

City of Vernon

Interconnection Guidelines: Customer Owned Solar Generating Facility

1. Introduction

This document is intended to be a general overview of the City of Vernon Department of Public Utilities ("VPU") technical requirements for interconnection of Customer Generator's ("CG") solar distributed generation (a "Facility") to the VPU distribution system (the "VPU System"). It is not intended to be relied on to determine the interconnection requirements for any Facility. VPU does not design, engineer or install generating systems for its customers. VPU is also not able to recommend specific contractors or equipment suppliers.

To properly interconnect distributed generation, certain protective equipment (relays, circuit breakers, etc.) must be installed. These devices ensure that faults or other abnormalities initiate prompt and appropriate disconnection of the Facility from the VPU System. Protective equipment requirements vary based on the distributed generation sources and interconnection. Significant issues that could affect these requirements include:

- The configuration of the Facility.
- The Point of CG Connection to the power system.
- The level of existing service and protection to adjacent facilities (including those of other VPU customers).

In addition, certain modifications and/or additions to the VPU System may be required for Facility interconnection and will be at the expense of the Customer. Each individual request for interconnection must result in a protection system consistent with these technical requirements. VPU makes the final determination as to the protective devices and related modifications and/or additions required to interconnect with VPU's System. VPU works with the customer to achieve an installation that meets the CG's and VPU's requirements.

VPU does not assume any responsibility for protecting the customer's Facility. Customers are solely responsible for protecting their equipment in such a manner that faults, imbalances, or other disturbances on the VPU System do not cause damage to the Facility.

2. Generation Source

This standard(s) addresses inverter-based interconnection. The connection to the VPU distribution system must be into 60 Hz alternating current. An inverter must meet the following criteria to be considered:

- It is listed under UL-1741, and on the California Energy Commission's (CEC) approved inverter list. This list is accessible via a link:
<https://solarequipment.energy.ca.gov/Home/Index>
- It is compliant with ANSI/IEEE 1547-2018 (SA/SB) Standards for Interconnecting

In general, Customer Generator facility consists of solar photovoltaic electricity-generating modules, electrical controls, inverter(s), automatic disconnect devices, manual disconnect devices and wiring to connect all the above to VPU electric distribution system. Customer Generator's Facility shall be in accordance with the attached sample layouts and approved by VPU.

3. Parallel Operation

A parallel system is defined as one in which the Customer's generation can be connected to a bus common with the VPU's distribution system. A transfer of power between the two systems is a direct and often desired result. A consequence of such parallel operation is that the parallel generator becomes an electrical part of VPU distribution system that must be considered in the electrical protection of the VPU System.

In systems without parallel generation, the utility controls the only source of power supply to a given line and therefore has the responsibility to install equipment, which is adequate, under expected circumstances, to detect faulted equipment and de-energize it. A parallel generator connected to a utility line represents another source of power to energize the line and must also have adequate protective devices installed to sense trouble on the utility system.

4. Design Requirements

Customer's Facility, and all portions of it used to provide or distribute electrical power and parallel interconnection with VPU, shall be designed, manufactured, installed, operated, and maintained in compliance with this document and the National Electric Code (NEC).

5. Application Review and Plan Check

Prior to installation of customer interconnection facilities, customer shall submit a distributed generation interconnection application for utility review. The submittal shall include an electrical one-line or three-line diagram and a site plan showing the location of all electrical equipment being installed.

Modifications to the approved design shall not be made without prior approval. If modifications are desired, the customer must submit the revised plans including the modifications for utility approval.

Customer Generator shall obtain any governmental authorizations and permits required for the construction and operation of the facility and interconnection equipment. All Customer Generator facilities shall remain in a safe condition and in conformance with all applicable laws and regulations including, but not limited to, VPU's Guidelines for Interconnection of Customer Owned Solar Generating Facility.

Customer shall reimburse VPU for any and all losses, damages, claims, penalties, or

liability it incurs as a result of Customer's failure to obtain or maintain any governmental authorizations and permits required for construction, operation, and maintenance of Customer's generating facility.

