

ATTACHMENT B

INTERCONNECTION STANDARDS

For Customer-Owned, Grid Connected Electric Generating Systems
(25 kW or less)

General

The "Interconnection Standards for Customer-Owned, Grid Connected Electric Generating Systems" sets forth the requirements and conditions for interconnected non-utility-owned electric generation where such generation may be connected for parallel operation with the electrical system of the City of Bandon Electric Department (City). Generating systems will be permitted to interconnect to the City's electric distribution system (480V and below) only after a determination by the City that such interconnection will not interfere with the operation of the distribution system.

Interconnection Requirements

The customer equipment shall comply with all the latest applicable National Electric Code (NEC) requirements NEC Articles shown below, NESC requirements, State of Oregon requirements, building codes, local codes and regulations, and shall obtain electrical permit(s) for the equipment installation.

The National Electric Code (NEC) Articles:

- 250 – Grounding and Bonding
- 685 – Integrated Electrical Systems
- 690 – Solar Photovoltaic (PV) Systems
- 692 – Fuel Cell Systems
- 694 – Small Wind Electric Systems
- 700 – Emergency Systems
- 702 – Optional Standby Systems
- 705 – Interconnected Electric Power Production Sources
- 706 – Energy Storage Systems

The customer's power production control system and equipment shall comply with current Institute of Electrical and Electronics Engineers (IEEE) Standards.

- IEEE 929 Recommended Practice for Utility Interface of Photovoltaic (PV) Systems
- IEEE 1547 Recommended Practice for Interconnecting Distributed Resources with Electric Power Systems Distribution Secondary Networks
- IEEE 1547.1 Conformance Test Procedures for Equipment Interconnecting Distributed Resources with Electric Power Systems

The customer's solar photovoltaic equipment shall be in compliance with Underwriters Laboratories Standards.

- (UL) 1741, Standard for Static Inverters and Charge Controllers for Use in Photovoltaic Systems
- UL 1703, Standard for Safety: Flat-Plate Photovoltaic Modules and Panels

The City will provide and install labels when customer-generator's electric system is approved for interconnection. The meter and transformer, or the transformer pole serving the customer-generator shall be labeled to indicate potential electric current back feed. The customer shall furnish and install on customer's side of the meter, a UL-approved disconnect (safety switch, or approved equal) which shall be capable of fully disconnecting all customer energy production and storage sources from its distribution system for the safety of City line workers. The switch must be manually operable with a visible "ON" and "OFF" indication and capable of being locked in the off position. Draw-out or other

types of disconnects are not acceptable. The disconnect switch shall be located adjacent to the City's meter and shall be of the visible break type in a metal enclosure which can be secured by a padlock. The disconnect switch shall be accessible to City personnel at all times. If the switch cannot be located within 10 feet of the service meter or is not visible from the meter, a permanent placard at the service meter location must be provided that gives clear directions to the disconnect location.

The customer shall placard the overcurrent device for the generator circuit, at the service panel, to indicate an on-site power source is interconnected with the City's distribution system.

The customer shall assume the full responsibility for all acceptance and maintenance testing of the generator and protective equipment and keeping of records for such testing. These records shall always be available to the City for inspection.

Acceptance and Maintenance Testing

An acceptance test must be performed to verify that the equipment meets the requirements specified prior to initial parallel operation by a Generator, or any time interface hardware or software is changed.

Both acceptance and maintenance testing must include the testing of the generation disconnect features and verification that the disconnect is functional and reconnection time complies with IEEE Standard 1547. Following a generation facility disconnect due to a voltage or frequency excursion, the generation facility shall remain disconnected until City's service voltage and frequency are within the operating voltage range of 90% to 110% of nominal voltage and frequency range of 59.3-60.5Hz for a minimum of five (5) minutes.

Safety

All Safety and operating 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), State of Oregon rules, City standards and equipment manufacturer's safety and operating manuals.

Guidelines for System Diagrams

The required System Diagram(s) is/are an important part of the application for interconnection. The system diagrams are used by the City for an engineering impact assessment during the review and approval process, during field testing and meter installation and during subsequent review of periodic maintenance test reports. The diagram is a permanent record copy of the system and is filed at City for reference.

A good diagram will facilitate the City engineering impact assessment and can significantly shorten the review period and helps ensure City's field testing and meter installation are straightforward. Incomplete diagrams are one of the largest sources of delays during the application process. Discrepancies between the diagram and the actual installation as-built are cause for rejection at the final testing and net meter installation, which in turn means rescheduling and a significant delay in activating the system.

