.
- All facilities will meet or exceed the minimum Western Electricity Coordinating Council ("WECC"), North American Electric Reliability Corporation ("NERC"), and Transmission Provider performance and design standards.
- This report is based on information available at the time of the study. It is the Interconnection Customer's responsibility to check the Transmission Provider's web site regularly for Transmission system updates at <http://www.pacificorp.com/tran.html>

#### **4.0 PROPOSED POINT OF INTERCONNECTION**

The Interconnection Customer's proposed Generating Facility is to be interconnected to the Transmission Provider's 138 kV Lee Creek substation via a new line position. Figure 1 below, is a one-line diagram that illustrates the interconnection of the proposed Generating Facility to the Transmission Provider's system.

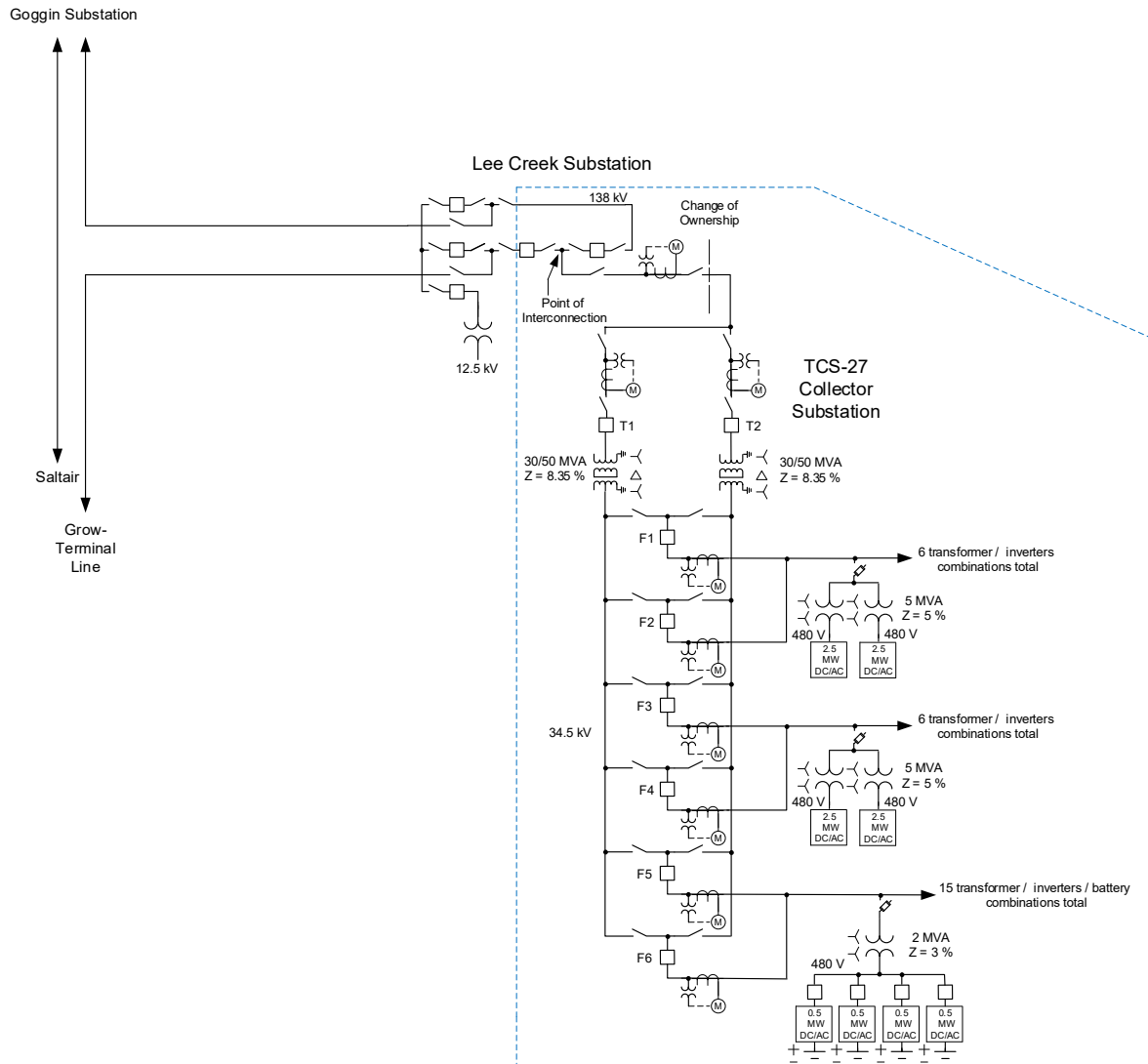


Figure 1: System One Line Diagram

## 5.0 SCOPE OF WORK

### 5.1 Generating Facility Modifications

The following outlines the design, procurement, construction, installation, and ownership of equipment at the Interconnection Customer's Generation Facility.