6. General Rules and Restrictions

- 6.1. The Customer Generator is responsible for all costs associated with its Facility and is also responsible for all costs related to any modifications to the Facility that may be required by VPU.
- 6.2. VPU maintains the right to approve the facilities for interconnection, and to inspect such facilities at any time and for any reason.
- 6.3. VPU maintains the right to disconnect, without liability, the Customer Generator for issues relating to safety and reliability.
- 6.4. .
- 6.5. The Customer shall not add generation capacity in excess of the Nameplate rating agreed upon in the utility interconnection agreement or otherwise modify the Generating Facility without the prior written permission from VPU.
- 6.6. Customer shall not commence parallel operation of the generator facility until written approval of the interconnection facilities has been given by VPU. Such approval shall not be unreasonably withheld. VPU shall have the right to have representatives present at the initial testing of Customer's protective apparatus, final inspection made by City of Vernon Building Inspectors, and during the initial Facility start-up.
- 6.7. Interconnection shall not be allowed on utility services that are ungrounded three phase, 3 wire, delta or wye systems and corner-grounded 3 phase systems.
- 6.8. Interconnection shall not be allowed for utility service voltages above 600V.
- 6.9. If the performance meter and disconnecting means are installed indoors, a dedicated electrical room with exterior 24/7 access shall be required in line sight of the service entrance switchgear. The exterior door shall not be alarmed.

7. Inverter Requirements

- 7.1. It shall automatically detect and isolate from the VPU source without any intentional delay within five cycles under the following conditions:
 - 7.1.1. Overvoltage +5 percent above Nominal Service Voltage on AC supply
 - 7.1.2. Undervoltage -5 percent below Nominal Service Voltage on AC supply
 - 7.1.3. Overfrequency - 1% above 60 Hz on AC supply
 - 7.1.4. Underfrequency – 1% below 60 Hz on AC supply
 - 7.1.5. AC overcurrent relay, circuit breaker, or internal fusing that will operate when the AC current is greater than the full load current.
- 7.2. Inverter output harmonic distortion shall meet IEEE 519 standards. Any voltage flicker at the Point of Common Coupling caused by the Customer Generator's Facility should not exceed the limits defined by the "Maximum Borderline of Irritation Curve" identified in IEEE 519.
- 7.3. In the event of inverter control failure, the DC contactor must return to the normally open condition.
- 7.4. Inverter must be tested for islanding and test result confirmed in writing by VPU.

- 7.5. The Facility shall have the capability to withstand voltage and current surges in accordance with the environments defined in IEEE Std C62.41.2-2002 or IEEE Std C37.90.1.2002 as applicable.
- 7.6. The distributed generated sources shall be clearly identified on the service equipment with the location of the sources' disconnect(s).
- 7.7. The Facility interconnection shall be capable of withstanding 220% of the VPU utility service rated voltage.
- 7.8. The Facility shall have accurate real-time telemetering capabilities, subject to approval by VPU.

8. Metering Requirements

8.1. General

The customer shall provide and install all necessary metering sockets and cabinets as required by the utility. The utility will furnish and install the revenue meter (or revenue net meter) at the point of delivery to the customer's facility.

The performance meter socket shall be wired so the output from the customer's inverter will be properly measured by the meter. The performance meter and utility disconnect will be installed in a location readily accessible by VPU during normal business hours. Under no circumstances shall any metering enclosure be used as a conduit or raceway for any conductors other than those phase conductors being metered and the associated grounded conductor (neutral) and grounding conductor (equipment ground).

8.2. Arrangement and Location

The performance/production meter shall be located within sight and within 10 feet of the net/revenue meter or at an approved location.

8.3. Equipment

All related metering enclosures and equipment shall be grounded in compliance with the NEC and any applicable local codes. Prior to purchasing equipment for interconnection to VPU, the customer is responsible for submitting and receiving approvals for the metering equipment shop drawings, from the manufacturer, with related EUSERC sections.

9. Access Requirements

9.1. VPU may enter Customer Generator's premises to:

- 9.1.1. inspect Customer Generator's interconnected equipment, read or test utility metering and verify SCADA communications (where applicable).
- 9.1.2. disconnect, without notice the interconnection facilities if, in VPU's opinion, a hazardous condition exists and such immediate action is necessary to protect from harm, persons, VPU's facilities, or properties of others.

10. A/C Disconnects

10.1. General

The Customer Generator shall furnish a disconnect switch to isolate all ungrounded conductors from their alternative generating facility to the utility's distribution system. The switch shall be a gang- operated, load-break device with a visible airgap in the open position. It shall be rated for the current, voltage, and fault duty of the Customer Generator's interconnected facility and shall be lockable in the open position.

10.2. Location

The utility AC disconnect, and all required AC disconnects shall be within sight and 10 feet of the customer's service entrance section, or an approved nearby location. AC disconnects shall be readily accessible to VPU and lockable. Height and working clearances must be in accordance with the NEC.

11. Monitoring and Control

11.1. Telemetry Requirements

VPU System requires telemetry data for the integration of new generation resources. This typically consists of the continuous telemetering of kW quantities and hourly transmission of the previous hour's Wh from the Facility to the VPU load dispatching and control center. The net Facility output, which is the Facility generation less the station service load and step-up losses, is normally telemetered. Customer shall be responsible for all costs associated with telemetering, including any required upgrades to VPU's SCADA system.

