1 General Requirements

1.1 General Definitions

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

The term "*Consult PGE*" means the customer shall obtain PGE approval prior to installation. This term applies to each and every installation involved. Failure to receive approval will result in denial of service until the installation meets PGE's approval.

1.2 Booklet Purpose and Organization

This Service Requirements book was prepared to aid you in getting service from PGE. This booklet applies to relocated services, rewired services, house relocations, and new services. *If additional information is required, please call the PGE Service Coordinators. The telephone numbers are on page xiv of this booklet.*

The Service Requirement book may also be found on-line at *http:// www.portlandgeneral.com/reqbook*. On-line forms for residential and commercial service requests may be found at *http://www.portlandgeneral.com/serviceforms*.

1.3 Changes or Conflicts in Requirements

These requirements are issued with the intent of complying with all applicable codes, ordinances, and tariffs. However, in the case of conflict, the appropriate tariff, code, or ordinance supersedes the interpretation offered in this booklet. In addition, these requirements 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 notice before making additions to electrical equipment or apparatus to allow PGE an opportunity to determine if changes are needed to its distribution facilities. (Refer to PGE Tariff, *Rule C*, *"Conditions Governing Consumer Attachment to Facilities",* page C-6).

PGE provides service conductor(s) and 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 P/N 39558) be installed on the customer's service termination equipment indicating 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 Customer's service entrance.

1.5.1 Single Family Residential (200 Amps or Less)

For single family residences with services that are 200 amps or less, the Customer is responsible for furnishing equipment that will withstand a minimum 10,000 amps 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 fault current to the Customer upon request.

1.5.2 Single Family Residential (201 to 400 Amps)

For single family residences with services in the range of 201 to 400 amps, the Customer is responsible for furnishing equipment that will withstand a maximum 22,000 amps fault current. For services larger than 400 amps, PGE will provide the calculated maximum available fault current to the Customer upon request.

1.5.3 Commercial, Industrial, Agricultural, and Multi-Family 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 (see page xix, PGE's Network district), Customers should expect fault current levels to be significantly higher than non-network services. The Customer is responsible for furnishing equipment that will withstand the maximum fault current available from PGE's network service. PGE will provide the calculated maximum available fault current to the Customer upon request.

1.6 Customer's Responsibility for Safety

The Customer shall comply with federal, state, and local laws and regulations concerning activities in the vicinity of PGE's electrical lines and equipment. The Customer shall 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 may require the Customer to obtain and maintain insurance coverage which PGE deems adequate to satisfy the duty of indemnification. PGE may also require a separate indemnification, hold harmless, and/or additional named insured agreement.

1.7 Customer's Responsibility for Maintaining Switchboards

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

1.8 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). The following are two requirements:

- 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.

1.9 Temporary Shutdown

It may be necessary to require a temporary shutdown of a Customer's service in order to safely maintain or upgrade PGE facilities. These shutdowns will normally be scheduled at a mutually convenient time determined by both PGE and the Customer.

1.10 Grounding and Bonding

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

1.11 Protection of PGE Equipment (Barrier Post)

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 will be required. (See Figure 6-4 and Table 6-3 for more details).

1.12 Trees, Shrubs, Barkdust, and Covers Over PGE Equipment

The Customer shall install and maintain landscaping so that trees, shrubs, and other vegetation will not interfere with the access, proper operation, or maintenance of PGE facilities, see Section 5 (Clearances). Additionally, barkdust or other landscape materials shall not cover vault lids or other below ground PGE facilities, nor shall covers (e.g., fake rocks) be placed over electrical equipment. Consult PGE for clearance requirements of your specific installation. For easements and rights–of–way refer to Section 2.2 on page 9.

1.13 Customer's Responsibility to Protect Property Pins

The utility infrastructure (e.g., vaults, ducts, road crossings, etc.) owned and maintained by PGE must have a minimum separation of one foot from all monuments (property pins) 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's infrastructure.

1.14 Power Factor

PGE's currently filed 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 design. A second meter socket is not required to meter power factor.

1.15 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.

1.16 Call Before You Dig

State laws require the Customer/Excavator to call for underground utility cable locations at least 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. ***Call 811 or 1–800–332–2344 before you dig. For Portland Metro Call (503)*** **246–6699**. **Website: www.digsafelyoregon.com**

1.17 Power Quality

The characteristics of the Customer's electrical equipment and devices must allow PGE distribution system to operate efficiently without undue interference to PGE service or to other Customers. Whenever a Customer's equipment has characteristics which cause undue interference with PGE service or to other customers, the Customer must make changes in such 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 shall submit information to PGE regarding any equipment which 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 which 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. Devices between the meter and the socket may be allowed at the sole discretion of PGE. Consult PGE for specific policies.

