



# DER Facilities Interconnection Standards

# Introduction

Distributed Energy Resource (DER) is any facility that can operate in parallel with the utility providing an energy resource back to the utility. This includes yet is not limited to battery systems, inverter-based generation, and rotating machines. The purpose of this document is to provide guidance on interconnecting energy resources within Orcas Power and Light Cooperative's (OPALCO) operating territory.

The objective of industry best practices, utility guidelines, and local/national codes is to provide safe and reliable power by outlining requirements to someone that plans to interconnect with into the electrical grid. This document is meant to be a guide and may not cover every applicable installation case and or requirement set forth.

## Interconnection Requirements

1. Interconnected DER facilities shall comply with all local and national codes as well as any applicable safety standards.
2. Interconnected DER installations should have the ability to communicate back to OPALCO's system. This is for energy management and system reliability. At this point, this is a future requirement not being implemented.
3. Facilities >200 kW will require transfer trip capability. This means that a direct signal from OPALCO will disconnect the energy resource in the event of a fault or system disturbance. This will be identified by the cooperative during the interconnection study process.
4. All energy resources must not allow energy to transfer to the OPALCO system when OPALCO system is de-energized, such to provide safety for OPALCO's crews.
5. Facilities 25 kW and larger will require a signed power purchase agreement before connecting to OPALCO's electrical system.
6. Members requiring a production meter shall provide space for metering equipment including a disconnect- switch and meterbase as per OPALCO's requirements. The location of this equipment must be pre-approved by OPALCO and meet all code requirements.
7. DER over-current device at the service panel shall be marked to indicate power source and connection to OPALCO's distribution system.
8. DER production meter and Utility disconnect shall be labeled with service voltage.
9. DER power production control system shall comply with all NEC and Institute of Electrical and Electronics Engineers (IEEE) standards for parallel operation with OPALCO including: Power output control system shall automatically disconnect from OPALCO's power source upon loss of OPALCO voltage and not reconnect until OPALCO's voltage has been restored for a least five (5) minutes continuously; Power output control system shall automatically initiate a disconnect from OPALCO's system within ten (10) seconds if the voltage rises above 126 volts, rms phase to

ground, or falls below 114 Volts, rms phase to ground, (nominal 120 V rms base) on any single phase.

10. Member shall pay all costs associated with the design, installation, operation, and maintenance of the generation equipment. Including OPALCO supplied and required equipment and labor cost.
11. OPALCO will install and maintain, a single Utility owned revenue meter capable of registering the bi-directional flow of electricity at the members premises. At the member cost, a separate single production meter may be installed to measure production of the renewable generation source. All costs associated with the production meter are the responsibility of the member.
12. Member shall not start installation of any generation equipment, including foundations, supports, or roof top connections until a pre-approval application with wiring diagram has been submitted to OPALCO' Energy Services Department and a site visit has been completed. On ferry served islands, member shall allow one (1) working week after pre- approval application has been submitted for an OPALCO's pre-inspection site visit to occur. On non-ferry served islands, member shall allow two (2) working weeks after pre-approval application has been submitted for an OPALCO's pre-inspection site visit to occur. Site visit requires that the member or member representative be present. Member is responsible for scheduling the pre-approval site visit with OPALCO's Energy Service Department.
13. Once generation facility is in operation, the member shall make no changes or modifications in the equipment, wiring or mode of operation without the prior approval of OPALCO.
14. OPALCO will provide an estimated invoice hereinafter called contribution in aide of construction, (CIAC), equal to the estimated cost of the production meter and/or any other OPALCO provided equipment and service. Contribution in aide of construction must be paid in full prior to installation of said member owned production metering equipment.
15. Utility Disconnect Switch – A disconnect switch that can be visibly-locked in the open position is to be provided and installed by the member. The location of this switch must be pre-approved by OPALCO before any generation equipment including: foundations; supports; and roof top attachments can be installed.
16. Any future modification or expansion of the DER will require an engineering review and approval by OPALCO before any modification can begin.
17. All generating units over 25 kW must be equipped with short circuit interruption devices consisting of thermal-magnetic over-current devices on each phase.
18. Safety – All safety and operation procedures for joint use equipment shall be in compliance with the Occupational Safety and Health Administration (OSHA standard 29 CFR 1910.269, the National Electrical Code (NEC), Washington Administrative Code (WAC) rules, the Washington Industrial Safety and Health Administration (WISHA) standard, OPALCO standards, and equipment manufactures safety and operation manuals.
19. Maintenance and Permits – Member shall:
  - a. Maintain the electric generation system and interconnection facilities in a safe and prudent manner and in conformance with all applicable laws and regulations including, but not limited to, OPALCO's Interconnection Standards and DER Service Policy 14.
  - b. Obtain any governmental authorizations and permits required for the construction and operation of the electric generating system and interconnection facilities, including electrical permit.