11.2. The following includes specific requirements based on Facility size:

- 11.2.1. Telemetry is required when the rated output of the Facility interconnected with VPU's system is 250 KW or greater: For this case, telemetry of real power and energy (kW, kWh), and reactive power (kVAr, kVArh) is normally required.
- 11.2.2. For Facilities below 250 KW, VPU determines telemetry needs on a case-by-case basis. Note that should an existing plant expand to over 250 KW, telemetry is required for the entire plant output.

11.3. Supervisory Control and Data Acquisition (SCADA) Requirements

Where required, the Customer Generator shall furnish and maintain equipment capable of connecting to VPU's SCADA system. The customer is responsible for receiving approvals of the equipment and wiring prior to installation. The power to the SCADA devices must not be disconnected by the Customer Generator's source disconnecting means. All wiring must be properly made so that VPU's SCADA system is not accessible to any other onsite metering system. The minimum information that will be remotely monitored is:

- 11.3.1. Watts in/out
- 11.3.2. Vars in/out
- 11.3.3. Amps
- 11.3.4. KWhr & kVARhr
- 11.3.5. Line voltage at interconnection

11.3.6. Interconnection breaker status/control

11.3.7. Phase angle across the interconnection power circuit breaker

12. Solar Equipment and Labeling Requirements

All National Electric Code (NEC), VPU, and Fire Department required labeling must be made of sunlight and weather-resistant materials. Labeling on disconnects, inverters and service panels must be made of engraved, plastic materials and be permanently attached to its respective device. All labeling, unless otherwise specified, shall be on a plaque with a red background having white lettering with a height of 3/8", all capital letters, arial or similar font, and non-bold. All labeling shall be attached directly to those pieces of equipment. Labeling for circuit breakers shall be placed directly next to the circuit breaker.

The following labels are required by VPU:

12.1. Customer Generator's source disconnects shall be labeled: "PHOTOVOLTAIC DISCONNECT"

12.2. On the service equipment, where metering is installed, a label stating: "CAUTION: MULTIPLE SOURCES OF POWER"

13. Applicable Codes and Standards

13.1. NFPA 70E, 2018 130.5(C) –National Fire Protection Association Electrical Safety Code

13.2. NFPA 70, 2020 - National Fire Protection Association National Electrical Code (NEC)

13.3. IEEE 1547-2018 Standard for Interconnecting Distributed Resources with Electric Power Systems

13.4. IEEE 1547.1—Standard for Conformance Test Procedures for Equipment Interconnecting Distributed Resources with Electric Power Systems

13.5. IEEE 929-Recommended Practice for Utility Interface of Photovoltaic Systems

13.6. IEEE 519-Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems

13.7. ANSI C84.1-Electric Power Systems and Equipment--Voltage Ratings (60Hz)

13.8. UL 1741-SA Inverters, Converters, Controllers, and Interconnection System Equipment for Use with Distributed Energy Resources

13.9. CA Rule 21

13.10. UL 98—Enclosed Switches

13.11. OSHA 1910.145(F)(7)

14. Disconnection, Interruption or Reduction of Deliveries

14.1. VPU shall not be obligated to accept or pay for, and may require Customer to interrupt or reduce, deliveries of as-available energy:

14.1.1. When necessary, to construct, install, maintain, repair, replace, remove, investigate, or inspect any of its equipment or any part of its system; or

14.1.2. If VPU determines that curtailment, interruption, or reduction is necessary because of emergencies, forced outages, Force Majeure, or compliance with prudent electrical practices.

14.2. Whenever possible, VPU shall give Customer reasonable notice of the possibility

that interruption or reduction of deliveries may be required. During electrical emergencies, it may be required to disconnect the Facility from the VPU system. Therefore, the disconnecting device shall be capable of being accessed quickly and conveniently 24 hours a day, 7 days a week by VPU personnel without obstacles or requiring those seeking access to obtain keys, special permission, or security clearances, unless other arrangements for access are mutually agreed upon by both parties.

- 14.3. Notwithstanding any other provisions of these Guidelines, if at any time VPU determines that:
 - 14.3.1. the Facility may endanger VPU personnel.
 - 14.3.2. the continued operation of Customer's Facility may endanger the integrity of VPU's System.
- 14.4. VPU shall have the right to disconnect Customer's Facility from VPU's System. Customer's Facility shall remain disconnected until such time as VPU is satisfied that the conditions(s) referenced in (14.1) or (14.2) of this Section have been corrected.

