

Community Solar Project Interconnection
Community Solar Project Facilities Study Report

Completed for

**(“Applicant”)
OCS045**

Proposed Point of Interconnection
**Circuit 5D5 out of Culver substation at 12.5 kV
(Approximately 44.487442°N, 121.249867°W)**

March 4, 2021

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1.0 DESCRIPTION OF THE PROJECT

(“Applicant”) proposed interconnecting 2.875 MW of new generation to PacifiCorp’s (“Public Utility”) circuit 5D5 out of Culver substation located in Jefferson County, Oregon. The project (“Project”) will consist of twenty-three (23) Solectria XGI 1500 125 kV inverters for a total requested nameplate output of 2.875 MW. The requested commercial operation date is October 1, 2021.

The Public Utility has assigned the Project “OCS045.”

2.0 APPROVAL CRITERIA FOR TIER 4 INTERCONNECTION REVIEW

Pursuant to Public Utility Commission of Oregon Order 19-392 approved Community Solar Project procedures, a Public Utility must use the Tier 4 review procedures for an application to interconnect a Community Solar Project that meets the following requirements:

- (a) The Community Solar Project does not qualify for or failed to meet Tier 2 interconnection review requirements; and
- (b) The Community Solar Project must have a nameplate capacity of three (3) megawatts or less.

3.0 SCOPE OF THE STUDY

Pursuant to Public Utility Commission of Oregon Order 19-392 approved Community Solar Project procedures the Facilities Study Report shall consist of:

- (a) A detailed scope identifying the interconnection facilities and system upgrades required to safely interconnect the Community Solar Project including the electrical switching configuration of the equipment, including the transformer, switchgear, meters, and other station equipment as applicable;
- (b) A good-faith, non-binding estimate of the costs for the facilities and upgrades, including equipment, engineering, procurement, and construction costs, and;
- (c) A detailed estimate of the time required to procure, construct, and install the required interconnection facilities and system upgrades.

4.0 PROPOSED POINT OF INTERCONNECTION

The Applicant’s proposed Community Solar Project is to be interconnected to the Public Utility’s distribution circuit 5D5 out of Culver substation via a 12.47 kV primary meter. The proposed Point of Interconnection (“POI”) will be located at approximately 44.487442°N, 121.249867°W located in Jefferson County, Oregon. Figure 2 below is a one line diagram that illustrates the interconnection of the proposed Community Solar Project to the Public Utility’s system.

