SECTION G1

METERING REQUIREMENTS

FOR TRANSMISSION GENERATION ENTITIES

PG&E GENERATION INTERCONNECTION HANDBOOK

PURPOSE:
This section specifies the metering requirements for Generating Entities interconnecting to PG&E’s Transmission Power System.

APPLICABILITY:
All wholesale generators (Participating Generators who sell power to the market), connected to the transmission system, must meet both PG&E and ISO metering requirements. PG&E metering is required for standby service. All other generators (not providing wholesale service) must meet PG&E’s metering requirements. Furthermore, all Generators 1 MW and above must meet all applicable WECC (Western Electricity Coordinating Council) metering standards.

G1.1 BASIC METERING REQUIREMENTS FOR GENERATORS

Metering location: PG&E and CAISO standard metering is required on the high-voltage side of the transformer for all Generating Entities. Exceptions may be granted if it can be demonstrated that high-side metering will create significant safety issues or impose extraordinary costs not typically associated with such metering. CAISO Metered Entities that have installed low side metering shall supply the Transformer Loss Correction (TLC) as specified in CAISO’s Metering Protocol Section. If it is not possible to install metering at the delivery point, the readings of the meter(s) shall be adjusted to correct for transformation and line losses. A two (2) percent adjustment factor for each stage of transformation shall be applied to the meter readings for bundled (full-service) PG&E customers.
**Metering structures:** Metered sites served at 60 KV and above, require structures mounted for combination metering units. In addition, a meter enclosure in accordance with Engineering Standard 063436, sheet 33 (Appendix E) is required. Note: The metering enclosure shall be sized adequately to meet all applicable codes and standards. If the Interconnecting Customer wishes to include additional equipment such as line protective relays, telecommunication and/or EMS/SCADA equipment, the size must be adjusted accordingly.

**Metering Disconnects:** This section applies to non-wholesale customers. High-side metering installations shall have a minimum of two gang-operated, lockable disconnect devices at the primary to facilitate establishing a visual open. Disconnect devices are necessary at the following locations:

- The first disconnect switch shall be installed at or near the point of interconnection with PG&E (this switch is PG&E-operated).
- The second disconnect switch shall be installed between the load side of PG&E's metering and the Generation Entity’s electrical facility (this switch is Generation Entity owned and operated). With PG&E’s approval, circuit switches with blades can double as the visual open disconnect between the metering transformers and the main transformer. If the Generating Entity deviates from this present design configuration **PG&E approval is required prior** to Generating Entity’s initial submission of related drawings or prints.
- If the Generator is a Qualifying Facility (QF) selling power to PG&E on a surplus sale basis, a separate disconnect device (generator or host-site owned and operated) is required on the metered side of the load. Refer to [Figure G1-1](#), located near the end of this section, for typical interconnections.

**G1.2 DETAILED METERING REQUIREMENTS FOR GENERATORS**

The following sections describe the detailed requirements for metering electricity supplied by generators connected to or operating in parallel with the PG&E Transmission System.

**G1.2.2 Metering Configurations For New Generators**

Metering configurations for the delivery of power into the PG&E Transmission System fall under the following two general classifications:

**Wholesale Generators:** Wholesale generators that participate in the CAISO market must execute CAISO’s Participating Generating Agreement and meter their power deliveries in accordance with CAISO Tariff. Metering installations must comply with the Meter Certification Requirements and Standards set forth in the CAISO Tariff and Protocols. Meters for Participating Generators are required at the point of interconnection (Figure G1-2).

**Retail Generators:** Power delivered to the generator entity is metered at or near the point of interconnection.

**G1.2.3 Metering Requirements For New Generators**

The Generation Entity (either retail or wholesale) shall provide, install, own and maintain all mounting structures, conduits, meter sockets, meter socket enclosures, metering transformer cabinets and switchboard service sections of the size and type approved by PG&E and/or ISO. The Generation Entity may have the option to provide, own and maintain metering transformers, as specified by PG&E, rated at more than 600 volts when located within the Generation Entity’s substation and used for high-side metering, except when pole-top or...
metal-clad enclosure metering is used. In addition, wholesale generators are responsible for securing combination revenue metering PT/CT’s.

The Generation Entity must provide, install, own and maintain all facilities necessary to accommodate PG&E metering or an entity-owned metering which meets PG&E’s metering requirements. PG&E must receive and approve meter-location and enclosure dimensional drawings prior to installation of metering equipment. Other requirements vary, depending on the amount of power delivered to PG&E. The distance between the meter and the revenue-metering transformers must not exceed 50 feet to maintain the required metering accuracy. PG&E must approve any variance from this general rule.

**G1.2.3.1 Wholesale Generators**

**Installation of meters**: Generation Entities directly connected to CAISO Controlled Grid are responsible for installing, operating, and maintaining CAISO delivery meters in accordance with applicable CAISO requirements. Generation Entities connected to CAISO Controlled Grid are required to provide PG&E access to the Generation Entity’s meter.