15. Revenue Metering Arrangement

15.1. Metering Terms:

- 15.1.1. NET Meter-- A meter designed to measure the power or energy delivered or received from the customer.
- 15.1.2. Performance / Production Meter (Performance Meter) -- A meter designed to measure only the energy output from the customer's alternate generation source.
- 15.1.3. Revenue Meter-- A meter designed to measure only the power or energy delivered to the customer.

15.2. Revenue and Net Metering Requirements for Billing Data

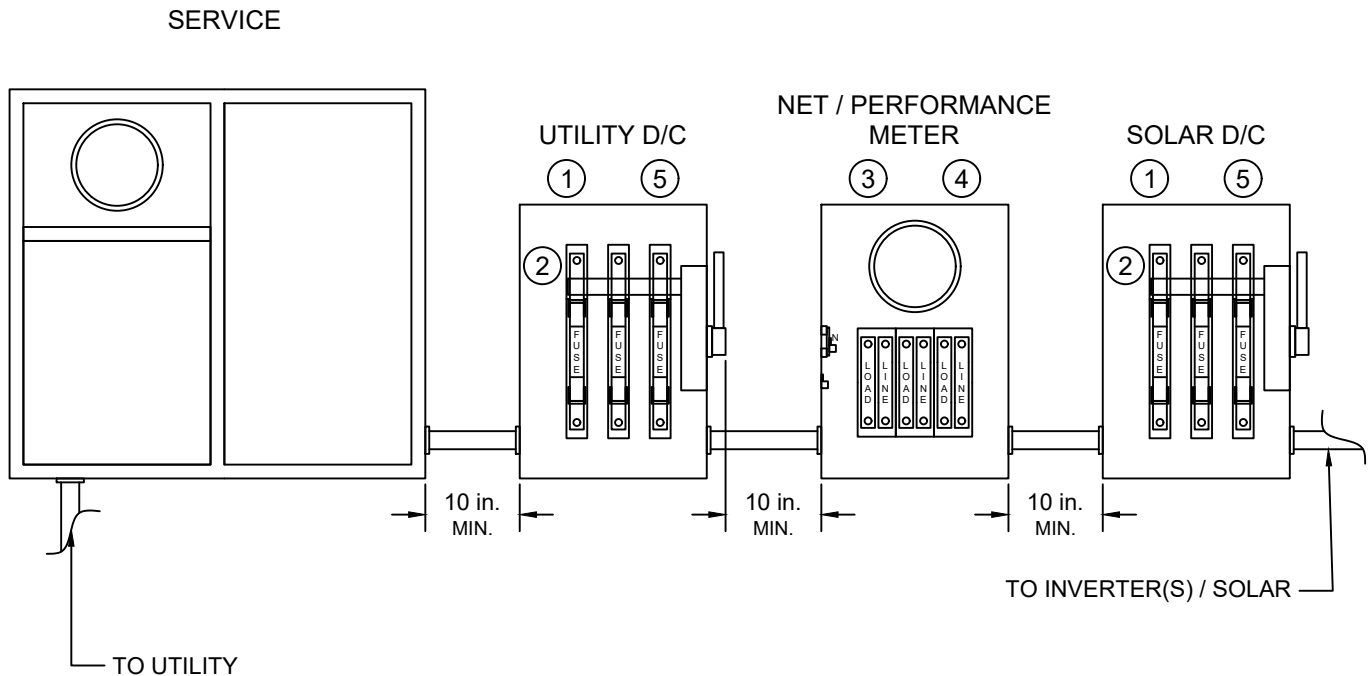
The Customer is required to have a VPU provided revenue grade bi-directional meter to record power flow to or from the Facility. VPU also requires a revenue grade generation meter for measuring power generated or consumed by the Customer Generator's interconnection source(s).

Customers enrolled in one of the three net metering (NM) rate schedules prior to the conclusion date of January 6th, 2025, will remain on either Schedule NM-Large, NM-Medium or NM-Small. Electricity flowing through the Customer Generator's interconnection with VPU's system shall be measured on a net-metering basis until termination of the Interconnection Agreement.


15.3. Meter Accuracy

Watt-hour meters shall be calibrated to $\pm 0.1\%$ accuracy at unity power factor for both full load and light load. Watt-hour meters shall also be calibrated to $\pm 0.3\%$ accuracy for 0.5 power factor at full load. VAr-hour meters shall have $\pm 0.2\%$ accuracy at unity power factor and $\pm 0.6\%$ accuracy at 0.5 power factor. Full load is defined as nominal voltage, 100% meter current rating. Light load is normal voltage, 10% meter current rating.