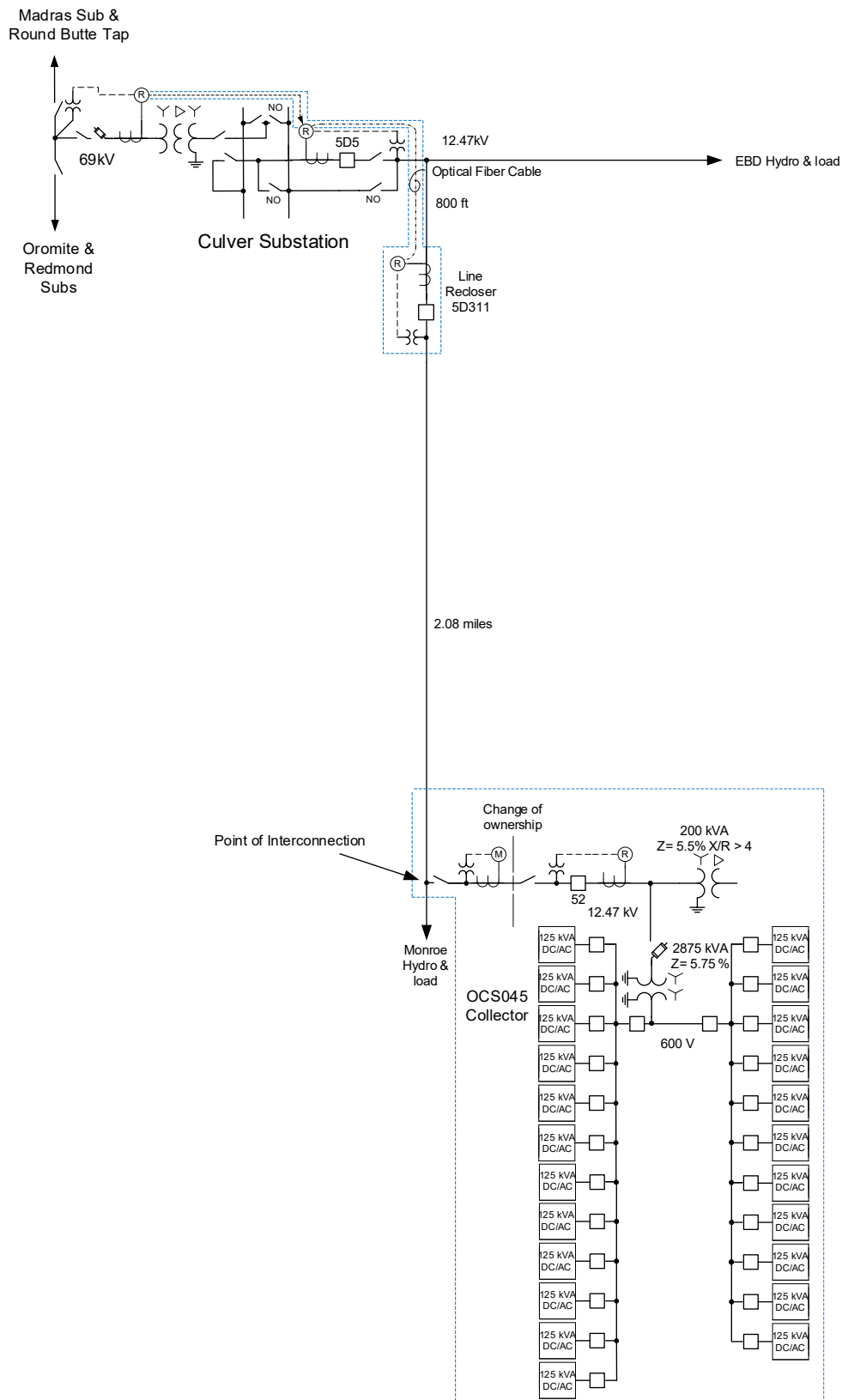


Figure 1:

System One Line Diagram

5.0 STUDY ASSUMPTIONS

- All active higher priority transmission service and/or generator interconnection and Community Solar Project requests will be considered in this study and are listed in Appendix 1. If any of these requests are withdrawn, the Public Utility 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 System Upgrades that are required to accommodate active transmission service requests will be modeled in this study.
 - Generation Interconnection Queue and Community Solar Queue: all relevant higher queue interconnection requests will be modeled in this study.
- The Applicant's request for interconnection service in and of itself does not convey any other form or service.
- This study assumes the Project will be integrated into Public Utility's system at the agreed upon and/or proposed POI.
- The Applicant will construct and own the facilities required between the POI and the Project unless specifically identified by the Public Utility.
- Line reconductor or fiber underbuild required on existing poles will be assumed to follow the most direct path on the Public Utility's system. If during detailed design the path must be modified it may result in additional cost and timing delays for the Applicant'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 Public Utility performance and design standards.
- This report is based on information available at the time of the study. It is the Applicant's responsibility to check the Public Utility's web site regularly for transmission system updates (<https://www.oasis.oati.com/ppw>)

6.0 REQUIREMENTS

6.1 COMMUNITY SOLAR PROJECT MODIFICATIONS

The following outlines the design, procurement, construction, installation, and ownership of equipment at the Applicant's Community Solar Project.

6.1.1 APPLICANT TO BE RESPONSIBLE FOR

- Design, construct, own and maintain the Applicant's Community Solar Project and associated collector system.
- Design the Community Solar Project 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 POI. The reactive compensation must be designed such that the discreet switching of all reactive devices (if required by the Applicant) does not cause step voltage changes greater than +/-3% on the Public Utility's system.
- Equip the Community Solar Project generators capable of operating under voltage reactive power mode, active power reactive power mode, and constant

reactive power mode as per IEEE standard 1547-2018. This project shall be capable of activating each of these modes one at a time. The Public Utility reserves the right to specify any mode and settings within the limits of IEEE standard 1547-2018 needed before or after the Community Solar Project enters service. The Applicant shall be responsible for implementing settings modifications and mode selections as requested by the Public Utility within an acceptable timeframe.

