Community Solar Project Interconnection
Community Solar Project System Impact Study Report

Completed for

(“Applicant”)
CSPQ011

Proposed Point of Interconnection
Circuit 5W28 out of Wallowa substation at 12.5 kV
(at approximately 45.56939°, -117.540753°)

May 13, 2020

TABLE OF CONTENTS

1.0 DESCRIPTION OF THE COMMUNITY SOLAR PROJECT

("Applicant") proposed interconnecting 0.7 MW of new generation to PacifiCorp's ("Public Utility") Circuit 5W28 out of Wallowa substation located in Wallowa County, Oregon. The project ("Project") will consist of twelve (12) Solectria Solar PVI60TL for a total requested output of 0.7 MW. The requested commercial operation date is December 31, 2020.

The Public Utility has assigned the Project "OCSQ011."

2.0 APPROVAL CRITERIA FOR TIER 4 INTERCONNECTION REVIEW

Pursuant to the Section I(1) of the Public Utility's CSP Interconnection 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 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 Section I(6)(g) of the CPS Interconnection Procedures, the System Impact Study Report shall consist of: (1) the underlying assumptions of the study; (2) a short circuit analysis; (2) a stability analysis; (3) a power flow analysis; (4) voltage drop and flicker studies; (5) protection and set point coordination studies; (6) grounding reviews; (7) the results of the analyses; and (8) any potential impediments to providing the requested Interconnection Service, including a non-binding informational network resource interconnection service (NRIS) assessment in Appendix 2. In addition, the System Impact Study shall provide a list of facilities that are required as a result of the Community Solar Project request and non-binding good faith estimates of cost responsibility and time to construct.

4.0 PROPOSED POINT OF INTERCONNECTION

The Applicant's proposed Community Solar Project is to be interconnected to the Public Utility's distribution circuit 5W28 out of Wallowa substation via a new 12.5 kV overhead primary meter. The Point of Interconnection ("POI") will be located west of the town of Wallowa, Oregon along West First Street near an existing pole located at map string 01101042.0, facility point 140702. Figure 1 below is a one line diagram that that illustrates the interconnection of the proposed generating facility to the Public Utility's system.

