

Community Solar Project Interconnection  
**Community Solar Project System Impact Study Report**

Completed for

**(“Applicant”)**  
**OCS081**

Proposed Point of Interconnection  
**Circuit 5L20 out of Turkey Hill substation at 12.0 kV**  
**(At approximately 42.056657°N, 121.402413°W)**

**June 29, 2023**

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## **1.0 DESCRIPTION OF THE COMMUNITY SOLAR PROJECT**

(“Applicant”) proposed interconnecting 470 kW of new generation to PacifiCorp’s (“Public Utility”) circuit 5L20 out of Turkey Hill substation located in Klamath County, Oregon. The project (“Project”) will consist of five (5) Photovoltaic 94kW-100KVA operating at 480V 3-phase for a total requested output of 470 KW. The requested commercial operation date is May 1, 2024.

The Public Utility has assigned the Project “OCS081.”

## **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 NRIS portion that addresses the additions, modifications, and upgrades to the Public Utility’s Transmission System that would be required at or beyond the point at which the Interconnection Facilities connect to the Public Utility’s Transmission System to accommodate the interconnection of the CSP Project. 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 5L20 out of Turkey Hill substation via a 12.0 KV primary meter. The proposed Point of Interconnection will be located at approximately 42.056657°N, 121.402413°W located in Klamath County, Oregon. Figure 1 below is a one line diagram that illustrates the interconnection of the proposed generating facility to the Public Utility’s system.