Depending on the complexity of the proposed electric generation system, the required System Diagram(s) may be simply a One-Line diagram, Site Plan and Manufacturer's Technical Bulletins/Information to complete Control Schematics, Wiring and Interconnection Diagrams that show every wire and every connection throughout. The City determines what submittal information is required to be submitted.

At a minimum, the System Diagram must show how the major components of the customer generator system are connected electrically. Additional information, such as equipment part numbers and physical locations, should also be included on the diagram. Basic information is required in the application. Documenting the additional information on the System Diagram(s) provides a single complete reference for the project and speeds the engineering reviews and field work.

Note: PV systems that do not use a UL-1741 approved synchronous inverter have more complex requirements for interconnection and will require more detailed design drawings for review and approval.

The System Diagram(s) shall provide the information as described below. Refer to the illustrative sketch on the next page for an example of information required.

Generator (PV Panels, Wind Turbine, Hydro Turbine, etc.)

Include manufacturer, part number, nameplate maximum capacity (kW) and physical location. For modular systems (e.g. PV panels), also include number of modules, configuration, nameplate maximum capacity of each module and total nameplate maximum capacity.

Inverter

Include manufacturer, type or series, part number, serial number, nameplate maximum capacity, output voltage and physical location.

Disconnect Switch

Include the physical location relative to the City Service Meter.

Electrical Service Panel

Include the panel or main breaker size and the position at which the generation is connected. Show all panels (if there are multiple panels or subpanels) even if not directly connected into the generation system.

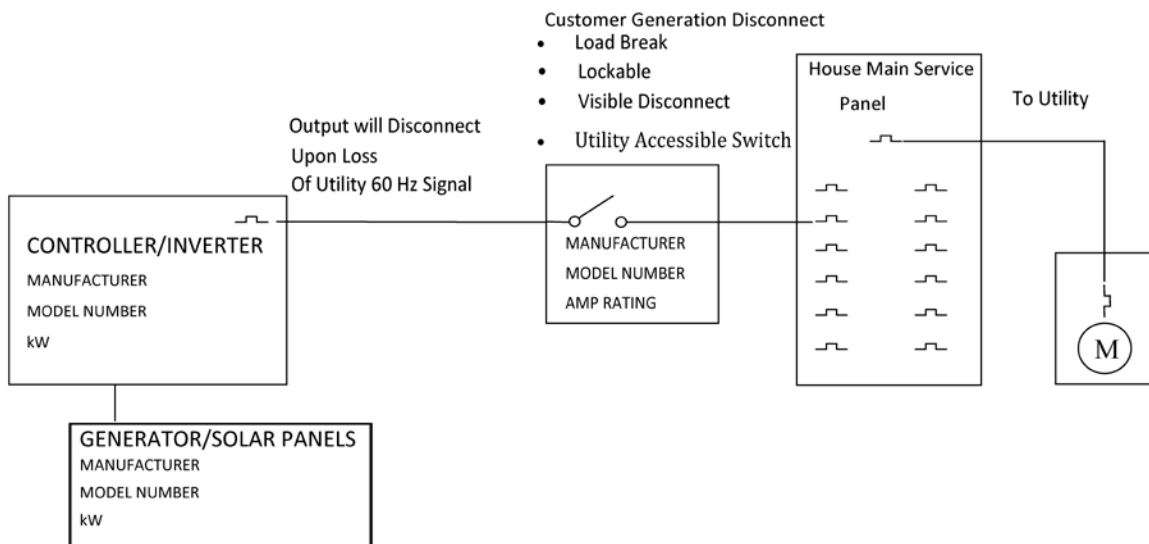
City Service Meter

Include existing meter serial number, meter form and class

Other Related Equipment (battery banks, transfer or bypass switches, backup generators, etc.)

Components and Connections Shown are for Illustrative Purposes Only

1. This illustrative sketch is not intended to specify utility interconnection or safety requirements.
2. This illustrative sketch is not intended to provide electrical design or code compliance directives.
3. Some components and connections shown may be internal to the generator controller or inverter. The manufacturer and model number of the generator controller or inverter must be shown on the drawing.
4. All switches, breakers, fuses and mechanical interlock mechanisms which are part of the operating scheme to isolate the customers generating equipment (including solar panels, standby generators and batteries) from the utility during emergency or maintenance conditions must be shown on the single-line diagram.
5. The narrative description accompanying the single-line interconnection diagram must contain sufficient detail to determine if the components in, and the operation of, the interconnection and protection systems meet the utilities interconnection and safety requirements.



Illustrative Sketch