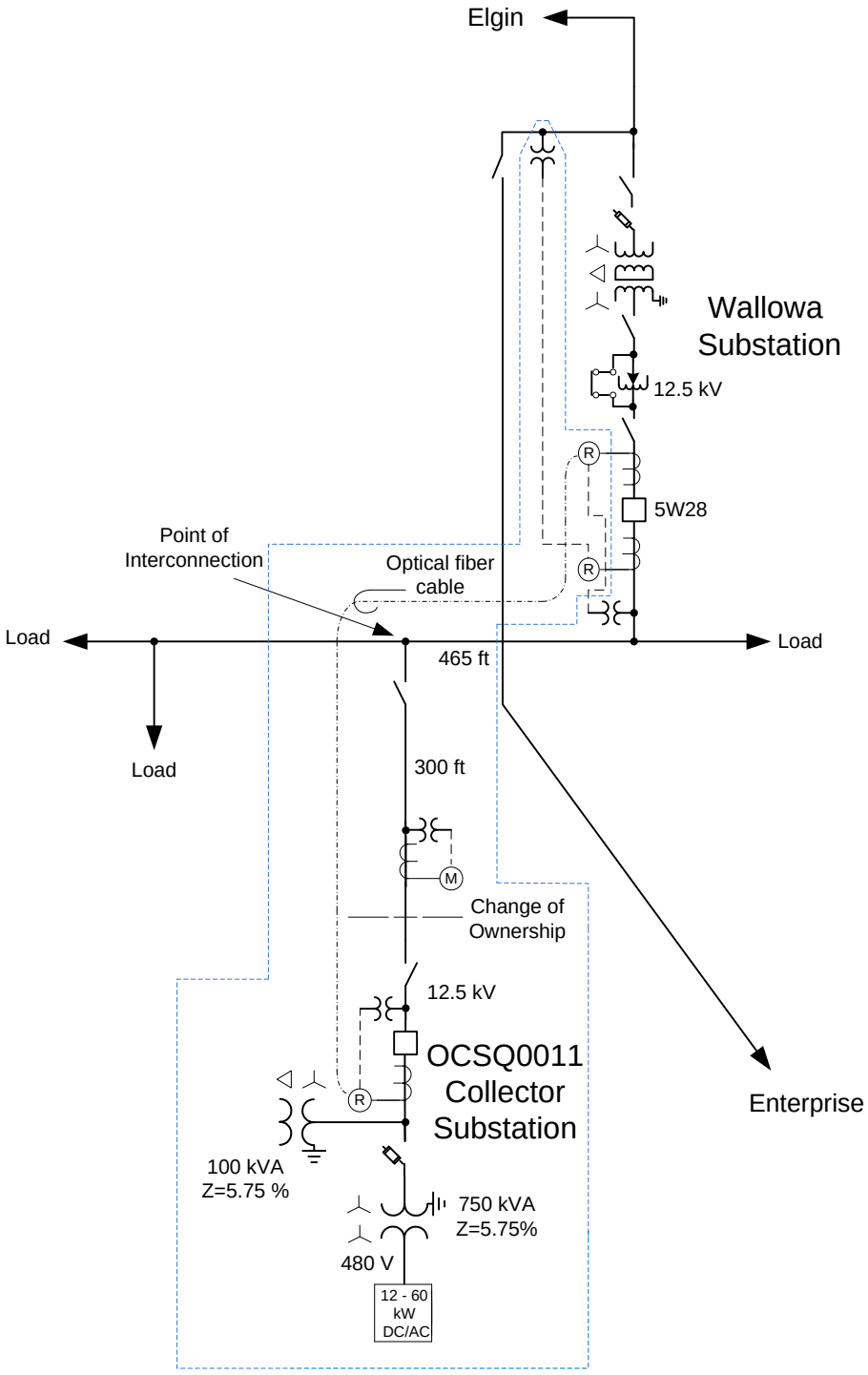

Figure 1: System One Line Diagram

5.0 STUDY ASSUMPTIONS

- All active higher-priority requests for transmission service and/or generator interconnection service (including requests in the traditional interconnection queue and other requests in the

Community Solar queue) in the local area of the requested point of interconnection 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.

- The Applicant's request for interconnection service in and of itself does not convey transmission service.
- This study assumes the Project will be integrated into Public Utility's system at the agreed upon and/or proposed Point of Interconnection.
- The Applicant will construct and own any 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.
- Time of use metering does not exist for Wallowa substation loading. The daytime minimum demand for the feeder is estimated based on peak demand readings on the circuit.
- The minimum daytime load on 5W28 including existing generation is estimated at 255 kW and – 480 KVAR (KVAR into substation).
- The Small Generator Facility is expected to operate during daylight hours every day 7 days per week 12 months per year.
- Contingency transmission configuration for the Transmission Provider's system is defined as any configuration other than normal transmission configuration.
- Two case studies were assembled and studied in power flow simulation at the transmission level:
  - Case 1: Normal Configuration, with the Enterprise substation fed radially via the 69 kV line from Hurricane substation.
  - Case 2: Contingency Configuration with Enterprise substation fed radially via the 69 kV backup feed from OTEC via Elgin switching station (Note, this is not possible under heavy loading conditions, and was studied at Light Loading only, as a sensitivity analysis).
- 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 Community Solar Project and Interconnection Equipment owned by the Applicant are required to operate under automatic voltage control with the voltage sensed electrically at the POI. The Community Solar Project should have sufficient reactive capacity to enable

the delivery of 100 percent of the plant output to the POI at unity power factor measured at 1.0 per unit voltage under steady state conditions.

Generators capable of operating under voltage control with a voltage droop are required to do so. Studies will be required to coordinate the voltage droop setting with other facilities in the area. In general, the Community Solar Project and Interconnection Equipment should be operated so as to maintain the voltage at the POI between 1.01 pu to 1.04 pu. At the Public Utility's discretion, these values might be adjusted depending on the operating conditions. Within this voltage range, the Community Solar Project should operate so as to minimize the reactive interchange between the Community Solar Project and the Public Utility's system (delivery of power at the POI at approximately unity power factor). The voltage control settings of the Community Solar Project must be coordinated with the Public Utility prior to energization (or interconnection). The reactive compensation must be designed such that the discreet switching of the reactive device (if required by the Applicant) does not cause step voltage changes greater than +/-3% on the Public Utility's system.

All generators must meet applicable WECC low voltage ride-through requirements as specified in the interconnection agreement.

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.

The Applicant is required to procure, install, and own a lockable gang operated switch which is able to provide a visible open as their first device after the point of change of ownership.

The Interconnection Customer will be required to install a transformer that will hold the phase to neutral voltages within limits when the generation facility is isolated with the Public Utility's local system until the generation disconnects. The proposed wye – wye step-up transformer will not accomplish the stabilization of the phase to neutral voltages on the 12.5 kV system. The circuit that the Project is connecting to is a four wire multi-grounded circuit with line to neutral connected load. Figure 1 shows the addition of a wye – delta grounding transformer of adequate power size and impedance that will meet the requirement.