- c. Consult with and obtain pre-approval from OPALCO's Energy Services Department for all generating facilities to be operated in parallel with OPALCO before any construction activities starts.
  - d. Reimburse OPALCO for any and all losses, damages, claims, penalties, or liability it incurs as a result of the members failure to obtain or maintain any governmental authorizations and permits required for construction and operation of DER generation system or failure to maintain DER facility.
- 20. Access to Premises – OPALCO may enter members premises or property under the following conditions:
  - a. To inspect, at all reasonable hours, DER protective devices and to read and maintain meter(s).
  - b. To disconnect the generation systems interconnection with OPALCO's, without notice if in OPALCO's judgment a hazardous condition exists and such immediate action is necessary to protect persons, OPALCO's facilities, or property of others from damage or interference caused by DER generation system.
- 21. Member shall not commence parallel operation of the generation equipment until a final inspection of the interconnection facilities has been completed by OPALCO. Slugging or by-passing of meterbase socket is not allowed. On ferry served islands, member shall allow one (1) working week after final State inspection has been passed and OPALCO's Energy Services Department has been notified of State inspection passage for OPALCO's final inspection to occur. On non-ferry served islands, Member shall allow two (2) working weeks after final State inspection has been passed and OPALCO notified of passage for an OPALCO's final inspection to occur.
- 22. Member shall allow one (1) working week after final OPALCO inspection has been passed for OPALCO's Metering Department to set a member owned production meter. On non-ferry served islands, member shall allow two (2) working weeks after final OPALCO inspection has been passed for OPALCO's Metering Department to set a member owned production meter. Final OPALCO inspection does not check if meterbase and disconnect have been wiring correctly. If metering department determines that the system is not properly wired, no meter can be set and system cannot be brought on line.