- Operate the Community Solar Project under constant power factor mode with a unity power factor setting unless specifically requested otherwise by the Public Utility. The Community Solar Project is expressly forbidden from actively participating in voltage regulation of the Public Utilities system without written request or authorization from the Public Utility.
- Operate the Community Solar Project so minimum power quality requirements in PacifiCorp's Engineering Handbook section 1C are met, the standards are available at <https://www.pacificpower.net/about/power-quality-standards.html>. Requirements specified in the System Impact Study that exceed requirements in the Engineering Handbook section 1C power quality standards shall apply.
- As per NERC standard VAR-001-1, the Public Utility is required to specify voltage or reactive power schedule at the POI. Under normal conditions, the Public Utility's system should not supply reactive power to the Community Solar Project.
- Install a transformer that will hold the phase to neutral voltages within limits when the Community Solar Project is isolated with the Public Utility's local system until the generation disconnects.
- Design, procure, install, and own a Public Utility approved 12.5 kV recloser containing a Schweitzer Engineering Laboratories ("SEL") 651R relay/controller to perform the following functions:
 - Detect faults on the 12.47 kV equipment at the solar-electric Community Solar Project
 - Detect faults on the 12.47 kV line to Culver substation
 - Monitor the unbalance current flowing through the grounding transformer and protect the transformer from damage due to phase unbalances on the 12.47 kV circuit
 - Monitor the voltage and react to under or over frequency, and /or magnitude of the voltage
 - Receive transfer trip from Culver substation
- Procure and install instrument transformers on the Public Utility side of the recloser.
- Input the settings provided by the Public Utility into the recloser relay.
- Provide the Public Utility Level 2 password control of the recloser relay.
- Terminate the Public Utility provided cable into the recloser relay.
- Provide the Public Utility the necessary easement to allow the Public Utility to construct its line extension between its existing facilities and the Point of Change of Ownership.

- Provide Public Utility unfettered and maintained access to its interconnection facilities.
- Construct the Applicant's last pole prior to the Public Utility's interconnection facilities to the Public Utility's standard.
- Arrange for and provide permanent retail service for power that will flow from the Public Utility's system when the Project is not generating. Applicant shall coordinate with the Public Utility's customer service group establish a request number and account number.
- Provide any construction or backup retail service necessary for the Project.
- Provide the Public Utility a Professional Engineer ("PE") stamped maintenance plan for all Applicant facilities.

6.1.2 PUBLIC UTILITY TO BE RESPONSIBLE FOR

- Develop and provide the settings for Applicant's recloser relay.
- Observe and provide acceptance of the relay settings in the Applicant recloser relay.
- Observe and provide acceptance of the Applicant's design of the final pole.
- Terminate the span of conductor between the Public Utility and Applicant facilities onto the Applicant's last pole.
- Install a pole with an antenna to provide a communications link to Culver substation.
- Install an enclosure for the radio, transceiver, battery and charger.
- Provide sufficient cable from the radio system to the Applicant's recloser relay.
- Observe and provide acceptance of the functionality of the communications path to the Applicant's recloser for transfer trip.

6.2 POINT OF INTERCONNECTION

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

6.2.1 PUBLIC UTILITY TO BE RESPONSIBLE FOR

- Design, procure, install, own and maintain the required extension of the 12.5 kV facilities from Public Utility's existing facilities (assumed to be facility point 01412012.0359960) to the Point of Change of Ownership including a minimum of two poles, conductor, cutouts, fuses, jumpers and a gang operated switch.
- Design, procure and install 12.5 kV pole mounted revenue metering equipment for the Project including a revenue quality meter and instrument transformers.
- Provide and install a cellular connection for retail sales and generation accounting via the Public Utility's MV-90 translation system.

6.3 OTHER

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

6.3.1 PUBLIC UTILITY TO BE RESPONSIBLE FOR

- Distribution Circuit
 - Reconductor approximately 2,200 feet of the distribution circuit with 4/0 Al conductor. Replace approximately ten transmission structures containing the distribution as underbuild.
 - Remove 100T line fuses at pole 01412012.0359961 and install 100T line fuses at pole 01412012.0359560.
 - Develop and implement a transfer trip scheme between the Applicant's Community Solar Project and both Culver substation and line recloser 5D311.
 - Install approximately 800 feet of fiber optic cable between line recloser 5D311 and Culver substation.
 - Terminate the fiber optic cable into the 5D311 recloser.
 - Install a cabinet at line recloser to hold an SEL radio, fiber transceiver and patch panel to establish a communications link to the radio system to be installed at the Applicant's site.
- Culver Substation
 - Modify the existing relays to key the transfer trip to the Applicant's recloser.
 - Modify the settings of the 69-12.5 kV voltage regulator to account for the Applicant's generator.
 - Install concrete capped conduits to allow for the installation of fiber running from line recloser 5D311 into the substation control building.
 - Install the necessary communications equipment to tie in the new fiber.
 - Include the new status points of the transfer trip radio system into the existing substation RTU.