#### 5.1.1 INTERCONNECTION CUSTOMER TO BE RESPONSIBLE FOR

- Procure all necessary permits, lands, rights of way and easements required for the construction and continued maintenance of the Interconnection Customer's Generating Facility and collector substation.
- Design, procure, construct, own and maintain the Interconnection Customer's Generating Facility and associated collector substation

- Design the Generating Facility with reactive power capabilities necessary to operate within the full power factor range of 0.95 leading to 0.95 lagging as measured at the high side of the Interconnection Customer's GSU transformer. This power factor range shall be dynamic and can be met using a combination of the inherent dynamic reactive power capability of the generator or inverter, dynamic reactive power devices and static reactive power devices to make up for losses.
- Design the generating facility such that it can provide positive reactive support (i.e., supply reactive power to the system) immediately following the removal of a fault or other transient low voltage perturbations or install dynamic voltage support equipment. These additional dynamic reactive devices shall have correct protection settings such that the devices will remain on line and active during and immediately following a fault event.
- Equip the Generating Facility with automatic voltage-control equipment and operate with the voltage regulation control mode enabled unless explicitly authorized to operate another control mode by the Transmission Provider.
- Install, maintain and operate a functioning governor or equivalent controls to ensure primary frequency capability as required under FERC Order 842.
- Operate the Generating Facility so as to maintain the voltage at the Point of Interconnection, or other designated point as deemed appropriated by Transmission Provider, at a voltage schedule to be provided by the Transmission Provider following testing. Voltage will typically be required to operate between 1.00 and 1.04 per unit.
- Operate the Generating Facility with a voltage droop.
- Have any Transmission Provider required studies, such as a voltage coordination study, performed and provide results to Transmission Provider. Any additional requirements identified in these studies will be the responsibility of the Interconnection Customer.
- Meet the Federal Energy Regulatory Commission (FERC) and WECC low voltage ride-through requirements as specified in the interconnection agreement.
- Provide test results to the Transmission Provider verifying that the inverters for this Project have been programmed to meet all PRC-024 requirements rather than manufacturer IEEE distribution standards.
- Provide the Transmission Provider the manufacturer Electromagnetic Transient Modeling ("EMT") model a minimum of 180 days prior to Commercial Operation.
- Provide the Transmission Provider a standard model from the WECC Approved Dynamic Model Library.
- Design the Generating Facility control system such that it can receive an analog output from the Transmission Provider for setpoint control

and provide an analog input back to the Transmission Provider on the status of the setpoint.

- Design and construct the collector substation such that the ground grid can be connected to the POI substation ground grid to support the installation of a Transmission Provider owned and maintained bus differential scheme. The Interconnection Customer is responsible to ensure the ground grid design supports safe step and touch potentials.
- Design, provide and install conduits between the Interconnection Customer collector substation and the marshalling cabinet to be installed just inside the fence of the POI substation to support copper circuits installed between the facilities.
- Provide and install two sets of current transformers to be fed into the bus differential relays with a maximum current transformer ratio matching the maximum CT ratio of the breakers at the POI substation. Provide and install conduit and cabling to the POI substation marshalling cabinet with these outputs.
- Provide a separate graded, grounded and fenced area along the perimeter of the Interconnection Customer's collector substation for the Transmission Provider to install a control building. The site will share a fence and ground grid with the Interconnection Customer collector substation and have separate, unencumbered access for the Transmission Provider. Fencing, gates and road access shall meet Transmission Provider standards. The Interconnection Customer shall provide a Transmission Provider approved easement for its control building.
- Perform a CDEGS grounding analysis for both the collector substation site and the Transmission Provider control building and provide the results to the Transmission Provider.
- Provide permanent AC power to the Transmission Provider's communications site control building.
- Design, procure and install conduit and control cabling and hard wire the Interconnection Customer's source devices to Transmission Provider's control building data concentrator. Replicated values are not acceptable.
- Provide the following points which are based on the Interconnection Customer's most recent design information. Please note that this list of points could change if the Interconnection Customer's final design changes:

Analog Written to the RTU

- Max Gen Limit MW Set Point

Analogs

- Max Gen Limit MW Set Point Feed Back
- Potential Power MW
- Real power flowing through the #1 138 – 34.5 kV transformer

