Supplemental Interconnection Guide

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Scope

This document provides additional details about Idaho Power's requirements for the installation and testing of customer Distributed Energy Resources (DER), including solar photovoltaic (PV) and battery storage, 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–Large General, Large Power and Irrigation On-site Generation 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

Making changes to an existing service will require the service to comply with the current service requirements. Refer to the **Customer Requirements for Electric Service** document on Idaho Power's website:

Customer Requirements for Electric Service (idahopower.com)

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):

- 519–IEEE Standard for Harmonic Control in Electric Power Systems
- 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 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; and thus, 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 feed 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 and must use one of the non-export control options. 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**: AC-coupled energy storage devices do not count toward the total nameplate capacity limits noted in Schedules 6, 8, and 84; however, they do count toward the DER's Total Nameplate Capacity for the Feasibility Review noted in Schedule 68.
    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 Schedule 68. 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.

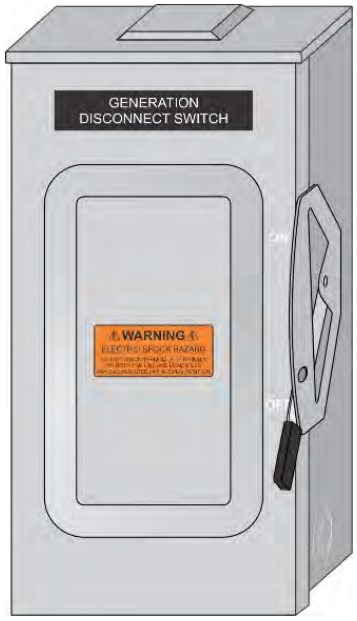
Installation Requirements

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

The disconnect 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.**



Generation Disconnect Switch

If multiple DERs (e.g., 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.

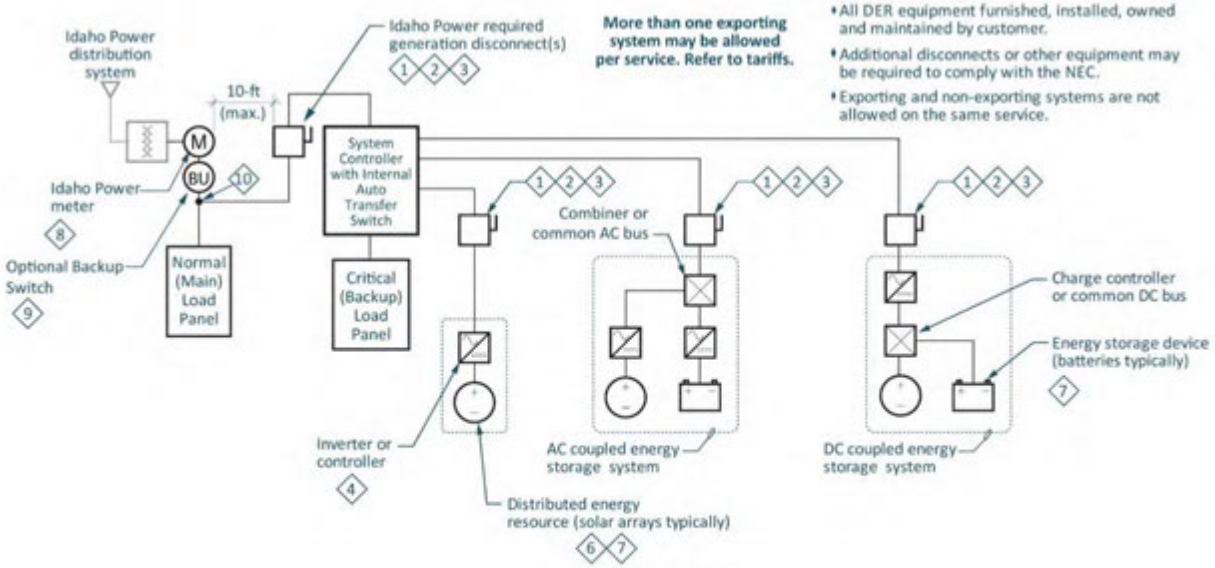
Labeling The switch must be labeled "GENERATION DISCONNECT SWITCH" or similar language, as approved by Idaho Power, with permanent ⅜ inch or larger letters.

- The label should indicate what type of DER the switch controls (e.g., Generation Disconnect Switch, Energy Storage Disconnect Switch, Generation and Energy Storage Disconnect Switch).
- If multiple disconnects are used, 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).
- Additional labeling may be required by the NEC.

