

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

Completed for

**(“Applicant”)**  
**OCS039**

Proposed Point of Interconnection  
**Circuit 5R53 out of Cave Junction substation 12.0 kV**  
**(At approximately 42°08’2.13’’N, 123°37’51.98’’W)**

**November 3, 2020**

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

(“Applicant”) proposed interconnecting 2.25 MW of new generation to PacifiCorp’s (“Public Utility”) circuit 5R53 out of Cave Junction substation located in Josephine County, Oregon. The project (“Project”) will consist of eighteen (18) Delta M125HV 125 kW inverters for a total requested output of 2.25 MW. The requested commercial operation date is May 31, 2021.

The Public Utility has assigned the Project “OCS039.”

## **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 5R53 out of Cave Junction substation via a 12.0 kV primary meter. The proposed Point of Interconnection (“POI”) will be located at approximately 42°08’2.13”N, 123°37’51.98”W located in Josephine 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.



## **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 POI.
- 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.
- This study assumes that the Applicant will provide constant power factor control at unity power factor (100% PF).
- Contingency transmission configuration for the Public Utility's system is defined as any configuration other than normal transmission configuration.
- Three base cases were developed and studied in power flow simulation at the transmission level covering summer peak load, winter peak load and daytime minimum load conditions. Analysis was performed on each case evaluating three transmission system configurations prior to and with the requested OCS039 generation:
  - Normal transmission configuration: Cave Junction substation supplied from Grants Pass substation via 115 kV transmission loop formed by Line 44 and Line 88.
  - Contingency transmission configuration 1: Grants Pass-Applegate segment of 115 kV Line 44 is out of service.
  - Contingency transmission configuration 2: Grants Pass- Jerome Prairie segment of 115 kV Line 88 is out of service.
- The point of interconnect for this customer is assumed to be facility point 01339008-347500.
- The generators were assumed to operate during daylight hours, 7 days per week, 12 months per year. The generation contribution at the primary meter (POI) was assumed to be 2250 kW at unity power factor.
- This study assumes that the Applicant will provide constant power factor control at unity power factor (100% PF).
- A daytime minimum load value of 2500 kW, unity power factor was assumed based on measurements. The new generation is not expected to provide reverse power flow to the circuit 5R53 or the Cave Junction substation transformer.

- The Applicant's facilities must be operated in a manner so as not to cause objectionable power quality issues to other Distribution Provider customers. Voltage fluctuations caused by the generation facility are required to meet the Distribution Provider's Engineering Handbook, Voltage Fluctuation and Flicker, Standard 1C.5.1 which is found at <https://www.pacificpower.net/about/power-quality-standards.html>. Table 1 of Standard 1C.5.1 indicates that for this project the medium voltage planning levels for voltage fluctuation under any condition is a Pst < 0.9 and a Plt < 0.7. It is the Applicant's responsibility to design and construct a system capable of meeting these levels. Specific system information will be provided on request to the Applicant for design purposes. During operation if measured voltage fluctuation levels exceed the limits specified in Standard 1C.5.1 the Applicant is required to cease generation until the condition is mitigated. The requirement for the Applicant's system to meet Standard 1C.5.1 will be incorporated in the interconnection contract. The Distribution Provider may, at its' discretion, disconnect the Applicant's facilities until mitigations to meet these standards are made. The Applicant must also comply with all of the Distribution Provider's Engineering Handbook standards addressing power quality, including but not limited to Voltage Level, Voltage Balance, Harmonic Distortion, and Voltage Frequency.
- For calculation of the forecasted voltage fluctuation, it was assumed that the power flow from the Applicant would change from full generation to no generation during a one minute interval.
- Six cases were assembled and studied at the 12.0 kV distribution voltage level.
  - Daytime minimum load, no generation.
  - Daytime minimum load, full generation.
  - Summer peak, no generation.
  - Summer peak, full generation.
  - Winter peak, no generation.
  - Winter peak, full generation.
- The following substation load tap changer output voltages were assumed in the respective cases:
  - Daytime minimum load case: 1.029 per unit.
  - Summer peak case: 1.033 per unit.
  - Winter peak case: 1.033 per unit.
- 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 automatic power factor control with the power factor sensed electrically at the POI. The required power factor is 1.0 per unit at the POI.

The minimum power quality requirements are in PacifiCorp's Engineering Handbook section 1C and are available at <https://www.pacificpower.net/about/power-quality->

standards.html. Requirements 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.

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.

## **6.2 TRANSMISSION SYSTEM MODIFICATIONS**

No transmission system modifications are required to accommodate the proposed Applicant's facility.

## **6.3 DISTRIBUTION/TRANSMISSION LINE MODIFICATIONS**

The load flow model was modified from its present state by including the following construction items:

1. Reconductor existing # 4 CU three phase from facility point 01335008.220361 to 01339008.340902 with 477 AAC and 4/0 AAC neutral approximately 1.6 miles.
2. Replace 100T fuse with 140T fuse at Facility Point 01339008.287503
3. Replace 65T fuse with 100T fuse at facility point 01339008.345900
4. Distribution scope included for a short line extension from pole 01339008.347500 to the yet to be specified point of delivery. This scope includes three new poles, one gang operated switch, on primary metering assembly, and a riser pole. Additional poles may be required if other Utility departments specify a control house and/or Utility protective device. Note that the Applicant's single line diagram shows a customer owned recloser near the utility meter. The Applicant will be responsible for obtaining all necessary permissions and easements.