- Reactive power flowing through the #1 138 – 34.5 kV transformer
- Real power flowing through the #2 138 – 34.5 kV transformer
- Reactive power flowing through the #2 138 – 34.5 kV transformer
- 34.5 kV Real power 52-F1
- 34.5 kV Reactive power 52-F1
- 34.5 kV Real power 52-F2
- 34.5 kV Reactive power 52-F2
- 34.5 kV Real power 52-F3
- 34.5 kV Reactive power 52-F3
- 34.5 kV Real power 52-F4
- 34.5 kV Reactive power 52-F4
- 34.5 kV Real power 52-F5
- 34.5 kV Reactive power 52-F5
- 34.5 kV Real power 52-F6
- 34.5 kV Reactive power 52-F6
- Global Horizontal Irradiance (GHI)
- Average Plant Atmospheric Pressure (Bar)
- Average Plant Temperature (Celsius)

**Status**

- 138 kV transformer breaker 52-T1
- 138 kV transformer breaker 52-T2
- 34.5 kV breaker 52-F1
- 34.5 kV breaker 52-F2
- 34.5 kV breaker 52-F3
- 34.5 kV breaker 52-F4
- 34.5 kV breaker 52-F5
- 34.5 kV breaker 52-F6
- Procure and install Transmission Provider approved H-Frame structures for the Transmission Provider's instrument transformers. The installation locations shall be coordinated with the Transmission Provider.
- Install complete conduit and control cable provided by the Transmission Provider from each of the Transmission Provider's instrument transformers to the Transmission Provider's collector substation control building. Leave sufficient quantities of control cable to allow the Transmission Provider to terminate the cable inside its control building.
- Install the Transmission Provider provided instrument transformers.
- Procure and install disconnect switches on each side of each of the instrument transformers.
- Provide Transmission Provider unfettered and maintained access to the Transmission Provider's instrument transformers.
- Install Transmission Provider approved fiber optic cable in conduit from the Transmission Provider's collector substation control building



to the POI substation fence line. Leave sufficient amounts of cable for the Transmission Provider to terminate the fiber in both its collector substation control building and POI substation control building.

- Provide Transmission Provider approved easements for all Transmission Provider Interconnection Facilities to be installed in the Interconnection Customer's collector substation.
- Arrange for and provide permanent retail service for power that will flow from the Transmission Provider's system when the Project is not generating with the Transmission Provider's retail business unit. The arrangement must be in place prior to backfeed.
- Provide any construction or backup retail service necessary for the Project.

#### **5.1.2 TRANSMISSION PROVIDER TO BE RESPONSIBLE FOR**

- Provide the Interconnection Customer the designated point at which the voltage is to be maintained and the associated voltage schedule.
- Identify any necessary studies that the Interconnection Customer must have performed.
- Install a control building on the property prepared by the Interconnection Customer.
- Procure and install a backup DC battery system for the Transmission Provider control building.
- Procure and install a communications rack and associated communications equipment in the Transmission Provider's control building.
- Coordinate with the Interconnection Customer on the location of the Transmission Provider's instrument transformers.
- Provide the Interconnection Customer the specifications for the instrument transmission installation structures.
- Procure and provide to the Interconnection Customer two sets of 138 kV instrument transformers to be on installed on the high side of each of the Interconnection Customer's main step up transformers.
- Design, procure and install two sets of 138 kV revenue metering equipment including metering panels, primary and secondary revenue quality meters, test switches, junction boxes and secondary metering wire.
- Procure and provide to the Interconnection Customer six sets of 34.5 kV instrument transformers to be installed on each of the Interconnection Customer's circuits to separate solar and battery storage.
- Design, procure and install six sets of 34.5 kV revenue metering equipment including metering panels, primary and secondary revenue quality meters, test switches, junction boxes and secondary metering wire.

- Provide the control cable to be installed by the Interconnection Customer from the instrument transformers to the Transmission Provider's control building and coordinate on the location of the cable.
- Terminate the fiber optic cable provided by the Interconnection Customer in the control building communications panel.
- Establish an Ethernet connection for retail sales and generation accounting via the MV-90 translation system.

## **5.2 Point of Interconnection**

The following outlines the design, procurement, construction, installation, and ownership of equipment at the Point of Interconnection.