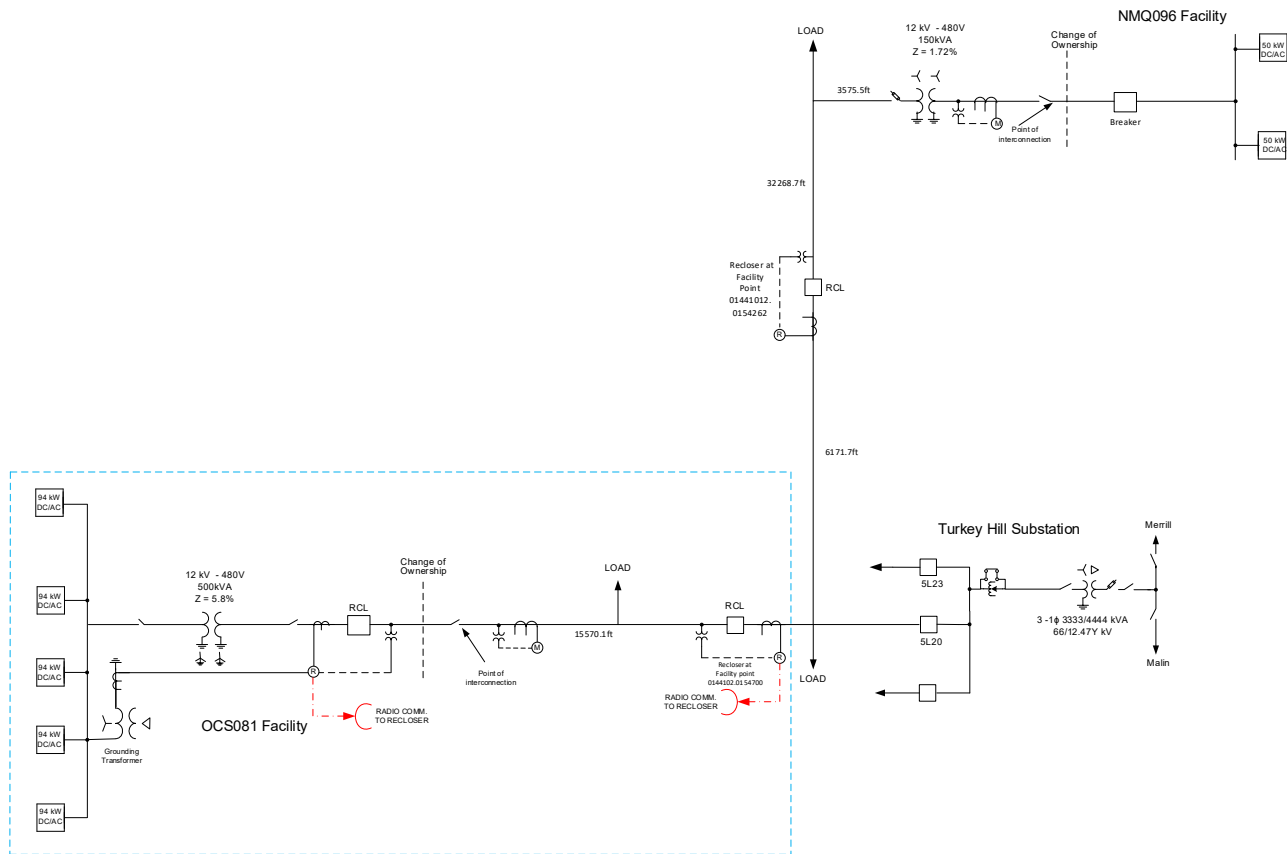


Figure 1: System One Line Diagram

## 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 POI 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 Point of Interconnection 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.
- The Public Utility distribution facility point closest to the point of interconnection is 01440012.0342001 on Maupin Road.
  - Distribution load flows were performed at light load and full generation with summer and winter loading conditions.
  - 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 REQUIREMENTS**

The Community Solar Project and Interconnection Equipment owned by the Applicant are required to operate 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. The Community Solar Project shall 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 shall be capable of operating under Voltage-reactive power mode, Active power-reactive power mode, and Constant reactive power mode as per IEEE Std. 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 Std 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. 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. In all cases the minimum power quality requirements in Public Utility’s Engineering Handbook section 1C shall be met and 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.

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

## **6.2 DISTRIBUTION/TRANSMISSION LINE MODIFICATIONS**

Extend #2 AAAC phase and neutral from Maupin Rd at or near facility point 01440012.0342001 to the Point of Interconnection. The line extension includes a pole for primary metering and a pole with a 600-amp group operated switch. The project is to provide access for Public Utility vehicles to Public Utility's facilities at the Point of Interconnection.

## **6.3 EXISTING BREAKER MODIFICATIONS – SHORT-CIRCUIT**

The increase in the fault duty on the system as the result of addition of the Project with photovoltaic arrays fed through 5 – 94KW inverters connected to a 500KVA 12kV – 480V transformer with 5.8% 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 Project will need to disconnect in a high-speed manner from the distribution circuit out of Turkey Hill substation for faults on the 12.0 kV line. The daytime load on breaker 5L20 out of Turkey Hill substation is greater than the potential power output of this facility plus the existing generation on the circuit so the unbalance between the load and the generation can be relied on to cause the timely disconnection of the Project. However, the same is not true for 12.0 kV line faults beyond the line recloser located at facility point 01441012.0153700. The load to generation unbalance when the Project is isolated with the load after the opening of the line recloser cannot be relied upon to cause a timely disconnection of the Project for faults on the line beyond the line recloser. Since most faults on overhead lines are temporary and the circuit can be restored as soon as all the sources of power to the fault have been disconnected, the line recloser will have automatic reclosing enabled. The opening of the line recloser will need to trigger the high-speed disconnection of the Project to permit the successful operation of the automatic reclosing. This will be accomplished by sending a transfer trip signal from the line recloser to the Project via an SEL mirrored bits radio.

The line recloser located at facility point 01441012.0153700 is equipped with a relay that can perform the following functions as well as the overcurrent protection functions:

- 1) The relay will communicate with the relay at the Project to support the transfer trip signal.
- 2) With the addition of a three-phase set of voltage transformers on the side of line recloser toward the Project the automatic reclosing of the line recloser will be delayed until there is indication that the circuit is dead. The delaying of the reclosing operation is so that if for some reason the Project is not disconnected in a timely manner due to a delay in receiving or reacting to the transfer trip the Applicant's equipment on the circuit will not be exposed to potential damage due to the rapid acceleration of the rotating equipment which would result from the reclosing into the energized circuit.

The Applicant will be required to install a transformer that will hold the phase to neutral voltages within limits when the Project is isolated with the Public Utility's local system

until the generation disconnects. Figure 1 (one line drawing) shows the addition of a 480 V D-Y grounding transformer.

The 12kV circuit reclosers planned to be installed at the Project will need to be equipped with a Schweitzer Engineering Laboratories (SEL) 651R relay/controller and voltage instrument transformer mounted on the utility side of the circuit recloser. The SEL-651R will perform the following protection functions:

1. Receive transfer trip from the utility line recloser
2. Detect faults on the 12kV equipment at the Project
3. Detect faults on the 12.0 kV line to Turkey Hill substation
4. Monitor the voltage and react to under or over frequency, and /or magnitude of the voltage
5. Monitor the current through the grounding transformer to protect the transformer from unbalance current conditions on the 12.0 kV system that are not resolved in a timely matter

#### **6.5 DATA REQUIREMENTS (RTU)**

No telemetry points will be required from the Applicant's Community Solar project. The Public Utility will monitor the status of the line recloser providing the transfer trip signal to the Community Solar Project.