## **6.4 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 18– 125 kW inverters connected to 1 – 2.5 MVA 12 kV – 600 V transformer with 5.8 % impedance will not push the fault duty above the interrupting rating of any of the existing fault interrupting equipment.

## **6.5 PROTECTION REQUIREMENTS**

The OCS039 generation facility will need to disconnect from the network in a high speed manner for faults on the 12 kV line on circuit 5R53 out of Cave Junction Substation. The minimum daytime load on circuit 5R53 is 2.5 MW which is above the maximum potential power output of the proposed OCS039 generating facility. For this reason the imbalance condition of the load and generation can be relied upon to cause the high speed disconnection of the generating facilities for faults on the distribution system.

The generation facility is planned to be connected beyond an existing line recloser 197D at facility point 01339008.0289861. During some daytime periods the load beyond the

recloser will be less than the potential generation from the proposed solar electric generation facility. Since the unbalance between the generation and load cannot be relied upon to cause the timely disconnection of the solar facility for faults on the 12 kV circuit beyond the recloser a transfer trip circuit will be required between the line recloser and the OCS039 POI recloser at the solar facility. A dead line checking control circuit will be required for the line recloser to delay the automatic reclose if the generation at the solar facility is not disconnected due to a failure of the relay circuitry. An optical fiber cable will be installed between the 197D line recloser and the OCS039 POI recloser to carry the transfer trip signal.

With the addition of the OCS039 generation facility there will be a potential for the generation facility to contribute more fault current for phase to ground faults between line recloser 197D and Cave Junction Substation to be above the pickup value for the ground overcurrent element in the recloser. With the current recloser this will cause it to trip for these type faults. This will down grade the service to the existing customers and will not be acceptable. There is a project planned to replace the 197D line recloser. The new recloser will have all of the capabilities needed for the OCS039 project except for having a set of load side voltage senses monitor the line being dead on the load side of the line reclosers. These voltage senses will need to be added as part of the OCS039 project. There will also be potential for the generation facility to contribute more fault current for phase to ground faults on the other 12 kV feeder out of Cave Junction Substation for the relay for breaker 5R53 to operate for causing the breaker to trip. The relay is currently set to be non-directional but has the capability to be set directional so that the breaker will only be tripped for faults on the feeder it is there to protect. This relay setting change will be needed for this project.

The 12 kV circuit recloser planned to be installed at the OCS039 project will need to be equipped Schweitzer Engineering Laboratories (SEL) 651R relay/controller and voltage instrument transformers mounted on the utility side of the circuit recloser. The 651R will perform the following protection functions:

1. Detect faults on the 12 kV equipment at the solar-electric generation facility
2. Detect faults on the 12 kV line to Cave Junction Substation
3. Monitor the voltage and react to under or over frequency, and/or magnitude of the voltage
4. Communicate with line recloser 197D to receive transfer trip from the line recloser

## **6.6 DATA REQUIREMENTS (RTU)**

Due to the power size of the solar-electric generation facility no real time monitoring will be required by the Public Utility for the operation of the transmission network so no RTU will be required.

## **6.7 COMMUNICATION REQUIREMENTS**

### *6.7.1 LINE PROTECTION*

A 48-fiber, single mode, ADSS optical fiber cable will need to be installed along the distribution line between the line recloser 197D and the OCS039 POI recloser for transfer trip. The fiber will be terminated in patch panels inside enclosures. Fiber optic jumpers will be installed from the patch panels to the relays' fiber optic transceivers.

### *6.7.2 DATA DELIVERY TO THE CONTROL CENTERS*

Since no RTU is required at the solar electric generation facility no communication circuit will be required for this function.

## **6.8 SUBSTATION REQUIREMENTS**

### Cave Junction Substation

Relay and load tap changer settings modifications will be performed

## **6.9 METERING REQUIREMENTS**

### Interchange Metering

The metering will be located on the high side of the customer generator step up transformer at the POI. 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 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

The Applicant 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.

<b>OCS039 Collector Station</b>	<b>\$110,000</b>
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*Install metering, transfer trip and develop settings.*

<b>OCS039 Point of Interconnection</b>	<b>\$60,000</b>
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*Install line extension at POI*

<b>Line Recloser 197D</b> <i>Install VTs and transfer trip.</i>	\$46,000
<b>Distribution</b> <i>Reconductor Line and re-fuse two locations.</i>	\$339,000
<b>Communication</b> <i>Install ~2.3 miles of fiber.</i>	\$83,000
<b>Cave Junction Substation</b> <i>Develop settings for relay and LTC</i>	\$7,000
<b>Total</b>	<b>\$645,000</b>

\*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 11-12 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 31, 2021.

## **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:

Q1104 (3 MW)

**10.2 APPENDIX 2: INFORMATIONAL NETWORK RESOURCE INTERCONNECTION  
SERVICE ASSESSMENT**

The following is the Public Utility's assessment of the requirements that would be assigned to this interconnection request were it to be for network resource interconnection service. This assessment is for informational purposes only as part of the Oregon Community Solar program and is not required for the Applicant's interconnection request.

### **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.

#### **10.4 APPENDIX 4: TRANSMISSION/DISTRIBUTION STUDY RESULTS**

The results of the transmission study show that the proposed OCS039 project does not result in negative impacts to the Public Utility's transmission system. Power flow simulation indicates that steady state and post transient voltages are projected to remain within acceptable limits and loading on transmission facilities is projected to remain within facility ratings.

There are no contingent facilities identified for this interconnection request at the transmission level.