Certain extreme contingency configurations may warrant generation curtailment until the system returns to a normal state. This includes an outage of the Hurricane 230 – 69 kV transformer or the 230 kV source at Hurricane, resulting in loss of service and, under certain circumstances, restoration from the alternate OTEC source available at Elgin switching station.

6.2 DISTRIBUTION/TRANSMISSION LINE MODIFICATIONS

Distribution modifications made by the Public Utility are required as follows:

- From the POI along West 1st Street the Public Utility will design, procure, and install a line extension onto private property to the point of change of ownership. One pole will hold the Public Utility owned and operated gang switch, and on one pole primary metering units will be installed. Conductor from this primary metering pole will be installed one span to land on the first Applicant owned pole, the termination of this conductor at the Applicant's pole will be the point of change of ownership. These Public Utility facilities will require rights of way obtained by the Applicant as required in Appendix 3.

6.3 EXISTING BREAKER MODIFICATIONS – SHORT-CIRCUIT

The increase in the fault duty on the system as the result of the addition of the generation facility with photovoltaic arrays fed through 12 – 60 kW inverters connected to a 750 kVA 12.5 kV – 480 V transformers with 5.75% impedance will not push the fault duty above the interrupting rating of any of the existing fault interrupting equipment.

6.4 PROTECTION REQUIREMENTS

The proposed OSC0011 generating facility will be connected to the 12.5 kV circuit 5W28 out of Wallowa substation. For faults on the 12.5 kV circuit, the 69 – 12.5 kV transformer in Wallowa substation or on the 69 kV line to Enterprise substation the generating facility must disconnect in a high speed manner. Most faults on overhead circuits are temporary so that after all of the sources of power to the fault are disconnected the circuit can be re-energized. To facilitate the restoration of the circuits both 5W28 and 3W106 are setup for automatic reclosing. The 12.5 kV system is lightly loaded. The minimum daytime load on the 12.5 kV circuit out of Wallowa substation can be less that the existing generation source on the circuit plus the addition of the OCS011 generating facility. Since the potential unbalance between the generation and the load following the opening of breaker 5W28 cannot be relied upon to cause a high speed disconnection of the generating facilities a transfer trip communication circuit will be needed between Wallowa substation and the OCS011 collector facility. An optical fiber cable will be installed to carry the transfer trip signal between the sites.

For 12.5 kV circuit faults the transfer trip will be keyed by the opening of breaker 5W28 at Wallowa substation. Currently the 69 – 12.5 kV transformer is protected with 69 kV fuses. The fuses were adequate since there are no significate sources of fault current on the 12.5 kV before this Project. A relay will be installed as part of this Project which will be set to detect transformer faults and key transfer trip to the generation facility. 69 kV instrument voltage transformers will be installed. The relay that will be installed to detect faults in the transformer will monitor the 12.5 kV current and the 69 kV voltage and will be able to detect faults on the 69 kV line.

The 12.5 kV circuit relays associated with the breaker 5W28 will need to be replaced with a relay that will provide a dead-line check function. The dead line checking will be required to block the automatic reclosing of CB 5W28 for the cases when a failure of the protective systems leads to delayed tripping of the generating facility for a feeder fault. Reclosing for this type of situation could cause damage to the equipment and needs to be prevented. The

output from the existing 12.5 kV transformers on the line side of the CB 5W28 will provide the signals for the relay to monitor.

At the generating facility the Applicant will need to install a recloser that contains a SEL 651R protective relay which will need to perform the following functions:

1. Receive the transfer trip signals from Wallowa substation over the optical fiber cable.
2. Monitor the voltage magnitude and frequency. If the magnitude or frequency of the voltage is outside of normal range of operation the recloser will be tripped.
3. Monitor the current and the voltage to detect faults on the 12.5 kV distribution line.
4. Detect faults on the 12.5 kV system at the generation facility.
5. Monitor the phase unbalance current flowing from the generation facility to detect excessive current flow that could damage the grounding transformer

6.5 COMMUNICATION REQUIREMENTS

Approximately 500 feet of 48-fiber, single-mode fiber optic cable will be installed in a trench between Wallowa substation and the OCS011 generating facility. The fiber will be terminated in patch panels at both ends. Fiber Optic jumpers will be installed from the patch panels to the relays.

6.6 SUBSTATION REQUIREMENTS

Wallowa Substation
Fiber will be installed into the substation control house. Two protection panels and an annunciator will be installed inside the control house. The following equipment has been identified as being required and may change during detailed design.

3 – 69 kV, CCVT

6.7 METERING REQUIREMENTS

Interchange Metering
The metering will be located on the high side of the customer generator step up transformer at the Point of Interconnection. The metering will be installed overhead on a pole per distribution DM construction standards. The Public Utility will procure, install, test, and own all revenue metering equipment. The metering will be bi-directional to measure KWH and KVARH quantities for both generation received and back-up retail load delivered. There will be no additional station service metering for supplying generation load. The metering generation and billing data will be remotely interrogated via the Public Utility's MV90 data acquisition system.

