

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

Completed for

**(“Applicant”)**  
**OCS038**

Proposed Point of Interconnection  
**Circuit 4M850 out of Calapooya substation at 20.8 kV**  
**(at approximately 44°24'21.0"N, 122°59'50.7"W)**

**October 27, 2020**

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

(“Applicant”) proposed interconnecting 0.981 MW of new generation to PacifiCorp’s (“Public Utility”) circuit 4M850 out of Calapooya substation located in Linn County, Oregon. The project (“Project”) will consist of seven (7) Delta M125H (factory limited to 123 kW) inverters and one (1) Delta M125H (factory limited to 120 kW) inverter for a total requested nameplate output of 0.981 MW. The requested commercial operation date is May 31, 2021.

The Public Utility has assigned the Project “OCS038”

## **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 4M850 out of Calapooya substation via a 20.8 kV primary meter. The proposed Point of Interconnection (“POI”) will be located at approximately 44°24'21.0"N, 122°59'50.7"W located in Linn County, Oregon. Figure 1 below is a one-line diagram that illustrates the interconnection of the proposed Community Solar Project to the Public Utility’s system.

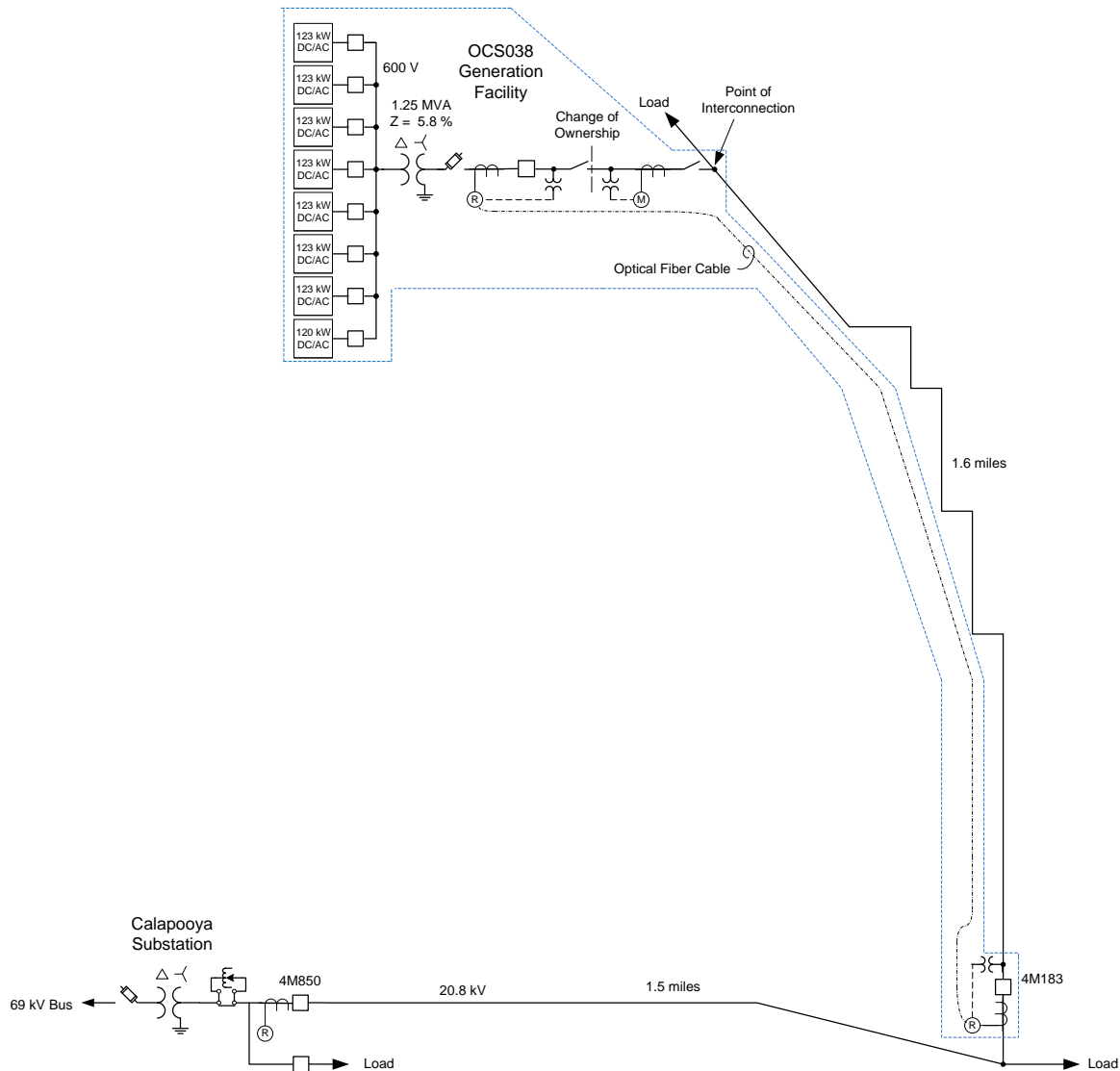


Figure 1: System One Line Diagram

## 5.0 STUDY ASSUMPTIONS

- All active higher-priority 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 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 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.