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

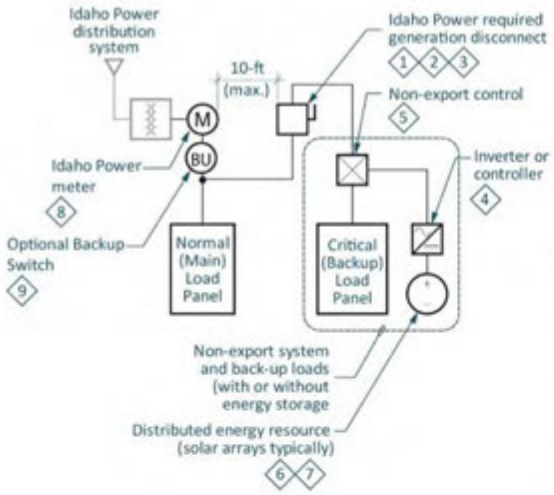
Exporting System(s)



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.

Non-Exporting System



NOTES TO DIAGRAMS

1. Idaho Power required generation disconnect switch(es) must disconnect ALL energy resources AND storage (see Schedule 68 for disconnect requirements). 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.
8. Meter furnished and installed by Idaho Power. Meter base furnished, installed, owned and maintained by customer.
9. **OPTION: Backup Switch**. A ring-style, meter base connected, disconnect switch (e.g. Tesla brand's "Backup Switch") is allowed, but may not be installed directly behind/physically onto Idaho Power's meter (Idaho Power does not allow customer-owned equipment between the meter and the meter base) and it must be installed in a separate/standalone meter base (a.k.a. "meter panel") downstream (on the customer side), of Idaho Power's meter.
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 5 minutes.

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

Smart inverters must be programmed with the following settings (Apply to Connect Your System - Idaho Power):

Voltage-Reactive Power Settings for Smart Inverters

Voltage-Reactive Power Parameter	Setting
V_1	0.92 p.u. of nominal voltage
Q_1	44% of nameplate apparent power rating, injecting
V_2	0.98 p.u. of nominal voltage
Q_2	0
V_3	1.03 p.u. of nominal voltage
Q_3	0
V_4	1.06 p.u. of nominal voltage
Q_4	44% of nameplate apparent power rating, absorption
Open-loop response time	5 seconds

Voltage Ride Through Settings for Smart Inverters

OV or UV*	Voltage (p.u. of nominal voltage)	Clearing time (seconds)
OV2	1.20	0.16
OV1	1.10	13.0
UV1	0.88	21.0
UV2	0.50	2.0

*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 10 cycles if the voltage falls below 60 V_{RMS} phase to ground (nominal 120 V_{RMS} base) on any phase.
- Within 2 seconds if the voltage falls below 106 V_{RMS} phase to ground (nominal 120 V_{RMS} base) on any phase.
- Within 1 second if the voltage rises above 132 V_{RMS} phase to ground (nominal 120 V_{RMS} base) on any phase.
- Within 10 cycles if the voltage rises above 144 V_{RMS} phase to ground (nominal 120 V_{RMS} base) on any phase.
- Within 10 cycles if the frequency rises above 60.5 Hz or falls below 59.3 Hz.

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.

Expansions to existing DERs that do not qualify as “legacy” systems must be made on the customer’s side of the meter such that Idaho Power has a single point of delivery. Refer to the “Customer Requirements for Electric Service” document on the Idaho Power website. Customer Requirements for Electric Service

Compliance and Protection-Harmonic Compliance–All customer facilities interconnected with Idaho Power's electrical system are **required** to comply with the applicable harmonic limits described in IEEE Standards 519 or 1547. The customer may need to install specific harmonic filtering equipment to meet this requirement. Whether or not harmonic filtering equipment is needed to comply with IEEE Standards 519 or 1547, Idaho Power **recommends** that customers install at least 3% line reactors and transient voltage surge suppressors at any variable frequency drives (VFDs) in their facility to help protect the VFDs from voltage transients and distortion that can damage the rectifiers in VFDs.

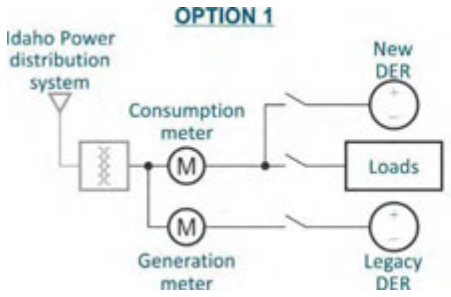
Legacy Two-Meter Interconnection–

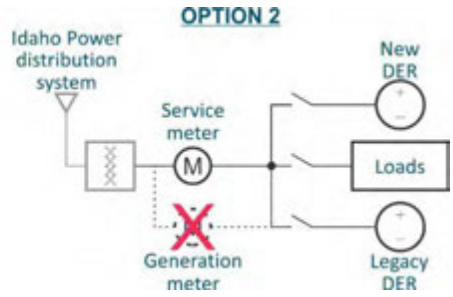
Some Large General Service, Industrial, and Irrigation customers who met specific requirements may have legacy status under the 2020 Schedule 84 compensation structure for excess energy. Legacy status may apply to:

> Idaho: Systems that had completed or started Idaho Power's interconnection process by December 19, 2019.
>
> Oregon: Systems that had completed or started Idaho Power's interconnection process by June 1, 2024.