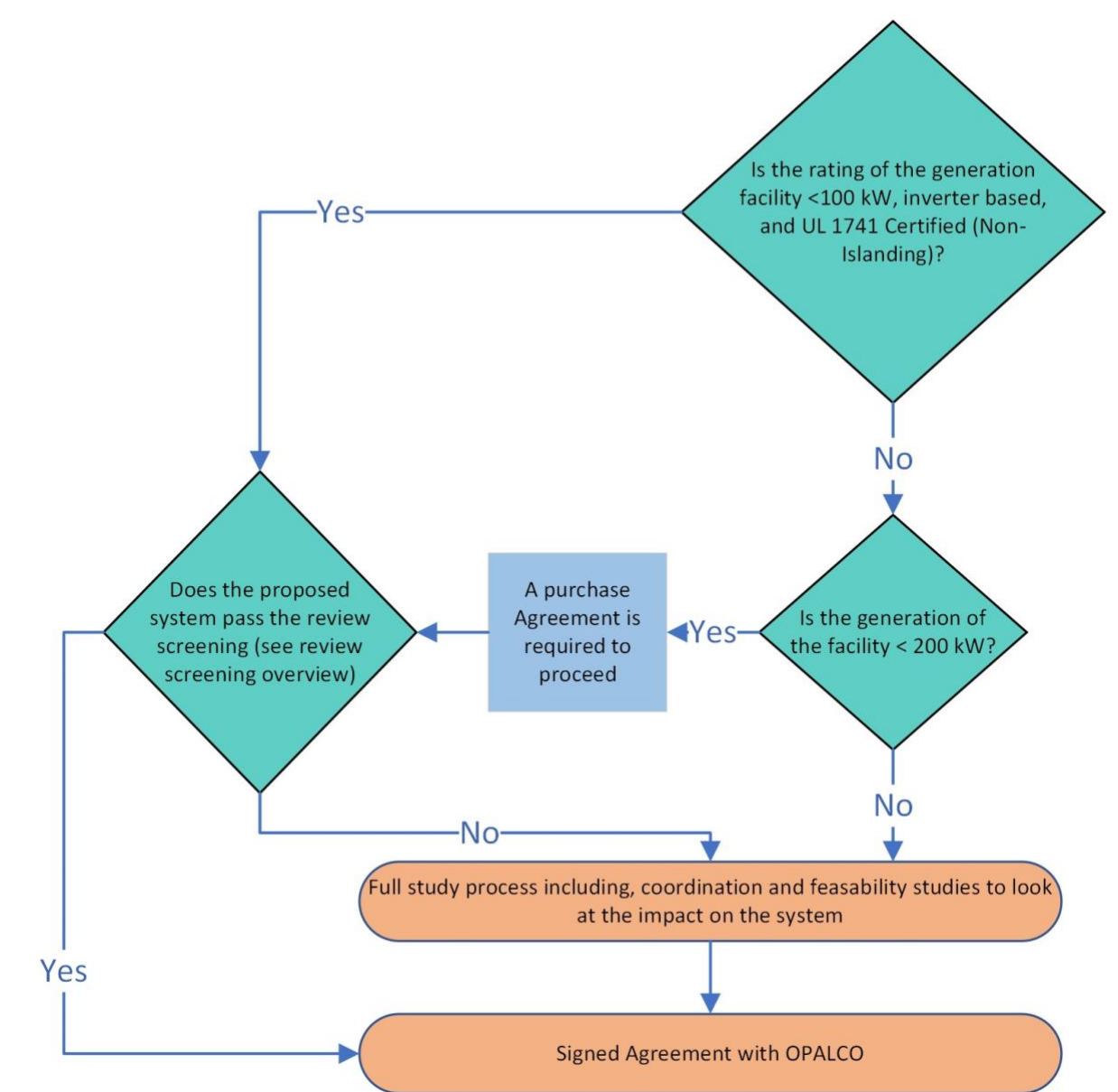


Figure 1: OPALCO Review Process

#### Requirements for Expedited Screening:

1. Expedited screening only applies to inverter-based energy resources.
2. Inverter based equipment shall meet IEEE 519 recommended practices for harmonic control in electrical power systems.
3. The aggregate nameplate rating of the energy resources must be less than 10% of the feeder peak load.
4. The fault current contribution of the proposed energy resource cannot exceed 80% of the equipment rating.
5. The fault current contribution from the equipment shall be less than 10% of the minimum fault current at the point of interconnect.
6. Equipment meets IEEE Standard 1547 requirements

7. AC rating of the energy resource does not exceed the transformer nameplate kVA.
8. The inverter conforms with UL-1741 standards and meets all non-islanding requirements.
9. Three phase interconnections must be connected grounded-wye and include ground overcurrent protection.

#### Full Study Process:

The following may be required but are not limited to that which is listed below.

1. Feasibility Study

The feasibility study will look at the feasibility of the location, provide a detailed cost estimate and include site specific technical documentation.

2. Full system protection study including direct transfer trip requirements.

Evaluate the impact on coordination on the distribution system back to the substation and adjust settings as necessary. Changes in fault current can impact expected clearing times leading to miscoordination with other distribution devices. Additionally, where required substation feeder relays will need to be upgraded to handle direct transfer trip from the end user's energy resource facility.

3. Communications Study (Direct communication requirements to facility)

When it is necessary a direct communication line will be required with the end user's energy resource facility. This is required to disconnect the energy resource facility during high-speed reclosing. In addition, direct transfer trip ensures the facility is disconnected from the grid during outages to provide safe operating conditions for the crews working on the system.

4. Fault current study.

Study to evaluate the effect of increased fault current on the system. This is done to make sure distribution equipment ratings are not exceeded and to evaluate the impact on fault location to help minimize outage time.

5. Voltage study

Evaluate the effect on distribution voltage regulators and substation load tap changers which may be impacted by the generation being added onto the grid. Energy resource may have rapidly changing output which could cause excessive operations on the distribution voltage regulation.

Costs associated with study work, feeder modifications, and protection work will be billed to the member.