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  $\pm 3\%$  on the Public Utility's system. No additional reactive compensation requirements are identified as a result of this system impact study.

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 Applicant's proposed generating facility.

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

Requirements are based on the Applicant's requested POI which may need to be revised for actual construction.

- Install 3 phase tap from existing pole 01313003.0256201 (the POI)
- Install new pole and three phase gang operated switch to be fed from new tap.
- Install new pole to serve as metering location and change of ownership
- Extend approximately 100' of new #2 AAAC three phase to connect new tap with gang operated switch and meter
- Install new settings in line recloser 4M183

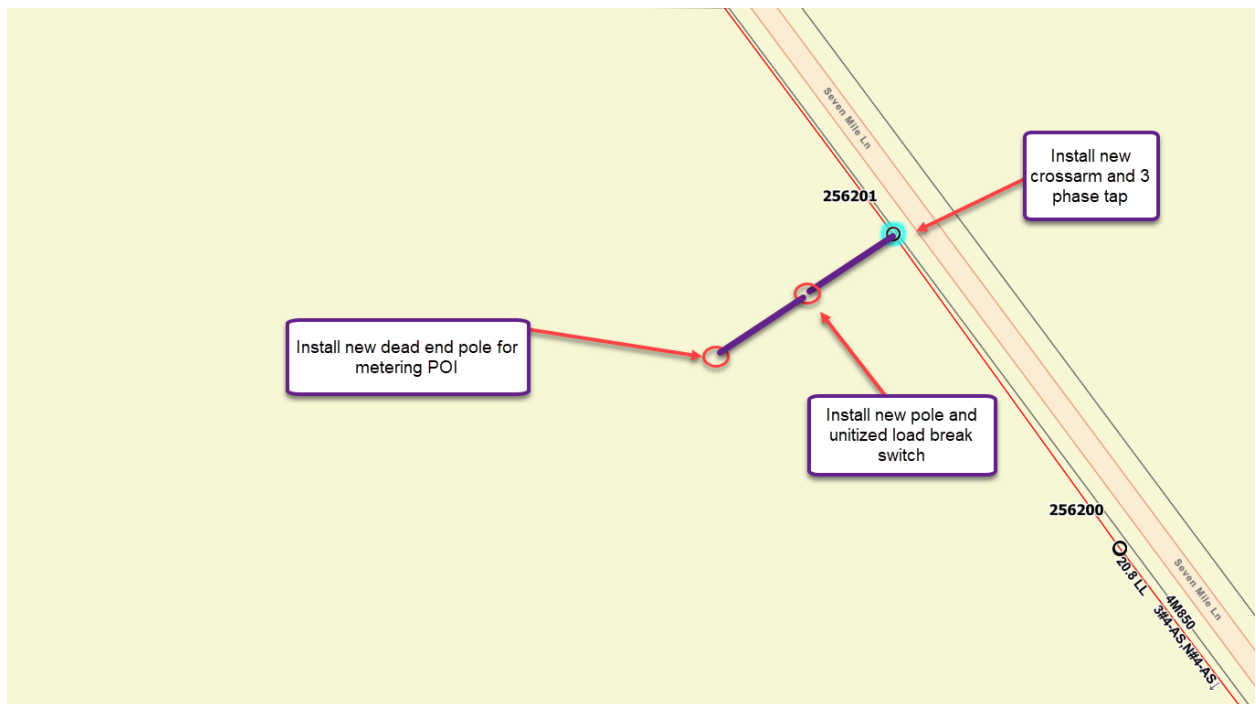


Figure 2: POI Map

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

The increase in the fault duty on the system as the result of the addition of the Community Solar Project with photovoltaic arrays fed through 7– 123 kW inverters and 1 – 120 kW inverter connected to 1 – 1.25 MVA 20.8 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 Applicant's generating facility will need to disconnect from the network in a high speed manner for faults on the 20.8 kV line on circuit 4M850 out of Calapooya substation. The minimum daytime load on circuit 4M850 is 1,100 kW which is above the maximum potential power output of the proposed 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 facility for faults on the distribution system.