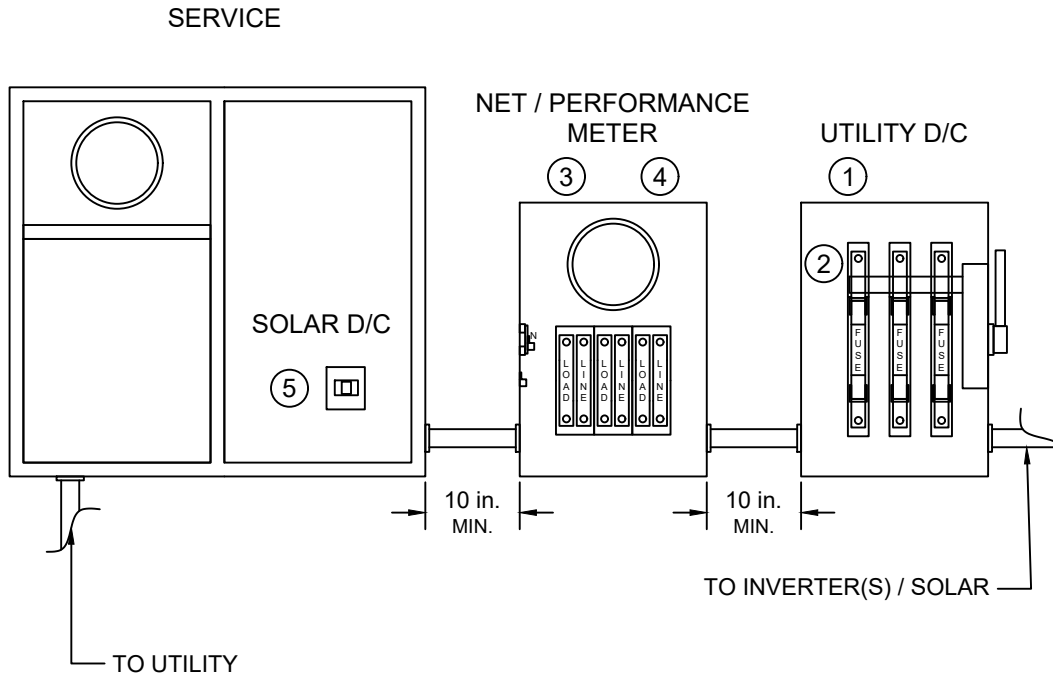
INTERCONNECTION GUIDELINES: CUSTOMER OWNED SOLAR GENERATING FACILITY SAMPLE LAYOUT #1




1. UTILITY DISCONNECT CAN BE ANY AGREED UPON LOAD BREAK RATED AND LOCKABLE DISCONNECTION METHOD THAT HAS A VISIBLE BREAK. I.E. FUSED SWITCH WITH VIEWING WINDOW, NON-FUSED SWITCH WITH VIEWING WINDOW, OR RACK OUT CIRCUIT BREAKER.
2. FUSES MAY OR MAY NOT BE REQUIRED TO PROTECT EQUIPMENT.
3. RECEIVE UTILITY APPROVAL PRIOR TO PURCHASING METERING ENCLOSURE WITH TEST BLOCKS.
4. WHEN TERMINATING WIRE IN THE NET/PERFORMANCE METER, THE INTERCONNECTED DISTRIBUTED GENERATION SHALL BE CONNECTED TO THE "LINE" SIDE TERMINALS.
5. UTILITY DISCONNECT AND SOLAR DISCONNECT ARE FUNCTIONALLY INTERCHANGEABLE. ONLY ONE IS REQUIRED TO BE A LOAD BREAK AND VISIBLE BREAK WITH VIEWING WINDOW TYPE DISCONNECT SWITCH. THAT SWITCH, WHETHER INSTALLED ON THE LOAD SIDE OR LINE SIDE OF THE METER WILL BE CALLED THE UTILITY DISCONNECT. BOTH DISCONNECTS MUST BE LOCKABLE. SEE SAMPLE #2 FOR BREAKER WITH SWITCH CONFIGURATION.