Per PUC order, 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 two-meter system have two options:

1. Keep the original system behind the generation meter and place a second, new system behind the service consumption meter. The second new system will not have Legacy Status.
2. Combine the original and new systems into a single system behind the service (consumption) meter, follow the current rules and forfeit the system's legacy status.





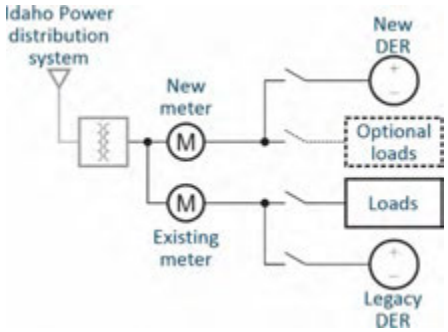
Legacy Single-Meter Interconnection–

Some systems of Residential and Small General Service customers, and some Oregon Large General Service and Irrigation customers, who met specific requirements may have legacy status under the 2019 compensation structure for excess energy. Legacy status may apply to:

> Idaho: Systems that had completed or started Idaho Power's interconnection process by December 19, 2019.
>
> Oregon: Systems that had completed or started Idaho Power's interconnection process by June 1, 2024.

Per PUC order, 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 on-site generation meters and services are required. The existing generation system connects to the existing service meter, and the new generation system will connect to a new second service meter.



Idaho Power will serve both systems and services through one set of service conductors to a customer-provided, double socket (2-gang) meter base (preferred):

- 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.

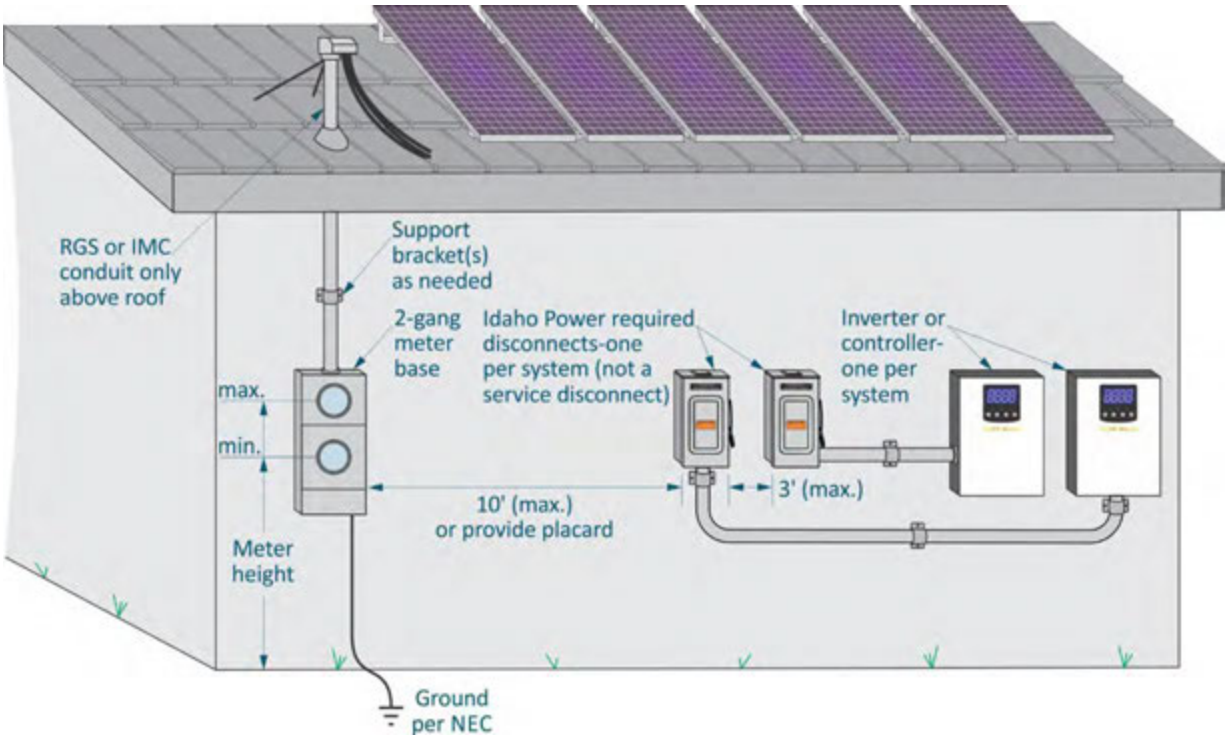
OR through a termination cabinet as described in Idaho Power's "Customer Requirements for Electric Service" document.

