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# 1 Basic Requirements

## 1.1 Definition of Customer

The *Customer* is the individual responsible for requesting electric service from Portland General Electric (PGE). The Customer may be the electrical contractor, developer, or homeowner installing the electric service.

**IMPORTANT:** When you see the words “Consult PGE” or “Consult with PGE” in this book, it means that the Customer must obtain PGE approval prior to installation. This applies to each and every installation. Failure to receive approval will result in denial of service until the installation meets PGE approval. For more information, see *Errors That May Result in a Request for Electric Service Being Turned Down* in the *Preliminary Information* section.

## 1.2 Purpose of This Book

This *Electric Service Requirements (ESR)* book was prepared to aid you in receiving service from PGE. The information in this book applies to relocated services, rewired services, house relocations, and new services. If additional information is required, contact a PGE Service Coordinator.

The *ESR* book is meant to be read and interpreted in its entirety. Individual figures or pages do not represent the complete requirements for service and should not be cited as a stand-alone.

Phone numbers for the Service Coordinators can be found in the *PGE Contact Information by Phone Number* table in the *Preliminary Information* section. You may contact a Service Coordinator at [service.coordinators@pgn.com](mailto:service.coordinators@pgn.com).

### 1.2.1 Online Version of the ESR Book

To access the *ESR* book online:

1. Go to [www.portlandgeneral.com](http://www.portlandgeneral.com).
2. Scroll to the bottom of the page and click **Construction**.
3. In the box on the right side of the screen, click **Electric Service Requirements**.
4. Click **Complete ESR book** to open a PDF file of the entire book, or click the name of an individual section to open a PDF of that section only.

## 1.3 Changes or Conflicts in Requirements

The requirements in this *ESR* book are issued with the intent of complying with all applicable codes, ordinances, and tariffs. However, in case of conflict, the

appropriate tariff, code, or ordinance supersedes the interpretation offered in this book.

The requirements in this book may change if governing codes, ordinances, or tariffs change. PGE does not assume responsibility for keeping this book current and should be consulted when questions arise on the applicability of any item.

## **1.4 Additional Load for Existing Customers**

The Customer must give PGE prior written notice before adding load or modifying existing electrical equipment to allow PGE an opportunity to determine if changes are needed to its distribution facilities. See PGE tariff, Rule C, *Conditions Governing Consumer Attachment to Facilities*.

PGE provides a service conductor(s) and a transformer(s) to accommodate existing or calculated demand load. New and existing Customer service equipment may have a larger load rating than the calculated or existing demand. PGE may provide and require that a placard (PGE part number 39558) be installed on the Customer's service termination equipment that indicates the need to verify service source capacity prior to adding load.

## **1.5 Maximum Available Fault Current**

The maximum available fault current will depend on the characteristics of the service being provided. It is the Customer's responsibility to furnish service equipment capable of interrupting and withstanding the maximum available fault current. Upon request, PGE will provide the calculated maximum available fault current at the PGE point of delivery.

### **1.5.1 Single-Family Residential, 200 Amps or Lower**

For single-family residences with services that are 200 amps or lower, the Customer is responsible for furnishing equipment that will withstand a minimum 10,000 amp fault current. Where the conditions exist, such as short-service lengths or larger service transformers, the maximum available fault current may exceed 10,000 amps. PGE will provide the calculated maximum available fault current to the Customer upon request.

### **1.5.2 Single-Family Residential, 201 Amps and Higher**

For single-family residences with services that are 201 to 400 amps (320 amp continuous), the Customer is responsible for furnishing equipment that will withstand a maximum 22,000-amp fault current.

For services higher than 400 amps (320 amp continuous), PGE will provide the calculated maximum available fault current to the Customer upon request.

### **1.5.3 Commercial, Industrial, Agricultural, and Multifamily Services**

The Customer is responsible for furnishing equipment that will withstand the maximum fault current available from PGE. PGE will provide the calculated maximum available fault current to the Customer upon request.

### **1.5.4 Network Services**

Due to the electrical design of network services, Customers should expect fault current levels to be significantly higher than non-network services. (For more information, see the *PGE and PacifiCorp Commercial Underground Network District Portland, Oregon* map in the *Preliminary Information* section.) The Customer is responsible for furnishing equipment that will withstand the maximum fault current available from the PGE network service. PGE will provide the calculated maximum available fault current to the Customer upon request.