### **5.2.1 TRANSMISSION PROVIDER TO BE RESPONSIBLE FOR**

- Procure the necessary permits and property rights required to expand the substation to construct a new line position.
- Design, procure and construct, own and maintain a new 138 kV line position which will include the following major pieces of equipment:
  - (2) 145KV, 2000A Breaker
  - (3) 138 KV, 2000 AMP Horizontal Mount, Group Operated Switch
  - (1) 138 KV, 2000 AMP, Vertical Mount, Group Operated Switch
  - (1) 138 KV, 2000 AMP, Vertical Mount, Group Operated Switch, w/ Motor Operator
  - (3) 138kV Surge Arresters
  - (3) CT/VT Metering Units
  - (1) Marshalling Cabinet
- Terminate the last segment running from the Interconnection Customer's collector substation into the POI substation deadend structure using Interconnection Customer provided and installed conductor, shield wire and line hardware.
- Design, procure and install a bus differential relay system for the connection to the Interconnection Customer's collector substation.
- Procure and install a relay for under/over voltage and over/under frequency protection of the system.
- Modify the existing line relays for the Grow-Terminal and Goggin transmission lines to account for the expanded substation infrastructure.
- Install conduit and the fiber optic cable provided by the Interconnection Customer from the substation fence to the control building and terminate into the communications panel.
- Include the following data points into the substation RTU:  
Analogs:
  - Net Generation MW
  - Net Generator MVAR

- Interchange metering kWh
- Design, procure and install 138 kV revenue metering equipment for the Project including two (2) revenue quality meters, test switch, instrument transformers, metering panels, junction box and secondary metering wire.
- Provide and install an Ethernet connection for retail sales and generation accounting via the MV-90 translation system.

### **5.3 Other**

The following outlines the design, procurement, construction, installation, and ownership of equipment past the Point of Interconnection.

#### **5.3.1 TRANSMISSION PROVIDER TO BE RESPONSIBLE FOR**

- System Operations Centers
  - Update databases to include the Interconnection Customer's Generating Facility along with Interconnection Facilities and Network Upgrades.

### **6.0 COST ESTIMATE**

The following estimate represents only scopes of work that will be performed by the Transmission Provider. Costs for any work being performed by the Interconnection Customer are not included.

<b>Collector substation</b>	<b>\$1,657,000</b>
<i>Control building, metering and communications equipment</i>	

<b>Lee Creek Substation</b>	<b>\$1,804,000</b>
<i>Line position, termination and metering</i>	

**Total: \$3,461,000**

\*Any distribution line modifications identified in this report will require a field visit analysis in order to obtain a more thorough understanding of the specific requirements. The estimate provided above for this work could change substantially based on the results of this analysis. Until this field analysis is performed the Transmission Provider must develop the project schedule using conservative assumptions. The Interconnection Customer may request that the Transmission Provider perform this field analysis, at the Interconnection Customer's expense, prior to the execution of an Interconnection Agreement in order to obtain more cost and schedule certainty.

Note: Costs for any excavation, duct installation and easements shall be borne by the Interconnection Customer and are not included in this estimate. This estimate is as accurate as possibly given the level of detailed study that has been completed to date and approximates the costs incurred by Transmission Provider to interconnect this Generator Facility to Transmission

Provider's electrical distribution or transmission system. The Interconnection Customer will be responsible for all actual costs, regardless of the estimated costs communicated to or approved by the Interconnection Customer.

**7.0 SCHEDULE**

Execute Interconnection Agreement	September 1, 2021
Provision of Financial Security	January 3, 2022
Interconnection Customer Approval for Transmission Provider to Commence Engineering and Procurement Activities	January 3, 2022
*Interconnection Customer Initial Design Package Provided	January 3, 2022
Transmission Provider Engineering & Procurement Commences	February 7, 2022
Energy Imbalance Market Modeling Data Submittal	March 4, 2022
Interconnection Customer Property/Permits/ROW Procured	June 3, 2022
Transmission Provider Property/Permits/ROW Procured	August 5, 2022
*Interconnection Customer Final Design Package Provided	August 15, 2022
Transmission Provider Engineering Design Complete	January 6, 2023
Interconnection Customer Approval for Transmission Provider to Commence Construction Activities	February 6, 2023
Construction Begins	March 13, 2023
Interconnection Customer Requests Voltage Schedule	April 3, 2023
Interconnection Customer Maintenance and Commissioning Plans Provided	June 2, 2023
Interconnection Customer and Transmission Provider Construction Complete	September 8, 2023
Transmission Provider Commissioning Activities Complete	October 20, 2023
Transmission Provider Commissioning Document Review Complete	October 27, 2023
Interconnection Customer's Facilities Receive Backfeed Power	October 30, 2023
Initial Synchronization/Generation Testing	November 6, 2023
Commercial Operation	December 15, 2023

\*Interconnection Customer initial design package shall include final generating facility location, inverter/turbine selection, basic protection package, tie line route and collector system locations and data as applicable. Interconnection Customer final design package shall include PE stamped issued for construction (“IFC”) drawings for generating facility, collector substation, tie line as well as an updated PSS/e model and updated WECC approved model, electromagnetic transient (“EMT”) model and a detailed short circuit model of its generation system using the ASPEN OneLine short circuit simulation program as applicable. The WECC model parameters must be adjusted to reflect the plant’s actual anticipated performance. The plant controller must be included in the model. If there is to be coordination between facilities or a master VAR controller, this must be included in the detailed WECC dynamic model, as well as in the PSS/e user-written model.