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|  | | | | | | | CITY OF VERNON PUBLIC UTILITIES DEPARTMENT |
| | | | | | | | LOCATION: N/A |
| | | | | | | | SOLAR EUSERC - 501, 502, 503 |
| | | | | | | | SAMPLE #1 |
| | 0 | SAMPLE CREATION | 02/06/2025 | TB | RH | NVS | |
| | NO. | REVISION | DATE | APPV'D | CHK | BY | S#T-001-00 |

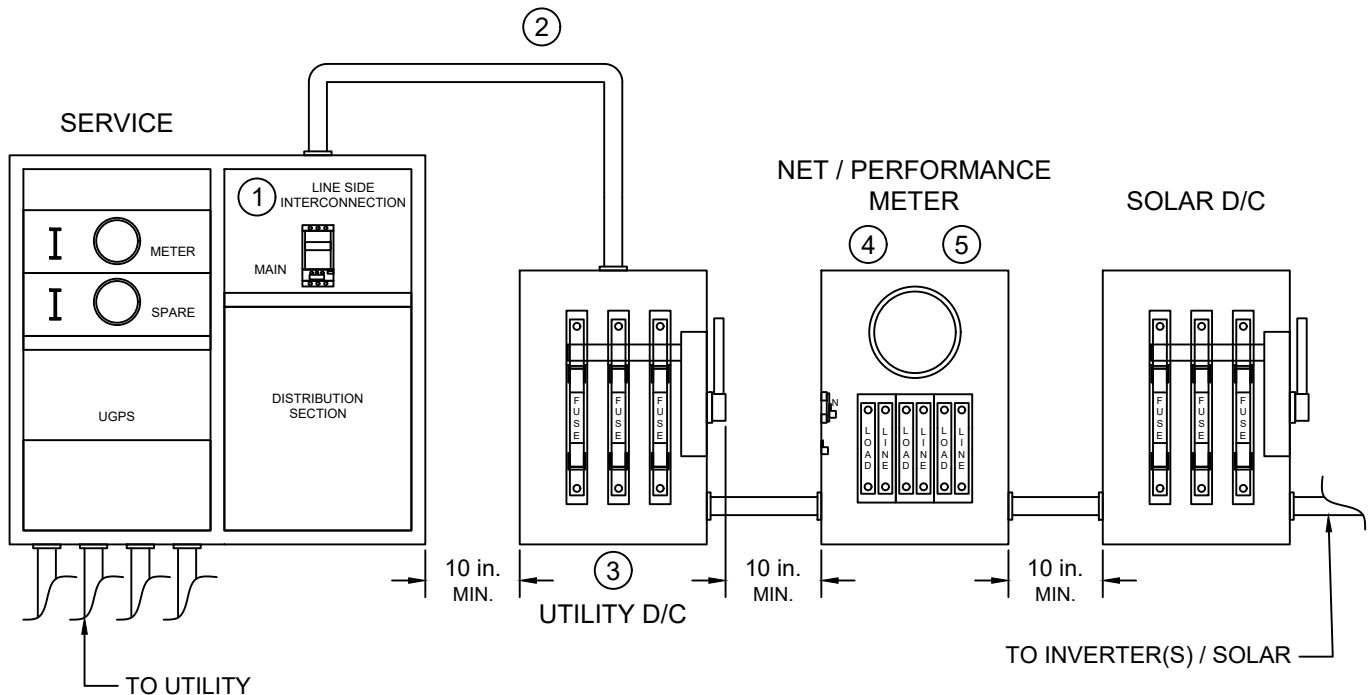
INTERCONNECTION GUIDELINES: **CUSTOMER OWNED SOLAR GENERATING FACILITY** **SAMPLE LAYOUT #2**




1. UTILITY DISCONNECT CAN BE ANY AGREED UPON LOAD BREAK RATED, LOCKABLE, AND VISIBLE BREAK DISCONNECTION METHOD. I.E. FUSED SWITCH WITH VIEWING WINDOW, NON-FUSED SWITCH WITH VIEWING WINDOW, OR RACK-OUT CIRCUIT BREAKER.
2. FUSES MAY OR MAY NOT BE REQUIRED TO PROTECT EQUIPMENT.
3. RECEIVE UTILITY APPROVAL PRIOR TO PURCHASING METERING ENCLOSURE WITH TEST BLOCKS.
4. WHEN TERMINATING WIRE IN THE NET/PERFORMANCE METER, THE INTERCONNECTED DISTRIBUTED GENERATION SHALL BE CONNECTED TO THE "LINE" SIDE TERMINALS.
5. SOLAR DISCONNECT CAN BE A BREAKER IN THE DISTRIBUTION SECTION, SO LONG AS IT IS LOCKABLE.