## **1.6 Customer's Responsibilities**

### **1.6.1 Safety**

The Customer must comply with federal, state, and local laws and regulations concerning activities in the vicinity of PGE electrical lines and equipment. The Customer must comply with all laws and regulations to protect themselves, their family, their employees, PGE and its employees, contractors, and all third parties from injury, loss, or damage.

If PGE serves the Customer by means of primary voltage or transmission voltage circuits on the Customer's premises, or if the Customer resells power and energy furnished by PGE, PGE requires the Customer to obtain and maintain insurance coverage that PGE deems adequate to satisfy the duty of indemnification. PGE requires a separate indemnification, hold harmless, and/or additional named insured agreement.

### **1.6.2 Switchgear Maintenance**

The Customer is responsible for the proper installation and periodic maintenance of Customer-owned switchgear including overcurrent devices, cable and bus connections and terminations, and all other electrical equipment.

### **1.6.3 Grounding and Bonding**

Grounding and bonding is critical for safety and electrical reliability. The Customer is responsible for ensuring that the electrical wiring and service equipment is grounded and bonded in accordance with applicable NEC requirements.

## 1.6.4 PGE Equipment Protection and Barrier Posts

The Customer is responsible for providing barrier posts for protection of PGE electrical equipment. When vehicles or other equipment can be near or around PGE facilities, barrier posts are required. For more information, see Section 6.4.6, *Barrier Post*.

## 1.6.5 Temporary Cover on All Openings

Where the Customer provides openings for PGE equipment, such as a pad-mounted transformer, the Customer must provide and install a temporary cover. The cover must be 3/4-inch marine- or exterior-grade plywood that is 6 inches larger than the opening and secured without damaging the concrete. PGE will remove the temporary cover during installation of the electrical equipment.

## 1.6.6 Landscaping

The Customer must install and maintain landscaping so that trees, shrubs, and other vegetation will not interfere with the access, proper operation, or maintenance of PGE facilities. For more information, see Section 5, *Clearances*.

Bark dust or other landscape materials must not cover a vault lid or other below-ground PGE facilities, nor must covers—such as fake rocks—be placed over electrical equipment. Consult PGE for clearance requirements of your specific installation. For easements and rights of way, see Section 2, *Permits and Applications*.

## 1.6.7 Monument Protection

Utility infrastructure, such as vaults, ducts, and road crossings owned and maintained by PGE must have a minimum separation of one foot from all monuments, or property markers, in accordance with ORS 92.004. It is the responsibility of the Customer to ensure that this requirement is met prior to the installation of PGE infrastructure.

## 1.7 Work Activity Near High-Voltage Overhead Power Lines Over 600 Volts

State statute and federal OSHA laws require that non-qualified persons must not enter, work, or otherwise move equipment such as ropes, booms, poles, stages, or scaffolding within 10 feet of a high-voltage overhead power line; some lines require even greater clearance. Two requirements include:

- The responsible party must notify PGE of the intended work activity a minimum of five working days prior to construction work. More lead time may be required depending on the work to be done.
- The responsible party and PGE must agree to a mutually satisfactory method to accomplish the activity safely.

## 1.8 *Temporary Shutdown*

A temporary shutdown of a Customer's service may be required to safely maintain or upgrade PGE facilities. These shutdowns will normally be scheduled at a mutually convenient time for the Customer and PGE.

## 1.9 *Power Factor*

The current PGE tariff specifies a charge for low-power factor for certain commercial and industrial Customers. Low-power factor may cause inferior performance of the Customer's electrical system. PGE recommends that the Customer install corrective devices to make the most effective use of the electrical system. PGE can provide a copy of the tariff if the Customer would like to determine potential savings during the design. A second meter socket is not required to meter power factor.

## 1.10 *Time-of-Use Metering*

The tariff may require time-of-use metering for certain commercial and industrial loads. Contact PGE for special requirements.

Time-of-use metering is available as an option for residential Customers. Contact PGE for further information.

## 1.11 *Call Before You Dig*

State laws require the Customer or excavator to call to determine the location of underground utilities two full working days (48 hours) prior to excavation. The excavation **must not** be started until locations have been marked or the utilities have informed the excavator that they have no facilities in the area.