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 of the service by Idaho Power at the customer's expense.

Legacy Single-Meter Service, Separate Meter Expansion Option

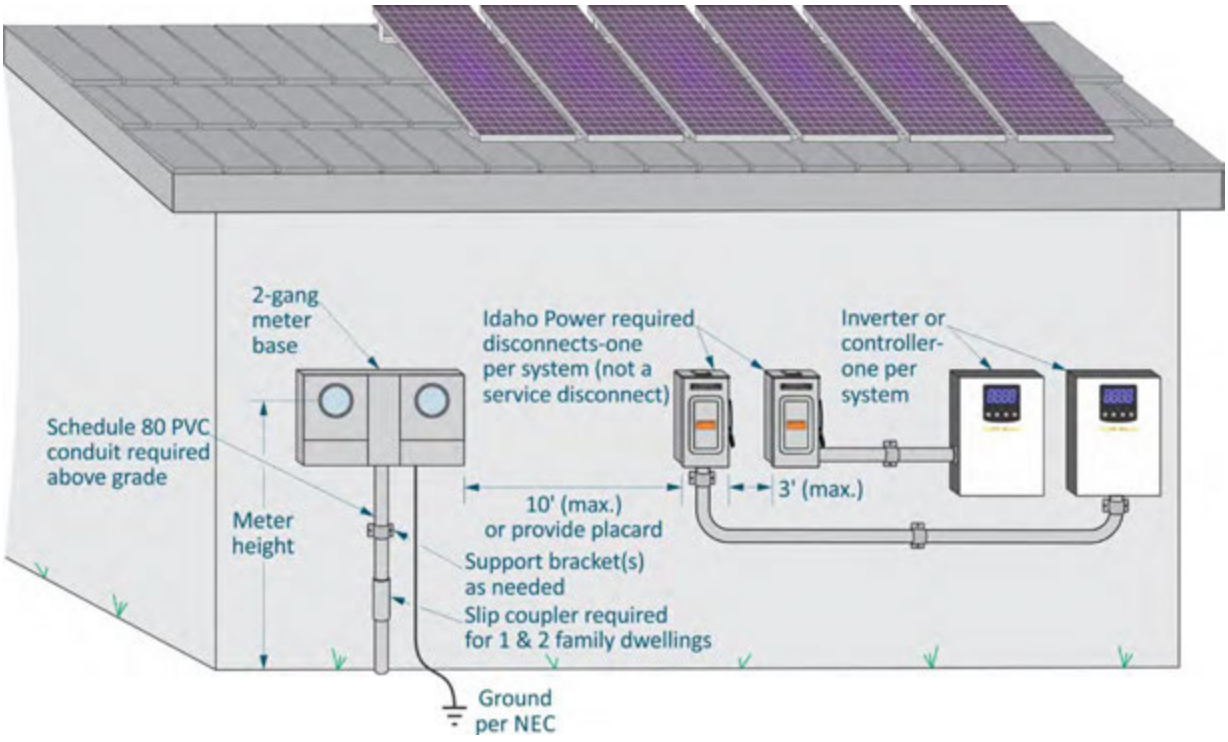
Preferred Overhead Meter Base Arrangement
(1-Ø, vertical 2-gang meter base shown)



Item	Provided by	Installed by	Maintained by
Meters	Idaho Power	Idaho Power	Idaho Power
Conductors from transformer to drip loop	Idaho Power	Idaho Power	Idaho Power
Connectors for service conductors at drip loop	Idaho Power	Idaho Power	Idaho Power
2-gang meter base with lugs (preferred)	Customer	Customer	Customer
Conduit, support brackets, weatherhead and bracing (as required)	Customer	Customer	Customer
Structure for equipment mounting	Customer	Customer	Customer
Conductors from meter base to drip loop per the NEC	Customer	Customer	Customer
Grounding electrode(s), ground conductor and connections per the NEC	Customer	Customer	Customer
Idaho Power required disconnects	Customer	Customer	Customer

Legacy Single-Meter Service, Separate Meter Expansion Option

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



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

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** (Underground Residential Conduit Installation) document for more information.