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| | | | | | | | LOCATION: N/A |
| | | | | | | | SOLAR EUSERC - 501, 502, 503 |
| | 0 | SAMPLE CREATION | 02/06/2025 | TB | RH | NVS | SAMPLE #2 |
| | NO. | REVISION | DATE | APPV'D | CHK | BY | S#T-002-00 |

INTERCONNECTION GUIDELINES: CUSTOMER OWNED SOLAR GENERATING FACILITY SAMPLE LAYOUT #3



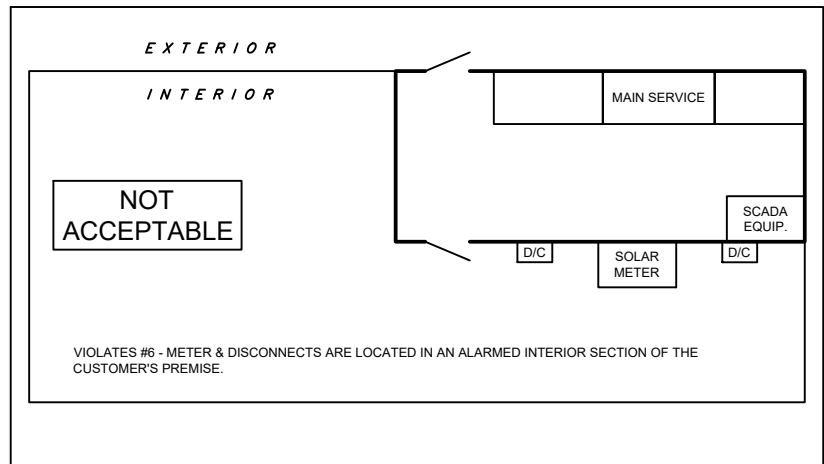
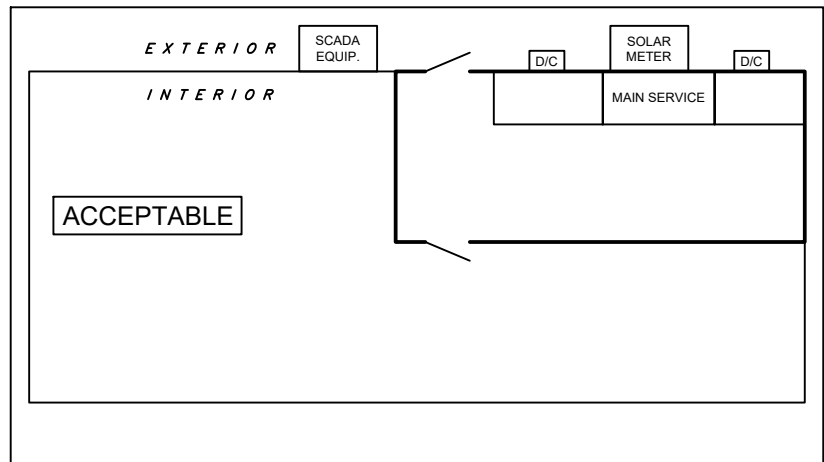
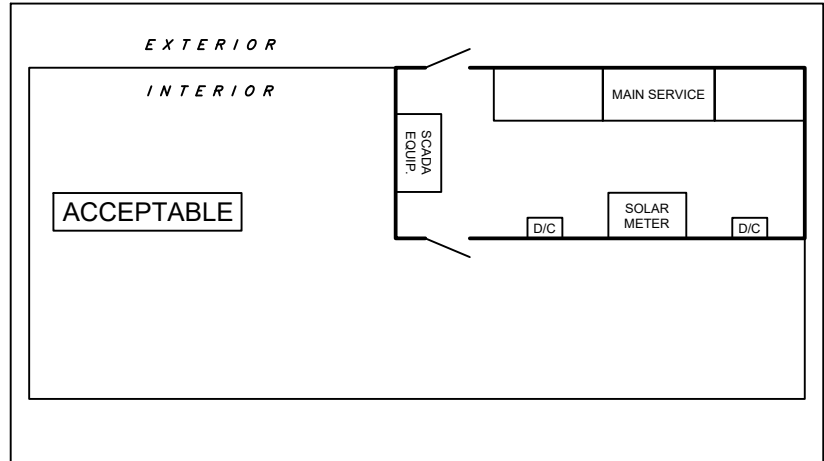
1. INTERCONNECTIONS INSTALLED ON THE LINE SIDE OF THE MAIN BREAKER REQUIRE UTILITY AGREEMENT ON THE LOCATION OF THE TAP. NO LINE SIDE TAPS SHALL BE INSTALLED WITHIN THE UTILITIES' SECTIONS. THE TAPS MUST BE INSTALLED BETWEEN THE NET METER (SERVICE METER) AND THE MAIN SERVICE DISCONNECT IN THE SERVICE FOR THE NET METER TO CAPTURE GENERATION.
2. CONDUCTORS MADE TO TAP THE LINE SIDE OF THE MAIN CAN NOT BE CONTAINED WITHIN THE SAME SECTIONS AS NON-METERED CONDUCTORS. THIS INCLUDES THE UTILITIES' METERING SECTION OR PULL SECTION. LINE SIDE TAP CONDUCTORS ARE CONSIDERED SERVICE CONDUCTORS, MUST USE THE APPROPRIATE WIRING METHODS FOR SERVICE CONDUCTORS, AND CANNOT OCCUPY THE SAME SECTIONS, BOXES OR CONDUIT OF PROTECTED CONDUCTORS (LOAD SIDE OF THE MAIN).
3. FUSES, OR SIMILAR PROTECTION METHODS, MAY BE REQUIRED TO MEET EQUIPMENT PROTECTION REQUIREMENTS LIKE SERIES RATING AIC.
4. RECEIVE UTILITY APPROVAL PRIOR TO PURCHASING METERING ENCLOSURE WITH TEST BLOCKS.
5. WHEN TERMINATING WIRE IN THE NET/PERFORMANCE METER, THE INTERCONNECTED DISTRIBUTED GENERATION SHALL BE CONNECTED TO THE "LINE" SIDE TERMINALS.