**IMPORTANT:** Call 8-1-1 or 1-800-332-2344 before you dig. In the Portland metro area call 503-246-6699, or visit [www.digsafelyoregon.com](http://www.digsafelyoregon.com).

## 1.12 *Power Quality*

The characteristics of the Customer's electrical equipment and devices must allow the PGE distribution system to operate efficiently without undue interference to PGE service or to other Customers. Whenever a Customer's equipment has characteristics that cause undue interference with PGE service or to other Customers, the Customer must make changes in that equipment or provide—at Customer expense—additional equipment to eliminate the interference. Where practical, PGE will furnish additional equipment in accordance with the present tariff.

PGE reserves the right to inspect and test any equipment connected to its lines and to obtain any information necessary to determine the operational characteristics of the equipment. Prior to purchase, the Customer must submit

information to PGE regarding any equipment that might cause interference with service to other Customers and/or require additional PGE facilities for its satisfactory operation.

Electric service supplied by PGE may be subjected to voltage disturbances that will not normally affect the performance of typical electrical equipment. These disturbances may result in the improper operation of voltage-sensitive equipment, such as computers or microprocessors. The Customer must provide any power conditioning devices needed to obtain the quality of power necessary for optimum performance of voltage-sensitive equipment.

The Customer may use additional facilities (such as a separate PGE transformer and a separate service) to minimize voltage fluctuations on secondary-voltage circuits for devices such as welders, induction heating equipment, and X-ray machines. Where the operation of these types of equipment causes undue voltage fluctuations on PGE primary voltage lines, the additional equipment required may include a separate primary voltage line. Where practical, PGE will furnish additional equipment in accordance with the present tariff.

The effects of the design and operation of high-frequency equipment—such as electronic heating systems, spark discharge devices, radio transmitting equipment, and equipment that generates harmonics, such as an induction furnace—must not create disturbances on the PGE electrical system that interfere with any other Customer's proper operation of communication, radio, television, remote control, or other equipment.

Devices that can produce harmonic distortion—such as adjustable speed drives, electronic ballasts for fluorescent lighting, and switching power supplies for computers and electric vehicles—must be filtered so that the harmonic distortion that results from these devices is kept within the limits specified in IEEE 519-2014, Section 10. Compliance with this requirement is by PGE measurement at the point of change of ownership between PGE and the Customer, otherwise known as the *point of delivery*. PGE limits the maximum voltage distortion present on our distribution system to five percent for any one frequency and the total harmonic distortion (THD) to eight percent.

## 1.13 Motors

### 1.13.1 Protection

To assure adequate safety to personnel and to prevent damage to equipment, the Customer is responsible for providing and maintaining code-approved protective devices to protect all motors against overloading, short circuits, ground faults, and low voltage.

The Customer is responsible for protecting three-phase motors against single-phasing system events. Primary single phasing occurs when at least one of the primary sides of the transformer phases is open and no longer delivering electricity. Single phasing may occur for numerous reasons and cannot be fully eliminated, but risk to the Customer's

equipment may be mitigated by protection schemes as determined by the Customer.

### 1.13.2 Starting

Motors rated in excess of 10 horsepower that normally start more than four times an hour, or motors rated in excess of 35 horsepower, may require reduced-voltage starters or adjustable-speed drives.

PGE will furnish information regarding permitted starting currents. The starting currents permitted depend on the frequency of motor starting, the size and character of the Customer's load, and the design of the PGE distribution system in the area. Permitted starting currents will generally be equivalent to the maximum starting current, which—in the opinion of PGE—can be supplied without undue interference with service to other Customers.

PGE will not normally invest in additional facilities to reduce voltage fluctuations on an individual Customer's service caused by the starting of that Customer's motors until after the Customer completes installation of all approved reduced-voltage starters.

If the Customer still requires additional facilities, such facilities will be installed at the Customer's expense.

### 1.13.3 Adjustable-Speed Drive Controller

With prior permission, irrigation pumps or other equipment featuring an adjustable-speed drive (ASD) controller that would normally require three-phase service, may be served with single-phase service limited to a direct-connect, safety-socket meter base rated 200 amps or lower, 120/240 volts or 240/480 volts. An ASD controller must meet harmonic distortion requirements described in Section 1.12, *Power Quality*. Contact PGE for further information.