The Customer may use additional facilities (such as separate PGE transformers 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, etc., and equipment that generates harmonics, such as an induction furnace) must not create disturbances on PGE electrical system which interferes with any other Customer's proper operation of communication, radio, television, remote control, or other equipment.

Devices which can produce harmonic distortion (such as adjustable speed drives, electronic ballasts for fluorescent lighting, and switching power supplies for computers and electric vehicles) shall be filtered such that the harmonic distortion resulting from these devices is kept within the limits specified in IEEE 519-1992, 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 delivery."

The Customer can more easily stay within these harmonic distortion limits by requiring their supplier to provide "low harmonic current distortion" equipment. Suggested individual equipment current distortion limits are available from PGE.

PGE limits the maximum voltage distortion present on our distribution system to 3% for any one frequency and the total voltage harmonic distortion (THD) to 5%.

1.18 Motors

1.18.1 Protection

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

1.18.2 PGE's Maximum Voltage Unbalance

PGE limits the maximum voltage unbalance to 3% for "no-load" conditions.

1.18.3 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.

PGE will furnish information regarding permitted starting currents. The starting currents permitted depend upon the frequency of motor starting, the size and character of the Customer's load, and the design of PGE's distribution system in the area. Permitted starting currents will generally be equivalent to the maximum starting current which, in PGE's opinion, 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 PGE facilities, such facilities will be installed at the Customer's expense.

1.19 Customer Generation

Contact PGE prior to the installation of any generation equipment.

1.19.1 Emergency or Standby Generators

Connect permanently-installed emergency or standby generators to the Customer's wiring system by a permanently-installed, open transition ("break before make") transfer switch intended for that purpose. Use the transfer switch to disconnect all ungrounded conductors connected to PGE system prior to connecting the generator to the customer's electrical system. Design and install the transfer switch to prevent connection of the generator to 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 accidents:

- NEVER connect portable generators 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.
- Governmental electrical inspectors must approve all transfer switches and/or transfer operating schemes.

1.19.2 Parallel Generation

Parallel generation is defined as the parallel production of electric energy where sources of generation outside of PGE connect with PGE's 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. (Examples of Customer-owned sources include wind turbines, waterwheels, 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 metering type and location, and determine the method of interconnection between the Customer system and PGE's system.

1.19.3 Cogeneration

Cogeneration is defined as the joint production of electric energy and useful thermal energy in a combined process. It typically includes gas

turbines or diesel-driven generators with waste heat recovery and steam or back pressure turbines. 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 PGE's system.

1.19.4 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/renewable dedicated energy, or specific biomass fuel powered facility with a generating-installed capacity of 25kW or less 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 generator. Both PGE electricity and the excess generation pass through a bi-directional (two-way) meter. The meter is provided free-of-charge to the Customer to replace their existing single-direction meter.

A written agreement with PGE is required prior to interconnection (see Rate Schedule 203). All net metering facilities, with production capabilities of 7.2kW (30A, 240V) or greater require a lockable, 24-hour accessible disconnect switch within 10-feet of the interconnection meter unless another location has been approved by PGE.

1.19.5 Small Power Production

Small power production is a parallel generation arrangement for Customer-owned facilities with generating capacities of 10 MW or less and meeting Qualifying Facility (QF) requirements outlined by FERC (Federal Energy Regulatory Commission). Unlike net metering, small power production generation does not require generation to first offset a Customer's load. The QF's generation, in full or in part, is sold to PGE at "avoided cost" under Rate Schedule 201.

A written agreement with PGE is required prior to interconnection, and PGE will designate the metering location and type of metering.

1.19.6 Solar Payment Option (a.k.a. Oregon Feed-in Tariff)

Solar Payment Option (SPO) power production is a parallel generation arrangement for Customer-owned solar electric facilities with a maximum DC nameplate of 100kW (small and medium scale systems) or with 100kW to a maximum of 500kW DC nameplate (large scale systems).

For SPO systems, 100kW DC nameplate or less, enrollment is on a bi-annual, first-come basis (for further program details see Rate Schedule 205). 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 bi-directional (two-way) meter provided free of charge. Unlike net metering, a second PGE-owned bi-directional meter is also installed.This second meter ("solar production meter") measures all solar generation and is subject to a monthly service charge. The meter socket MUST be wired the same as other PGE meter sockets. Contact PGE for further information.

For large-scale SPO systems (over 100kW DC nameplate and up to 500kW DC nameplate), enrollment is on an annual basis determined through a bidding process (for further program details, see Rate Schedule 206). Like Small Power Production (Section 1.19.5), large-scale SPO system generation does not require generation to first offset a Customer's load. PGE will designate the metering location and type of metering.

A written agreement with PGE is required prior to interconnection (see Rate Schedule 203). All SPO facilities, with production capabilities of 7.2kW (30A, 240V) or greater require a lockable, 24-hour accessible disconnect switch within 10-feet of the solar production meter unless another location has been approved by PGE.