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| | | | | | | | LOCATION: N/A |
| | | | | | | | SOLAR EUSERC - 516, 517, 518 |
| | | | | | | | SAMPLE #3 |
| | 0 | SAMPLE CREATION | 02/06/2025 | TB | RH | NVS | |
| NO. | | REVISION | DATE | APPV'D | CHK | BY | S#T-003-00 |

INTERCONNECTION GUIDELINES: CUSTOMER OWNED SOLAR GENERATING FACILITY INTERIOR SAMPLE LAYOUTS #4

NOTES

1. MAIN SERVICE SWITCHGEAR IS INSTALLED WITHIN AN ELECTRICAL ROOM OR OTHER AREA WITHIN THE BUILDING.
2. A/C DISCONNECT(S) MUST BE VISIBLE AND PAD-LOCKABLE. A VIEWING WINDOW IS REQUIRED ON THE DISCONNECT BETWEEN CUSTOMER GENERATION AND NET OR PERFORMANCE METER. A DISCONNECTING MEANS IS REQUIRED ON BOTH THE LINE AND LOAD SIDES OF THE PERFORMANCE METER.
3. PERFORMANCE METER (SOLAR METER) MUST BE INSTALLED NEAR THE DISCONNECT(S), AT AN APPROVED LOCATION, WITHIN AN APPROVED EUSERC METERING ENCLOSURE.
 - 3.1. NET METER IS INSTALLED IN THE MAIN SERVICE EQUIPMENT.
 - 3.2. PERFORMANCE METER SHOULD BE INSTALLED AS CLOSE AS POSSIBLE TO THE MAIN SERVICE (TYPICALLY WITHIN 10FT.).
4. THE ELECTRICAL ROOM, WHERE USED, MUST HAVE A ROOF (CHAIN-LINK FENCE IS NOT ACCEPTABLE).
5. EXTERIOR DOOR MUST BE ACCESSIBLE TO THE UTILITY 24/7 AND MUST NOT HAVE AN ALARM.
6. DISCONNECTS AND PERFORMANCE METERING SHALL NOT BE INSTALLED IN:
 - 6.1. AREAS WITH SECURITY ALARMS OR DOORS THAT TRIGGER THE FIRE ALARM.
 - 6.2. AREAS THAT ARE HIDDEN OR DIFFICULT TO ACCESS WITHIN THE FACILITY.
7. FOR INTERCONNECTED GENERATION WITH 250KW OR MORE, SCADA MONITORING IS REQUIRED. CUSTOMER IS RESPONSIBLE FOR THE INSTALLATION OF SCADA RELATED EQUIPMENT AND THE COSTS ASSOCIATED WITH CONNECTING IT TO THE CITY'S COMMUNICATION SYSTEM.
8. FOR ADDITIONAL REQUIREMENTS, SEE:
 - 8.1. COV INTERCONNECTION GUIDELINES
 - 8.2. VPU TELEMETRY SPECIFICATIONS
 - 8.3. EUSERC SECTION 500
 - 8.4. VPU EUSERC ACCEPTANCE TABLE
 - 8.5. CALIFORNIA ELECTRIC CODE
 - 8.6. VPU ELECTRIC SERVICE REQUIREMENTS



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|  | | | | | | | CITY OF VERNON PUBLIC UTILITIES DEPARTMENT |
| | | | | | | | LOCATION: N/A |
| | | | | | | | SOLAR - Site Plan |
| | | | | | | | SAMPLE #4 |
| | 0 | SAMPLE CREATION | 02/06/2025 | TB | RH | NVS | |
| | NO. | REVISION | DATE | APPV'D | CHK | BY | S#T-004-00 |