NOTE: When installing an ASD controller, contact PGE to determine if the controller is affected by the pole-top reclosers.

## 1.14 Customer Generation

Contact PGE prior to installation of any generation equipment.

### 1.14.1 Emergency or Standby Generator

A permanently installed emergency or standby generator must be connected to the Customer's wiring system using a permanently installed, open-transition (break-before-make) transfer switch intended for that purpose. The transfer switch must be used to disconnect all ungrounded conductors connected to the PGE system prior to connecting the generator to the Customer's electrical system. The transfer switch must be

designed and installed to prevent connection of the generator to the PGE system during any mode of operation.

For a closed transition (make-before-break) transfer switch, PGE will need to be notified prior to installation for review.

The Customer **must** comply with these provisions to prevent an accident:

- Never connect a portable generator to a permanent-wiring system unless the interconnection uses a permanently installed transfer switch. This can produce a hazardous situation for PGE or other service personnel.
- Government electrical inspectors must approve all transfer switches and/or transfer operating schemes.

## 1.14.2 Parallel Generation

Contact PGE prior to installation of any parallel generation equipment. For information on parallel generation equipment call PGE at 503-464-8100.

Parallel generation is defined as the parallel production of electrical energy where sources of generation outside of PGE connect with the PGE system for distribution. Such sources, when Customer owned, may provide all or a part of a Customer's requirements, or the Customer may sell directly to PGE all or part of the output. Customer-owned sources include wind turbines, wheels, steam turbines, solar conversion, and geothermal devices. PGE will handle each proposal for parallel generation on an individual basis and will require a special contract between the Customer and PGE.

PGE must approve operation of the Customer's parallel generation system. PGE will also designate the metering type and location, and determine the method of interconnection between the Customer system and the PGE system.

All parallel generation with production capabilities that will affect the service conductors by more than 30 amps requires a lockable ac disconnect switch located within 10 feet of the interconnection meter (unless another location has been approved by PGE). This disconnect switch must be accessible 24 hours a day.

## 1.14.3 Cogeneration

Cogeneration is defined as the joint production of electric energy and useful thermal energy in a combined process. It typically includes a gas turbine or diesel-driven generator with waste heat recovery and a steam or back-pressure turbine. PGE will handle each proposal for cogeneration on an individual basis by means of a special contract between the Customer and PGE.

PGE must approve the operation of the Customer’s cogeneration system. PGE will also designate the metering location, type of metering, and the method of interconnection between the Customer system and the PGE system.

