Supplemental Interconnection Information for Customer Distributed Energy Resources
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Scope

This document provides additional detail about Idaho Power’s requirements for the installation and testing of customer Distributed Energy Resources (DER), including solar photovoltaic (PV), interconnected with Idaho Power’s electrical system. These requirements ensure the safety of people and property and the integrity of the electrical system.

This document does not include all technical requirements, the eligibility requirements, or financial and contractual obligations associated with interconnecting DERs with Idaho Power’s electrical system. It does not replace the requirements outlined in the following Rate Schedules governing on-site generation or DER interconnection:

- 06 – Residential Service On-Site Generation
- 08 – Small General Service On-Site Generation
- 68 – Interconnections to Customer Distributed Energy Resources
- 84 – Customer Energy Production Net Metering Service

These tariff schedules and additional information, including the application requirements, are available on the Idaho Power website at:

www.idahopower.com/customergeneration

or by contacting the Idaho Power Customer Generation Team at cg@idahopower.com or (208) 388-2559.

These requirements are subject to change. Refer to the Idaho Power website or call the above number for the latest information prior to installation.

Additional Information

For detailed service requirements, refer to the Customer Requirements for Electric Service document on Idaho Power’s website:

www.idahopower.com/accounts-service/construction-remodeling/installing-new-service/

or by contacting Idaho Power’s Customer Care Team at 208-388-2323 or 1-800-488-6151 (outside the Treasure Valley).

For answers to frequently asked questions about Customer Generation, refer to Idaho Power’s website at: www.idahopower.com/solar
Definitions

Terms used in this document are defined in Schedules 6, 8, 84 and 68.

Applicable Standards

In addition to the Idaho Power requirements set forth in this document, DERs must comply with all applicable laws, rules, orders, regulations, codes, ordinances and standards required by entities with jurisdictional authority and meet all applicable safety and power quality standards established by the latest edition of the following documents:

The National Electric Code (NEC) and, especially, the following 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

Underwriters Laboratory, Inc. (UL) for listing of equipment:

♦ 1741 – Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources
♦ 1703 – Flat-Plate Photovoltaic Modules and Panels
♦ 6140 – Outline of Investigation for Wind Turbine Generating System
♦ 1008 – Transfer Switch Equipment
♦ 2200 – Stationary Engine Generator Assemblies

The Institute of Electrical and Electronics Engineers (IEEE):

♦ 929 – Recommended Practice for Utility Interface of Photovoltaic (PV) Systems
♦ 1547 – Recommended Practice for Interconnecting Distributed Resources with Electric Power Systems Distribution Secondary Networks
Other Provisions

**Required Permits.** All installations must meet the requirements of the NEC with modifications as adopted by the authority having jurisdiction at the service address and display the proper electrical permit.

**ATTENTION!** *Idaho Power cannot energize a new service or re-energize a disconnected service until it has passed an electrical inspection.*

**Non-exporting Systems.** Customers that do not want their DER to export power to Idaho Power’s distribution system and interconnect their system such that all of the power generated is consumed on-site, may use one of the following non-export control systems to prevent export:

1. **Advanced Functionality.** Use of an internal transfer relay, energy management system or other customer-owned facility hardware or software system(s) to ensure power is never exported across the Interconnection Point.

2. **Reverse Power Protection.** Use of a reverse power relay to ensure power is never exported across the Interconnection Point.

3. **Minimum Power Protection.** Use of an under-power protective function to ensure a minimum amount of power is consumed at all times; and therefore, power cannot be exported.

Refer to Schedule 68 for additional details.

**Energy Storage Devices.** Energy Storage Devices may share an inverter with a Generation Facility (“DC Coupled”), or Energy Storage Devices may have a stand-alone inverter (“AC Coupled”). Energy Storage Devices that are not coupled with a Generation Facility taking service under Schedules 6, 8, or 84 may not export energy onto Idaho Power’s system. The Total Nameplate Capacity is determined as follows:

1. **DC Coupled:** For Energy Storage Devices that are DC Coupled with a Generation Facility, the Total Nameplate Capacity of the Customer Generator System is defined by the inverter (kVA). A DC coupled system can be an Exporting or Non-Exporting system.