#### **6.6 COMMUNICATION REQUIREMENTS**

A radio system will be installed between the Public Utility's line recloser and the POI for transfer-trip communication. The antennas will need to be mounted at least 58' above ground level. If no room is available on the poles they will need to be raised or a new pole installed adjacent to the existing one. An equipment enclosure will be installed near the base of the pole with battery and charger for the radios. Fiber optic jumpers will be installed between the radios and the relays' fiber optic transceivers.

To enable SCADA monitoring of the radio link, another link will be installed between the POI and the Public Utility's Beth's Butte communication site. From there, existing systems will carry the SCADA circuit to the Public Utility's control centers.

#### **6.7 SUBSTATION REQUIREMENTS**

No substation upgrades are required.

#### **6.8 METERING REQUIREMENTS**

##### Interchange Metering

The metering will be located on the high side of the Applicant's generator step up transformer at the Point of Interconnection. The metering transformers will be installed overhead on a pole per distribution DM construction standards. The meter itself will be installed at the base of the pole. 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 feed 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.

#### Station Service/Construction Power

Prior to construction, Applicant must arrange construction power with the Public Utility as holding the certificated service territory rights for the area in which the load is physically located. Station service and temporary construction power metering shall conform to the Six State Electric Service Requirements manual.

Please note, prior to back feed, Applicant must arrange distribution voltage retail meter service for electricity consumed by the Project and arrange back up station service for power that will be drawn from the distribution line when the Project is not generating. 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.

<b>Project Administration</b> <i>Project management, administrative support</i>	\$17,100
<b>Protection and Control</b> <i>Relay settings development, review and implementation</i>	\$14,700
<b>Distribution</b> <i>Line extension, disconnect switch</i>	\$60,000
<b>Metering</b> <i>Metering equipment</i>	\$25,900
<b>Communications</b> <i>Communications equipment at recloser, POI, Beth's Butte</i>	\$76,500
<b>Other Costs</b> <i>Capital surcharge and contingency</i>	\$44,700

**Total \$238,900**

\*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 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 18 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 May 1, of 2024.

## **9.0 PARTICIPATION BY AFFECTED SYSTEMS**

Public Utility has identified the following Affected Systems: None

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

## **10.0 APPENDICES**

Appendix 1: Higher Priority Requests

Appendix 2: Informational Network Resource Interconnection Service Assessment

Appendix 3: Property Requirements

**10.1 APPENDIX 1: HIGHER PRIORITY REQUESTS**

All active higher priority transmission service and/or generator interconnection and Community Solar Project 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:

GI Queue	Size (MW)
721	55
741	40
849	100
OCS003	0.8
OCS004	0.8
OCS019	0.88
OCS020	0.17
OCS025	2.80
OCS034	0.98
OCS036	1.13
OCS039	2.25
OCS044	0.36
OCS046	2.25
OCS047	2.25
OCS048	1.50
OCS049	2.99
OCS050	1.00
OCS051	1.50
OCS055	1.35
OCS058	1.25
OCS067	1.00
OCS070	2.00
C1-15	2.30
C2-180	80
C2-181	80
C2-203	400
C2-210	80

## **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.

There are currently a significant number of higher-queued requests seeking interconnection in the southern Oregon area where the CSP generator proposes to interconnect. These interconnection studies must be completed before the transmission provider can determine what upgrades and associated cost estimates may be required for the aggregate of generation in the local area to be delivered to the aggregate of load on the transmission provider’s transmission system (the NRIS study scope).

### **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 Public Utility. 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 point of interconnection 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.

**10.4 APPENDIX 4: TRANSMISSION/DISTRIBUTION STUDY RESULTS****Distribution Study Results**

- The interconnection of this generation will cause the total connected generation on 5L20 to exceed 10% of the load during all loading conditions. This generation will be required to be effectively grounded.
- The Turkey Hill substation transformer T1749 has existing reverse power flow conditions due to existing generation.
- The interconnection of this generation will cause reverse power flow at 01441012.0153700 during winter peak and spring minimum daytime loading conditions. This location is scheduled to have a recloser installed. It will be required that this recloser have dead line check capability.