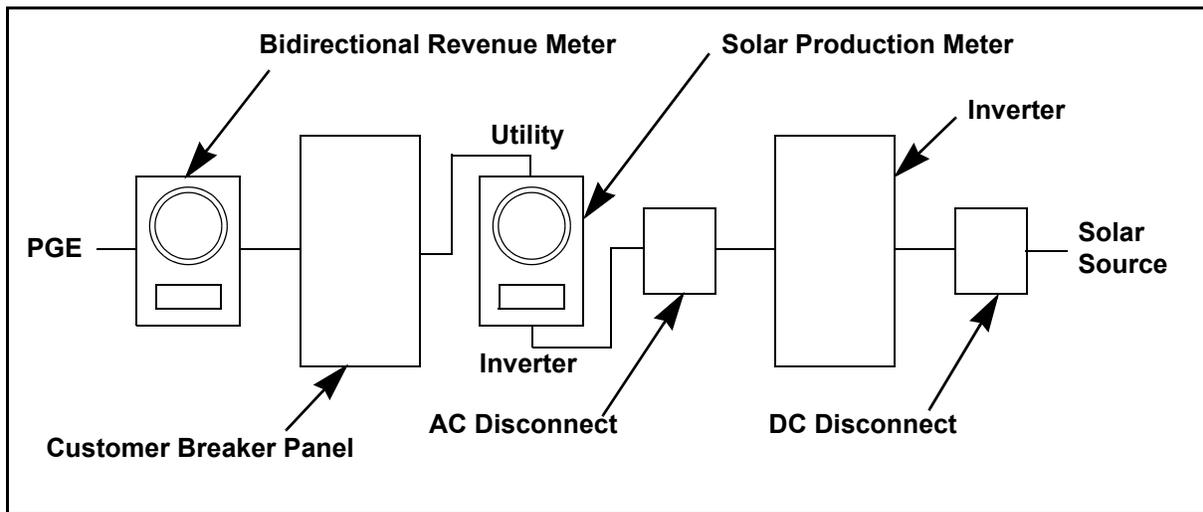
**1.14.4 Net Metering**

Net metering power production is a type of parallel generation made available to PGE from a Customer that owns and operates a solar, wind, fuel cell, hydroelectric, landfill or digester gas, low-emission or renewable dedicated energy, or specific biomass fuel-powered facility with a generating-installed capacity of 25 kW or lower for residential Customers or 2 MW for commercial Customers.

Net metering facilities are intended to first offset the Customer’s load before exporting excess generation to the grid. Net metering measures the difference between the electricity supplied by PGE and the electricity generated by the Customer’s generator. Both PGE electricity and the excess generation pass through a bidirectional meter. The bidirectional meter is provided free of charge to the Customer to replace its existing single-direction meter. A Customer-owned generation meter may be required. See **Figure 1-1** for a typical residential installation.

A warning label must be mounted on, or adjacent to, each meter base.

A written agreement with PGE is required prior to interconnection. See the PGE tariffs at [www.portlandgeneral.com](http://www.portlandgeneral.com).



**Figure 1-1: Typical Residential Solar Metering**

**1.14.5 Small Power Production**

Small power production is a parallel generation arrangement for Customer-owned facilities with generation capacities of 10 MW or lower

and meeting the qualifying facility (QF) requirements outlined by the Federal Energy Regulatory Commission (FERC). Unlike net metering, small power production generation does not require generation to first offset a Customer's load. The QF generation, in full or in part, is sold to PGE at avoided cost.

A written agreement with PGE is required prior to interconnection. (See PGE tariffs at [www.portlandgeneral.com](http://www.portlandgeneral.com).) Some installations will require metering on the primary side. PGE will designate the metering location and type of metering. Consult with PGE prior to designing the power production system.

## 1.14.6 Solar Payment Option

The solar payment option (SPO)—also known as the Oregon feed-in tariff—power production is a parallel generation arrangement for Customer-owned solar electric facilities with a maximum dc nameplate of 100 kW (small- and medium-scale systems) or with 100 kW to a maximum of 500-kW dc nameplate (large-scale system).

For an SPO system—100-kW dc nameplate or lower—enrollment is on a biannual, first-come basis. (For program details, see PGE tariffs at [www.portlandgeneral.com](http://www.portlandgeneral.com).) Like net metering, SPO generation first offsets the Customer's load before exporting excess generation to the grid. Electricity generated in excess of the Customer's load passes through a PGE-owned bidirectional meter provided free of charge. Unlike net metering, a second PGE-owned bidirectional generation meter is also installed. The second meter (solar production meter) measures all solar generation and is subject to a monthly service charge. The solar production meter socket **must** be wired the same as other PGE meter sockets, and the inverter conductors must be terminated in the lower section of the meter.

The solar production meter must be installed outside, within 10 feet of the other PGE-owned meter. Contact PGE for further information. See **Figure 1-1** above for a typical residential installation. A warning label must be mounted on, or adjacent to, each meter base.

For a large-scale (over 100-kW and up to 500-kW dc nameplate) SPO system, enrollment is on an annual basis, which is determined through a bidding process. Like small power production, large-scale SPO system generation does not require generation to first offset a Customer's load. Some installations will require metering on the primary side. PGE will designate the metering location and type of metering. Consult PGE prior to designing the SPO system.

A written agreement with PGE is required prior to interconnection. For more information, see the PGE tariffs at [www.portlandgeneral.com](http://www.portlandgeneral.com).

### **1.14.7 Warning Label**

A hard, plastic label must be mounted on, or adjacent to, each meter base. The label—with a red background and 3/8-inch-high white lettering—must be clearly legible and contain the following words:

WARNING: Customer-owned generation interconnected to PGE. Two sources may be present.

NOTE: PGE may require additional labels for parallel generation.

### **1.15 Six-Disconnect Rule**

PGE requires a main disconnect in front of all meter banks that contain more than six meters. The main disconnect must be in the same location as the meter bank. For additional information, see **Figure 8-2** in Section 8.1, *Basic Requirements*.

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