7.0 COST ESTIMATE

The following estimate represents only scopes of work that will be performed by the Public Utility. Costs for any work being performed by the Applicant are not included.

OCS045 Collector Station <i>Install metering, communications and develop relay settings</i>	\$111,000
Culver Substation <i>Install communications and modify line relays</i>	\$64,000
Recloser 5D311 <i>Install communications</i>	\$42,000
Distribution <i>Line extension, line reconductor, pole replacements, replace recloser</i>	\$307,000
Communications <i>Install ~900 feet of fiber</i>	\$13,000

Total **\$537,000**

*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 Public Utility must develop the project schedule using conservative assumptions. The Applicant may request that the Public Utility perform this field analysis, at the Applicant'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 Applicant and are not included in this estimate. This estimate approximates the costs incurred by the Public Utility to interconnect this Community Solar Project to the Public Utility's electrical distribution or transmission system based upon the level of study completed to-date. The Applicant will be responsible for all actual costs, regardless of the estimated costs communicated to or approved by the Applicant.

8.0 SCHEDULE

Execute Interconnection Agreement	May 3, 2021
Provision of First Progress Payment	May 3, 2021
Applicant and Public Utility Establish Request Number	May 17, 2021
*Applicant Initial Design Package Provided	June 4, 2021
Public Utility Engineering & Procurement Commences	July 5, 2021
Applicant Property/Permits/ROW Procured	August 20, 2021
Public Utility Property/Permits/ROW Procured	October 15, 2021
*Applicant Final Design Package Provided	November 12, 2021
Public Utility Engineering Design Complete	March 4, 2022
Construction Begins	May 23, 2022
Applicant Maintenance and Commissioning Plans Provided	June 10, 2022
Applicant and Public Utility Construction Complete	September 16, 2022
Public Utility Commissioning Activities Complete	October 7, 2022

Public Utility Commissioning Document Review Complete	October 14, 2022
Applicant's Facilities Receive Backfeed Power	October 17, 2022
Initial Synchronization/Generation Testing	October 19, 2022
Commercial Operation	October 21, 2022

*Applicant initial design package shall include final Community Solar Project location, inverter/turbine selection, basic protection package, tie line route and collector system locations and data as applicable. Applicant final design package shall include PE stamped issued for construction ("IFC") drawings for Community Solar Project, 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 Applicant's requested commercial operation date of October 1, 2021.

9.0 PARTICIPATION BY AFFECTED SYSTEMS

Public Utility has identified the following Affected Systems: Portland General Electric and Bonneville Power Administration

Copies of this report will be shared with each Affected System.

10.0 APPENDICES

Appendix 1: Higher Priority Requests

Appendix 2: Property Requirements

10.1 APPENDIX A: HIGHER PRIORITY REQUESTS

All active higher priority 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 Public Utility reserves the right to restudy this request, as the results and conclusions contained within this study could significantly change.

Transmission/Generation Interconnection/Community Solar Queue Requests considered:

Queue #	Size (MW)
TCS-43	40
TCS-44	80
TCS-45	40
TCS-46	80
TCS-51	9
TCS-52	20
TCS-53	20
TCS-54	40
OCS001	1.46
OCS002	0.9

PGE:

- 17-068; 65 MW. Requested ISD 12/31/2019.
- 19-080; 80 MW. Requested ISD 12/31/2023.
- 19-081; 53 MW. Requested ISD 12/31/2022.

10.2 APPENDIX B: PROPERTY REQUIREMENTS**Requirements for rights of way easements**

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

Real Property Requirements for Point of Interconnection Substation

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

The Applicant 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.

Applicant 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 Public Utility. The real property shall be a permitted or able to be permitted use in all zoning districts. The Applicant shall provide Public Utility with a title report and shall transfer property without any material defects of title or other encumbrances that are not acceptable to Public Utility. 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:

- 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 Public Utility unless waived by Public Utility.

- 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. Public Utility may require Applicant to procure various studies and surveys as determined necessary by Public Utility.
- Operational: inadequate access for Public Utility'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 Public Utility.