2. **AC Coupled:**
   i. **AC Coupled with an Exporting System:** For an Energy Storage Device coupled with an Exporting System taking service under Schedules 6, 8, or 84, the Total Nameplate Capacity is the aggregate Total Nameplate Capacity of all DERs on the Customer’s side of the Interconnection Point.
   ii. **AC Coupled with a Non-Exporting System:** An Energy Storage Device coupled with a Non-Exporting System is subject to the provisions of Section 3 of this Schedule. The Total Nameplate Capacity of the Energy Storage Device shall be considered 0 kVA.

**NOTE.** *AC coupled Energy Storage Devices are DERs and must meet the requirements in Schedule 68 including smart inverter and AC disconnect requirements.*
Installation Requirements

**AC Disconnect.** Idaho Power requires a safety disconnect switch to disconnect all customer DERs from its distribution system for the safety of its line workers.

The switch shall be located within 10-feet of the meter and both the switch and the meter must be accessible to Idaho Power employees at all times. If the switch cannot be located within 10-feet of the meter or is not visible from the meter, a permanent placard at the meter location must be provided that gives clear directions to the disconnect location.

The switch must be manually operable with a visible “ON” and “OFF” indication and capable of being locked in the off position with a standard Idaho Power padlock. The disconnect must enable visual confirmation that the customer’s and Idaho Power’s conductors are physically disconnected.

This requires the ability to visually inspect the actual conductors. Circuit breakers and/or switches do not satisfy this requirement if the conductors are not visible. **Draw-out or other types of disconnects are not acceptable.**

**Labeling** The switch must be labeled “GENERATION DISCONNECT SWITCH” in 3/8-inch or higher lettering. Additional labeling may be required by the NEC. If multiple DERs (i.e., Generation Facility and AC coupled battery), Idaho Power prefers all DERs to be installed behind a single AC disconnect. If multiple AC disconnects are used, Idaho Power prefers all disconnects to be located together. A permanent placard must be installed on or near the meter base indicating the number and location of all disconnects, and each disconnect must be labeled. *(e.g., Generation Disconnect Switch 1 of 3).*

Placards should be easy to read, designed to withstand weather and UV light. Idaho Power prefers an engraved placard, red with white ¾-inch lettering. Laminated instructions or instructions placed in plastic sleeves are not acceptable.
Sample Single-Line Diagrams

Exporting System(s)

More than one exporting system may be allowed per service. Refer to tariffs.

1. Idaho Power required generation disconnect(s)  
2. Combiner or common AC bus  
3. Optional transfer switch (typical)  
4. Distributed energy resource (typical)  
5. Optional battery backed loads  
6. DC coupled energy storage system  
7. Optional battery backed loads  
8. Energy storage device (typical)  
9. Charge controller or common DC bus  
10. (max.)

Non-Exporting System

Idaho Power required generation disconnect
1. Non-export control  
2. Inverter or controller (typical)  
3. Normal power loads  
4. Other loads  
5. Non-export system and back-up loads (with or without energy storage)  
6. Distributed energy resource (typical)  
7. (max.)

GENERAL NOTES

- All DER equipment furnished, installed, owned and maintained by customer. 
- Additional disconnects or other equipment may be required to comply with the NEC. 
- Exporting and non-exporting systems are not allowed on the same service.

NOTES TO DIAGRAMS

1. Idaho Power required generation disconnect switch(es) must disconnect ALL energy resources AND storage. Disconnect must be manually operable, with visible “ON” and “OFF” positions; and located within 10-ft of meter. Label “GENERATION DISCONNECT SWITCH”. Multiple switches must be grouped together or provide permanent placard with locations of all disconnects. See “Installation Requirements” section. 
2. Disconnect may also serve as NEC disconnecting means where it can be located to comply with both NEC and IPC requirements. Fuse may be required. 
3. Warning label may be required on disconnect indicating that both sets of terminals may be energized when switch is in the open (off) position. 
4. Equipment must comply with UL 1741 or IEEE 1547 listings for grid interaction, or be approved by Idaho Power. 
5. Non-export control systems must have advanced functionality, reverse power protection, or minimum power protection to prevent power export as described in Schedule 68. 
6. Renewable generation source may generate either AC or DC power. 
7. Separately derived systems must be properly grounded and/or bonded to the building grounding electrode system as required by the NEC. 
9. Manual or automatic transfer switch for battery-backed standby loads must comply with NEC-702. 
10. OPTION: Line-side connection. Connect before main disconnect to keep generation online when disconnect is off. Connection must meet NEC requirements. If connection is located in meter base, there must be adequate wiring space, and connectors or load-side lugs must be listed for this purpose. 