**G1.2.3.2 Metering Generator’s Loads**

**Metering Generator Loads**: When a Generation Entity delivers power to the PG&E Power System, electric service to the auxiliary load associated with the generator plant is also needed. Because deliveries to and from the plant must be separately recorded and treated as separate transactions under PG&E’s tariffs, additional revenue-metering will be required in most cases. All meters shall be equipped to prevent reverse registration. In addition, when a generator enters into a service agreement with PG&E for stand-by service, the Generation Entity shall allow PG&E to tap onto CAISO metering circuit with the installation cost to be borne by the end-user (Generation Entity). For Generation Facilities larger than 20 MW, this provision is pursuant to Large Generator Interconnection Agreement (LGIA) Article 7.1

**G1.3 TELEMETERING REQUIREMENTS FOR GENERATOR MONITORING**

**G1.3.1 For New Generation Facilities 1,000 kW or Greater**

For Generating Facilities 1,000 kW or greater, the following real-time data must at a minimum be telemetered to PG&E’s Control Centers as specified in Appendix F and CAISO, for each generating unit:

- kW
- kVar
- kWh
- generator terminal voltage (kV)
- customer substation breaker status
- individual generating unit breaker status

A generator equipped with a voltage regulator and power system stabilizer (PSS) must also provide telemetering indicating their status. In addition, transmission kW, kVar, kV depending on the number of generating units and transmission configurations may be required.

For protection circuits, a minimum number of alarms to be transmitted include the following:
• breaker trip,
• transfer trip receive,
• channel/equipment fail.

Telemetering equipment (usually a dual-ported RTU) shall be located in the metering enclosure. At the entity’s expense, PG&E may supply telemetering equipment at the Generation Entity’s site, at PG&E's Electric Energy Control Center in San Francisco and at the Designated PG&E Switching Center. Generating Entity is responsible for procuring and maintaining all telecommunication circuits in accordance with requirements detailed in Appendix F. For Generation Facilities larger than 20 MW, this provision is pursuant to LGIA Article 8.2.

G1.3.2 For New Generation Facilities Less Than 1,000 kW

On a case-by-case basis, PG&E may require telemetering for generators of less than 1,000 kW.

G1.4 METERING CURRENT AND VOLTAGE TRANSFORMERS FOR GENERATORS

The customer may have the option to provide, own and maintain metering transformers when they are within the Generator’s substation, provided the metering transformers are approved by PG&E before installation and meet the following PG&E specifications:

• CTs and PTs cannot have a bypass switch.
• CTs cannot be switched or fused.
• PT metering secondaries must have a 60-amp, three-pole, gang-operated solid blade switch for all transmission-voltage metering.
• Metering class PT/CTs (including Dual Winding devices) shall not be used for relaying purposes in the PG&E system. In particular, combination PT/CTs which are installed by PG&E or an approved meter installed by a qualified meter service provider shall not be connected to Generator’s protective relays or used to provide protection of Generator-owned equipment or devices. Refer to PG&E Guideline E-TSP-G005 in Appendix C.
• PG&E may grant exceptions to this policy and allow a dual winding PT/CT unit to be installed. However, in this case, the customer will be required to sign a waiver absolving PG&E from liability in the event of failure of dual winding unit or improper performance of the protective equipment due to, for example, saturation of the CT in the dual winding.
• Metering transformers shall be tested by the manufacturer prior to pre-parallel inspection, and a certified transformer test report shall be provided to PG&E prior to installation. Periodic testing may be required for metering CTs or PTs.
FIGURE G1-1
TYPICAL INTERCONNECTION
Protection and Metering Installation for Surplus Sale

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<th>Function</th>
<th>Trips Breaker</th>
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<td>25</td>
<td>Synchronizing (Required for synchronous generators only)</td>
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</tr>
<tr>
<td>27</td>
<td>Undervoltage</td>
<td>A</td>
</tr>
<tr>
<td>51G</td>
<td>Ground Overcurrent</td>
<td>B</td>
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<tr>
<td>50/51V</td>
<td>Overcurrent with Voltage Restraint or Voltage Control</td>
<td>A</td>
</tr>
<tr>
<td>59</td>
<td>Overvoltage</td>
<td>A</td>
</tr>
<tr>
<td>81D</td>
<td>Over Frequency</td>
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<tr>
<td>81U</td>
<td>Under Frequency</td>
<td>A</td>
</tr>
<tr>
<td>P</td>
<td>Line Protection</td>
<td>B</td>
</tr>
</tbody>
</table>

NOTES:
1. Additional metering and protection may be required on net generator output. Contact PG&E for details.
2. Telemetered data for generators 1 MVA or greater must be supplied through a PG&E meter equipped with analog outputs.
3. When a wholesale generator is connected to the CAISO Controlled Grid, it is the Generator Entity’s responsibility to satisfy the CAISO’s delivery metering requirements.
4. See Section G2 for a complete discussion of protection requirements.
FIGURE G1-2

TYPICAL INTERCONNECTION

Protection and Metering Installation for Net Sale and Wholesale Transactions

### Required Generator and System Protection

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