Please note, the time required to perform the scope of work identified in this report does not support the Interconnection Customer’s requested Commercial Operation date of December 31, 2021.

## **8.0 APPENDICES**

Appendix 1: Higher Priority Requests

Appendix 2: Property Requirements

**8.1 APPENDIX 1: HIGHER PRIORITY REQUESTS AND CONTINGENT FACILITIES**

All active higher priority Transmission Provider projects, and transmission service and/or generator interconnection requests will be considered in this study and are identified below. If any of these requests are withdrawn, the Transmission Provider reserves the right to restudy this request, as the results and conclusions contained within this study could significantly change.

Transmission/Generation Interconnection Queue Requests considered:

TSR Q2611 (600 MW)

TSR Q2417 (32 MW)

TSR Q2789 (75 MW)

TSR Q2790 (80 MW)

TSR Q2865 (70 MW)

TSR Q2882 (25 MW)

GI Q0524 (6 MW)

GI Q0754 (80 MW)

GI Q0799 (67 MW)

GI Q0846 (75 MW)

GI Q1003 (10 MW)

---

**8.2 APPENDIX 2: PROPERTY REQUIREMENTS****Property Requirements for Point of Interconnection Substation****Requirements for rights of way easements**

Rights of way easements will be acquired by the Interconnection Customer in the Transmission Provider's name for the construction, reconstruction, operation, maintenance, repair, replacement and removal of Transmission Provider's Interconnection Facilities that will be owned and operated by PacifiCorp. Interconnection Customer will acquire all necessary permits for the project and will obtain rights of way easements for the project on Transmission Provider's easement form.

**Real Property Requirements for Point of Interconnection Substation**

Real property for a point of interconnection substation will be acquired by an Interconnection Customer to accommodate the Interconnection Customer's project. The real property must be acceptable to Transmission Provider. Interconnection Customer will acquire fee ownership for interconnection substation unless Transmission Provider determines that other than fee ownership is acceptable; however, the form and instrument of such rights will be at Transmission Provider's sole discretion. Any land rights that Interconnection Customer is planning to retain as part of a fee property conveyance will be identified in advance to Transmission Provider and are subject to the Transmission Provider's approval.

The Interconnection Customer must obtain all permits required by all relevant jurisdictions for the planned use including but not limited to conditional use permits, Certificates of Public Convenience and Necessity, California Environmental Quality Act, as well as all construction permits for the project.

Interconnection Customer will not be reimbursed through network upgrades for more than the market value of the property.

As a minimum, real property must be environmentally, physically, and operationally acceptable to Transmission Provider. The real property shall be a permitted or able to be permitted use in all zoning districts. The Interconnection Customer shall provide Transmission Provider with a title report and shall transfer property without any material defects of title or other encumbrances that are not acceptable to Transmission Provider. Property lines shall be surveyed and show all encumbrances, encroachments, and roads.

Examples of potentially unacceptable environmental, physical, or operational conditions could include but are not limited to:

1. Environmental: known contamination of site; evidence of environmental contamination by any dangerous, hazardous or toxic materials as defined by any governmental agency; violation of building, health, safety, environmental, fire, land use, zoning or other such regulation; violation of ordinances or statutes of any governmental entities having jurisdiction over the property; underground or above ground storage tanks in area; known remediation sites on property; ongoing mitigation activities or monitoring activities; asbestos; lead-based paint, etc. A



phase I environmental study is required for land being acquired in fee by the Transmission Provider unless waived by Transmission Provider.

2. Physical: inadequate site drainage; proximity to flood zone; erosion issues; wetland overlays; threatened and endangered species; archeological or culturally sensitive areas; inadequate sub-surface elements, etc. Transmission Provider may require Interconnection Customer to procure various studies and surveys as determined necessary by Transmission Provider.

Operational: inadequate access for Transmission Provider's equipment and vehicles; existing structures on land that require removal prior to building of substation; ongoing maintenance for landscaping or extensive landscape requirements; ongoing homeowner's or other requirements or restrictions (e.g., Covenants, Codes and Restrictions, deed restrictions, etc.) on property which are not acceptable to the Transmission Provider.