OPTION: Branch breaker connection. Breaker must be properly sized for the generation system per the NEC and be listed for this application.

ATTENTION!

These sample diagrams are provided for illustrative purposes only and do not indicate all of the equipment, or the specific arrangement of such equipment that may be necessary for a Customer Generation System. They serve to provide an example of how Idaho Power’s interconnection requirements apply to a Customer Generation System, but should in no way be interpreted or used as installation instructions; and are not representative of the engineering design, installation, and/or National Electric Code requirements associated with a Customer Generation System.

All work should be performed by a licensed electrician that is familiar with the requirements for interconnected electric power production sources, and who obtains the necessary permits and inspections for the installation. Idaho Power cannot re-energize a service without it having passed an inspection from the Authority Having Jurisdiction. Refer to Idaho Power’s Customer Requirements for Electric Service for additional information.
Testing Requirements

When the customer owns, operates and maintains the interconnection protection and control equipment, either as discrete components (relays/circuit breakers) or as part of a DC inverter package, the DER shall conform to the acceptance and maintenance test requirements described below.

These test requirements apply only to interconnection disconnection devices and the protection and control equipment (e.g., equipment such as the AC Disconnect and Smart Inverters, which protect Idaho Power’s personnel, system and customers). Testing of equipment associated specifically with protection or control of generation equipment is recommended, but not required by Idaho Power unless they impact the interconnection protection.

Acceptance Testing

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

Generation Disconnect. Verification that the AC disconnect is functional.

For exporting systems, following a DER disconnect due to a voltage or frequency excursion, the DER shall remain disconnected until Idaho Power’s service voltage and frequency are within the operating voltage range of 106–132 V, and frequency range of 59.3–60.5 Hz for a minimum of five (5) minutes.

UL Listed (UL 1741-SA or UL 1741-SB) DC Smart Inverters. DC inverters permanently marked “Utility Interactive,” or the equivalent.

Attention! Beginning January 1, 2024, all new Customer Generation applications will be required to use UL 1741-SB certified inverters for inverter-based systems, including AC-coupled batteries with built-in inverters. Read our FAQs for more information.

Smart inverters must be programmed with the following settings:

<table>
<thead>
<tr>
<th>Voltage-Reactive Power Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>V₁</td>
<td>0.92 p.u. of nominal voltage</td>
</tr>
<tr>
<td>Q₁</td>
<td>44% of nameplate apparent power rating, injecting</td>
</tr>
<tr>
<td>V₂</td>
<td>0.98 p.u. of nominal voltage</td>
</tr>
<tr>
<td>Q₂</td>
<td>0</td>
</tr>
<tr>
<td>V₃</td>
<td>1.03 p.u. of nominal voltage</td>
</tr>
<tr>
<td>Q₃</td>
<td>0</td>
</tr>
<tr>
<td>V₄</td>
<td>1.06 p.u. of nominal voltage</td>
</tr>
<tr>
<td>Q₄</td>
<td>44% of nameplate apparent power rating, absorption</td>
</tr>
<tr>
<td>Open-loop response time</td>
<td>5 seconds</td>
</tr>
</tbody>
</table>
Voltage Ride Through Settings for Smart Inverters

<table>
<thead>
<tr>
<th>OV or UV*</th>
<th>Voltage (p.u. of nominal voltage)</th>
<th>Clearing time (seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OV2</td>
<td>1.20</td>
<td>0.16</td>
</tr>
<tr>
<td>OV1</td>
<td>1.10</td>
<td>13.0</td>
</tr>
<tr>
<td>UV1</td>
<td>0.88</td>
<td>21.0</td>
</tr>
<tr>
<td>UV2</td>
<td>0.50</td>
<td>2.0</td>
</tr>
</tbody>
</table>

*OV = overvoltage, UV = undervoltage

Other Protection and Control Equipment (relays, etc.) for Non-Inverter Based DER. The equipment shall automatically disconnect from the Idaho Power system as follows:

- Within ten (10) cycles if the voltage falls below $60 \text{ VRMS}$ phase to ground (nominal $120 \text{ VRMS}$ base) on any phase.
- Within two (2) seconds if the voltage falls below $106 \text{ VRMS}$ phase to ground (nominal $120 \text{ VRMS}$ base) on any phase.
- Within one (1) second if the voltage rises above $132 \text{ VRMS}$ phase to ground (nominal $120 \text{ VRMS}$ base) on any phase.
- Within ten (10) cycles if the frequency rises above 60.5 Hz or falls below 59.3 Hz.
- Within ten (10) cycles if the voltage rises above $144 \text{ VRMS}$ phase to ground (nominal $120 \text{ VRMS}$ base) on any phase.

All single-phase and three-phase test voltages shall be applied phase to ground. Test voltages are specified phase to ground for a 120-volt nominal system. Other system voltages require adjusting the test voltages by the appropriate percentage. Over and undervoltage protection should be wired phase to ground. Phase-to-phase voltage sensing results in less sensitive undervoltage detection and more sensitive overvoltage detection.

Expansions

In most cases, expansions to existing DERs are allowed so long as the expansion plus original system does not exceed the allowable size limits for the rate class as outlined in Schedules 6, 8 and 84. Expansions to legacy systems have additional requirements. Please contact Idaho Power before proceeding with an expansion to determine the legacy status of an existing project. Expansions, including modifications, are required to submit a new Customer Generation application and complete the interconnection process as described in Section 2 of Schedule 68.
Legacy Two-Meter Interconnection. Some systems of Commercial, Industrial and Irrigation customers taking service or applying to take service under Schedule 84 by **December 1, 2020**, and who interconnect their system by December 1, 2021, may have qualified for legacy treatment under the 2020 compensation structure for excess energy. Per PUC Order 34854 on Case IPC-E-20-26, customers with legacy systems may keep their existing two-meter systems at the originally approved nameplate capacity of the system. Customers who want to expand their legacy system have two options:

1. Keep the original system behind the generation meter and place a second, new system behind the service consumption meter.
2. Combine the original and new systems into a single system behind the service (consumption) meter and follow the rules in effect at that time and lose the legacy status of the system.

Legacy Single-Meter Interconnection. Some systems of Residential customers and Small General Service customers taking service or applying to take service under Schedules 6 and 8 by **December 20, 2019**, may have qualified for legacy treatment under the 2019 compensation structure for excess energy. Per PUC Order 34546 on Case 18-15, customers with legacy systems may add generating capacity (up to the allowed maximum Total Nameplate Capacity) to their premise without losing the original system’s legacy status if Idaho Power can separately measure the energy flows from the different systems.

For Idaho Power to separately measure the energy flows from the different systems, two separate net meters are required. The existing generation system will be measured on one meter, and the new generation system will be measured on a second meter. Idaho Power will serve both systems through one set of service conductors to a customer-provided, double socket (2-gang) meter base:

- The double socket meter base bus amp-rating must be equal to or greater than the existing meter socket rating with a single set of line-side lugs.
- The meter sockets may be vertically or horizontally arranged (see examples below.) All covers on the base must be sealable.

**NOTE.** Customers with legacy systems may add additional generation to their system up to the allowed maximum Total Nameplate Capacity without the above configurations but will lose their system’s legacy status and be billed under Idaho Power’s rate structure in effect at that time.

**Design Review.** Modifications to any system requires review and possible re-design for the service by Idaho Power at the customer’s expense.
Legacy Residential/Small General Service Separate Meter Option

Overhead Meter Base Arrangement
(1-Ø, vertical 2-gang meter base shown)