The Community Solar Project is planned to be connected beyond an existing line recloser 4M183 at facility point 01314002.0061900. During some daytime periods the load beyond the recloser will be as low as 752 kW which is less than the potential output from the proposed generating facility. Because the unbalance between the generation and load cannot be relied upon to cause the timely disconnection of the generating facility for faults on the 20.8 kV circuit beyond the recloser a transfer trip circuit will be required between the line recloser and the OCS038 POI recloser at the generating facility. A dead line checking control circuit will be required for the line recloser to delay the automatic reclose if the generating facility is not disconnected due to a failure of the relay circuitry. A communications circuit must be developed between the 4M183 line recloser and the OCS038 facility recloser to carry the transfer trip signal.

With the addition of the Applicant's generating facility there will be a potential for the generating facility to contribute fault current for a phase to ground fault between line recloser 4M183 and Calapooya substation above the pickup value for the ground overcurrent element in the recloser. This scenario would cause the recloser to trip for these type or faults which results in a down grade of the service to the existing customers which is not acceptable. Therefore line recloser 4M183 will need to be replaced as part of this project with a unit that can provide the following functions:

1. Communicate with the OCS038 facility recloser for transfer trip signal
2. The ground overcurrent element can be set to directional so that the recloser will only be tripped for faults beyond the recloser
3. The reclosing function will be delayed until there is indication that the line beyond the recloser is dead

The 20.8 kV circuit recloser planned to be installed at the Applicant's generating facility will need to be equipped with a 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 20.8 kV equipment at the generating facility
2. Detect faults on the 20.8 kV line to Calapooya substation
3. Monitor the voltage and react to under or over frequency, and/or magnitude of the voltage
4. Communicate with line recloser 4M183 to receive transfer trip from the line recloser

**6.6 DATA REQUIREMENTS (RTU)**

Due to the size of the Applicant's proposed generating 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**

The Public Utility will install approximately 1.6 miles of fiber optic cable along the distribution line between the line recloser 4M183 and the Applicant's generating facility recloser for transfer trip. The fiber will be terminated in patch panels in enclosures at both ends. Fiber optic jumpers will be installed from the patch panels to the relays' fiber optic transceivers.

**6.8 SUBSTATION REQUIREMENTS**

No substation modifications are required.

**6.9 METERING REQUIREMENTS****Interchange Metering**

The metering will be located on the high side of the customer generator step up transformer at the change of ownership. 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>OCS038 Collector Station</b>	<b>\$84,000</b>
<i>Install metering &amp; communications equipment, develop relay settings</i>	
<b>Distribution</b>	<b>\$30,000</b>
<i>Line tap/extension, switch</i>	



<b>Line Recloser 4M183</b>	<b>\$73,000</b>
<i>Replace recloser, communications equipment</i>	
<b>Communications</b>	<b>\$29,000</b>
<i>Install ~1.6 miles of fiber</i>	
<b>Total</b>	<b>\$216,000</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 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 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

Appendix 4: Distribution Cost Estimate

Appendix 5: Transmission/Distribution Study Results

**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:

<b>Q#</b>	<b>Size (MW)</b>
1098	3
1149	0.108
1150	0.504
1151	0.285
OCS008	2.16
OCS026	1.5
OCS027	2.875
OCS035	2.25

## **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.

Considering existing generation and higher-queued requests to interconnect in the Willamette Valley area where the CSP generator proposes to interconnect, 0.981 MW of additional generation can be absorbed. As a result, the transmission provider determines that no additional network upgrades would 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 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 5: TRANSMISSION/DISTRIBUTION STUDY RESULTS****Transmission:**

Three base cases were developed to represent heavy summer, heavy winter and light spring load conditions. A Power flow analysis was performed on each case for two system configurations described below.

1. Normal transmission configuration: Calapooya normally tied into the Fry to Diamond Hill 230 kV line. Switch 3M66 at Brownsville substation open and switch 3M93 at Lancaster tap open. Brownsville and Calapooya distribution radially fed.
2. Contingency transmission configuration: Loss of Calapooya 230-69 kV transformer. Transfer Calapooy and Brownsville to Diamond Hill source via Halsey Switching Station.

Each Power flow analysis was conducted pre and post OCS038. The study focused on the 69 kV system out of Calapooya and Diamond Hill substations and distribution substations in the area. Voltage and thermal limitation of surrounding substation buses and lines were monitored.

The results for the transmission study concluded that steady state and post transient voltages are within acceptable limits. No thermal violations were identified. The proposed OCS038 project does not result in additional deficiencies to the Public Utility's transmission system.

There are no contingent facilities identified for this interconnection request.