The present output rating of the generation Project is below the requirement for SCADA.

Station Service/Construction Power
The Interconnection Customer must arrange distribution voltage retail meter service for electricity consumed by the Project when not generating. Temporary construction power

metering shall conform to the Six State Electric Service Requirements manual. Applicant must call the PCCC Solution Center 1-800-640-2212 to arrange this service. Approval for back feed is contingent upon obtaining station service.

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.

Wallowa substation *Install communication & protective equipment and instrument transformers*	$449,000
OCS011 Collector substation *Communications & metering equipment, relay settings*	$89,000
Distribution Circuit *Line extension, fiber installation*	$37,000
Total Project Cost:	**$575,000**

*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 is as accurate as possibly given the level of detailed study that has been completed to date and approximates the costs incurred by Public Utility to interconnect this Community Solar Project to Public Utility's electrical distribution or transmission system. An estimate, based on finer detail, will be calculated during the Facilities Study. The Applicant will be responsible for all actual costs, regardless of the estimated costs communicated to or approved by the Applicant.

8.0 SCHEDULE

The Public Utility estimates it will require approximately 12-15 months to design, procure and construct the facilities described in this report following the execution of an Interconnection Agreement. The schedule will be further developed and optimized during the Facilities Study.

Please note, the time required to perform the scope of work identified in this report appears to result in a timeframe that does not support the Applicant's requested commercial operation date of December 31, 2020.

9.0 PARTICIPATION BY AFFECTED SYSTEMS

Public Utility has identified the following Affected Systems: Idaho Power

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

10.0 APPENDICES

Appendix 1: Higher Priority Requests in the Local Area of the Requested POI
Appendix 2: Informational Network Resource Interconnection Service Assessment
Appendix 3: Property Requirements

10.1 APPENDIX 1: HIGHER PRIORITY REQUESTS IN THE LOCAL AREA OF THE REQUESTED POI

All active higher-priority requests for transmission service and/or generator interconnection service (including requests in the traditional interconnection queue and other requests in the Community Solar queue) in the local area of the requested POI 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:

Q#	**Size (MW)**
650	10.000
651	10.000
652	10.000
653	10.000
1190	200.000
OCS005	0.36
OCS006	1.04
OCS009	1.625
OCS010	1.875

10.2 APPENDIX 2: INFORMATIONAL NETWORK RESOURCE INTERCONNECTION SERVICE ASSESSMENT

The study results described above reflect an energy resource interconnection service ("ERIS") evaluation, modified in the CSP program rules to examine only generation and load conditions local to the requested CSP project's interconnection point (sometimes referred to as the "zoomed in view"). The "zoomed in view" functions to: (1) study the project's proposed interconnection without considering certain existing or higher-queued requests outside of the local area; and (2) to inform whether the CSP facility must cap its project to mitigate, although not eliminate, the risk of potential deliverability-related network upgrades to accommodate the proposed CSP generator
.

By contrast, the following informational section provides a network resource interconnection service ("NRIS") evaluation performed with traditional assumptions, i.e., not modified to examine only local generation and load conditions, but rather one that assumes that all existing interconnections, higher-queued requests for interconnection service (in both the traditional and CSP queue), and generators with executed contracts beyond the local area are in-service. Depending on the severity of the conditions created when absorbing additional generation (capped or not capped) in that broader, "zoomed out" area, the local area-focused generator size cap developed in the "zoomed in" examination may not be sufficient to mitigate the need for deliverability-related network upgrades. Regardless of this report's informational NRIS results, the deliverability-related network upgrades ultimately necessary to accommodate the proposed CSP generator will depend on conditions present when the future transmission service study is performed, as well as whether network upgrade alternatives are available at that time.

Enterprise is part of the Walla Walla transmission bubble, which currently has insufficient network load (at peak) to absorb any additional generation. Therefore, to deliver the aggregate of generation in the local system to the aggregate of load (the NRIS study scope), construction of a new 230 kV transmission line from the Enterprise area system to the Yakima area system (where the generation could be absorbed) may be required, at a minimum. The new 230 kV line would interconnect Hurricane substation with Wine Country substation in the vicinity of Grandview, Washington. The new 230 kV line would be approximately 160 to 185 miles, depending on the line route. Upgrades at both Hurricane and Wine Country substations would be required to tie in the new line. The transmission provider's high level estimate for this transmission line is $185,000,000.

10.3 APPENDIX 3: 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.