<table>
<thead>
<tr>
<th>Item</th>
<th>Provided by</th>
<th>Installed by</th>
<th>Maintained by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meters</td>
<td>Idaho Power</td>
<td>Idaho Power</td>
<td>Idaho Power</td>
</tr>
<tr>
<td>Conductors from transformer to drip loop</td>
<td>Idaho Power</td>
<td>Idaho Power</td>
<td>Idaho Power</td>
</tr>
<tr>
<td>Connectors for service conductors at drip loop</td>
<td>Idaho Power</td>
<td>Idaho Power</td>
<td>Idaho Power</td>
</tr>
<tr>
<td>2-gang meter base with lugs</td>
<td>Customer</td>
<td>Customer</td>
<td>Customer</td>
</tr>
<tr>
<td>Conduit, support brackets, weatherhead and bracing (as required)</td>
<td>Customer</td>
<td>Customer</td>
<td>Customer</td>
</tr>
<tr>
<td>Structure for equipment mounting</td>
<td>Customer</td>
<td>Customer</td>
<td>Customer</td>
</tr>
<tr>
<td>Conductors from meter base to drip loop per the NEC</td>
<td>Customer</td>
<td>Customer</td>
<td>Customer</td>
</tr>
<tr>
<td>Grounding electrode(s), ground conductor and connections per the NEC</td>
<td>Customer</td>
<td>Customer</td>
<td>Customer</td>
</tr>
<tr>
<td>Idaho Power required disconnects</td>
<td>Customer</td>
<td>Customer</td>
<td>Customer</td>
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</table>
Legacy Residential/Small General Service Separate Meter Option

Underground Meter Base Arrangement
(1-Ø, horizontal 2-gang meter base shown)

<table>
<thead>
<tr>
<th>Item</th>
<th>Provided by</th>
<th>Installed by</th>
<th>Maintained by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meters</td>
<td>Idaho Power</td>
<td>Idaho Power</td>
<td>Idaho Power</td>
</tr>
<tr>
<td>Conductors from transformer or hand hole to meter base</td>
<td>Idaho Power</td>
<td>Idaho Power</td>
<td>Idaho Power</td>
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<tr>
<td>Connection of Idaho Power conductors at meter base</td>
<td>Idaho Power</td>
<td>Idaho Power</td>
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</tr>
<tr>
<td>Conduit below grade (see Note)</td>
<td>Idaho Power</td>
<td>Idaho Power</td>
<td>Idaho Power</td>
</tr>
<tr>
<td>2-gang meter base with lugs</td>
<td>Customer</td>
<td>Customer</td>
<td>Customer</td>
</tr>
<tr>
<td>Conduit riser above grade, slip coupler and support bracket(s)</td>
<td>Customer</td>
<td>Customer</td>
<td>Customer</td>
</tr>
<tr>
<td>Structure for equipment mounting</td>
<td>Customer</td>
<td>Customer</td>
<td>Customer</td>
</tr>
<tr>
<td>Conductors from meter base to main disconnect</td>
<td>Customer</td>
<td>Customer</td>
<td>Customer</td>
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<tr>
<td>Connection of customer conductors at meter base</td>
<td>Customer</td>
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<tr>
<td>Structure for equipment mounting</td>
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<tr>
<td>Grounding electrode(s), ground wire and connections per the NEC</td>
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<tr>
<td>Idaho Power required disconnects</td>
<td>Customer</td>
<td>Customer</td>
<td>Customer</td>
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</table>

**Note.** The Customer may provide and install the underground conduit from the Idaho Power service point to the meter riser for residential services that meet certain criteria. Refer to the *Underground Residential Conduit Installation Requirements* document for more information.
## Revision History

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<th>DESCRIPTION</th>
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<td>05/01/2020</td>
<td>Reformatted document. Revised Definitions.</td>
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<td>08/03/2020</td>
<td>Renamed document.</td>
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<tr>
<td>2</td>
<td>09/21/2020</td>
<td>Revised definition of “Generation Capacity.”</td>
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<tr>
<td>3</td>
<td>01/08/2021</td>
<td>Added “Additional Information” and “Grandfathered Services.” Removed 2-meter sample single-line diagram and added note for battery storage devices.</td>
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<tr>
<td>4</td>
<td>01/28/2021</td>
<td>Revise wording for two-meter grandfathered service qualifications.</td>
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<tr>
<td>5</td>
<td>08/31/2021</td>
<td>Renamed Document. Revised language and requirements for Distributed Energy Resources to align with Schedule 68.</td>
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<tr>
<td>6</td>
<td>12/06/2022</td>
<td>Revised requirement for Generation Disconnect Switch and clarified labeling.</td>
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<tr>
<td>7</td>
<td>06/13/2023</td>
<td>Added UL1741-SB certification requirement for inverters after January 1, 2024.</td>
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