Key Components of a Solar Generation System

This document lists the major components of a solar generation system. This isn't a complete list of what will be needed – your contractor or electrician can provide more information about the National Electric Code (NEC) requirements that will ensure your system is safe and reliable. However, this list will get you started in your planning.

Once designed, please include a simple one-line drawing and site plan for your system with the application (example files are provided on our "Resources" page).

Applications are processed on a per meter basis. If you are designing a generation system which will include multiple net meters, each meter should have its own application, one-line drawing, and site plan.

Panels

The solar panels (sometimes called solar modules) convert sunlight into Direct Current (DC) electricity. The size and number of panels used helps determine the output of your system. Pacific Power doesn't have any requirements regarding the type of solar panels you use.

Inverter

The inverter converts DC electricity into Alternating Current (AC) electricity. Your house, and the rest of the energy grid, runs on AC electricity. Pacific Power requires your inverter to be IEEE 1547 and UL 1741 certified. These certification standards govern how your inverter will interact with the energy grid, and ensure that your generation system won't adversely affect you or your neighbors.

Production Meter

Some solar incentive programs require the installation of a production meter to measure the output of the generation system before the electricity is used by your loads. If you're working with an incentive program, they will let you know if a production meter is required.

AC Disconnect Switch

This is a safety component that allows your generation system to be turned off should anyone need to work on or near the electrical system, and typically would only be used by emergency responders (such as a fireman or one of our linemen). In some circumstances, the AC disconnect switch requirement may be waived, depending on state codes, as follows:

State	California	Oregon	Washington
Requirement	Always Required	Required for generation systems producing more than 30 amps	Required for generation systems larger than 25kW

As a safety feature, the AC disconnect must be installed near the meter base so it can be quickly located and operated in an emergency. The distance requirements vary depending on the state as shown below:

State	California	Oregon	Washington
Distance	3 feet	10 feet	3 feet

If there are extenuating circumstances, the AC disconnect switch may be located further from the meter if:

- Permission is obtained in writing from Pacific Power before the switch is installed.
- A permanent director placard is installed on the meter base which shows the precise location of the disconnect switch. See the Signage section for more details.

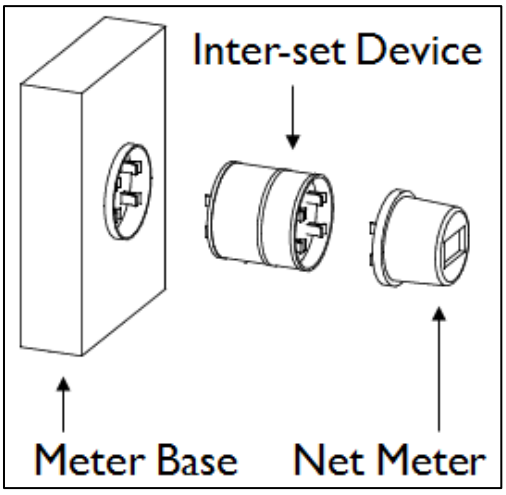
The AC disconnect switch must be lockable (with a standard padlock), load-break rated, and plainly indicate whether it is in the open or closed position. Most knife-type safety switches meet these requirements and are commonly used.

Pacific Power does not allow breakers to be used in place of a disconnect switch. Though they meet most of the requirements, breakers typically cannot be locked with a standard padlock. While most breaker cabinets can be locked with a padlock, the NEC does not allow the energy company to prevent a customer from accessing their other breakers by locking the entire cabinet. Even if there were only a single breaker for the generation system in the cabinet, if the property were sold or transferred, the new owner could inadvertently install additional breakers in the cabinet, which would negate the ability of the original breaker to act as an AC disconnect switch. For these reasons, a dedicated switch is required for the AC disconnect.

Interconnection Hardware

The connection between your generation system and the electrical system of your home or business is typically made through an UL-rated electrical panel. Please be sure your electrician follows NEC requirements for this connection.

Please note that inter-set devices are not allowed to connect customer generation systems (an inter-set device sits between the meter base and the meter, as shown below).



Net Meter

The net meter measures the flow of power in two directions and is used to determine your bill. It also serves as a demarcation point between your generation system and the energy grid.

Please be aware that our standard meters only measure the amount of power flow, not the direction it is flowing. If you were to install a generation system without a net meter in place, the standard meter would record any extra power you generated as energy we delivered to you, and you would be billed for it. Please wait for the net meter to be installed before turning your system on.

Signage

Pacific Power and the NEC require several permanent (metal or hard plastic) signs to be placed on components of your generation system. This is to prevent someone from inadvertently getting injured while working on or around your electric system. The signs should have a red background with white engraving.

The following signs are required by Pacific Power:

- On the meter base: "Parallel Generation On Site"
- On the AC disconnect switch: "Manual Disconnect for Parallel Generation"
  Note: if multiple AC disconnect switches are used, the signs should be modified to include a count of the number of switches – "1 of 3", "2 of 3", and so forth.

In the event the AC disconnect switch is located distant from the meter (please see the AC disconnect Switch section for details), a permanent director placard showing the precise location of the AC disconnect is required on the meter base. This will allow someone to quickly locate and operate the AC disconnect switch in an emergency.

This placard should have a red background with white engraving, and a map-style layout is preferred. The lettering on the placard should be at least ¼" tall (comparable to 25 point Arial font) with the rest of the map sized to match.

Pacific Power needs to approve the design of the placard before the system is installed. Please include a copy of the proposed placard in a standard image file format (JPG, PNG, BMP, etc) along with your application for review. Please note that a screen-shot of an AutoCAD file will not be sufficient – the image file needs to look just like the placard which will be installed on the meter base.

Below are two examples of placards that could be used for a solar generation system.

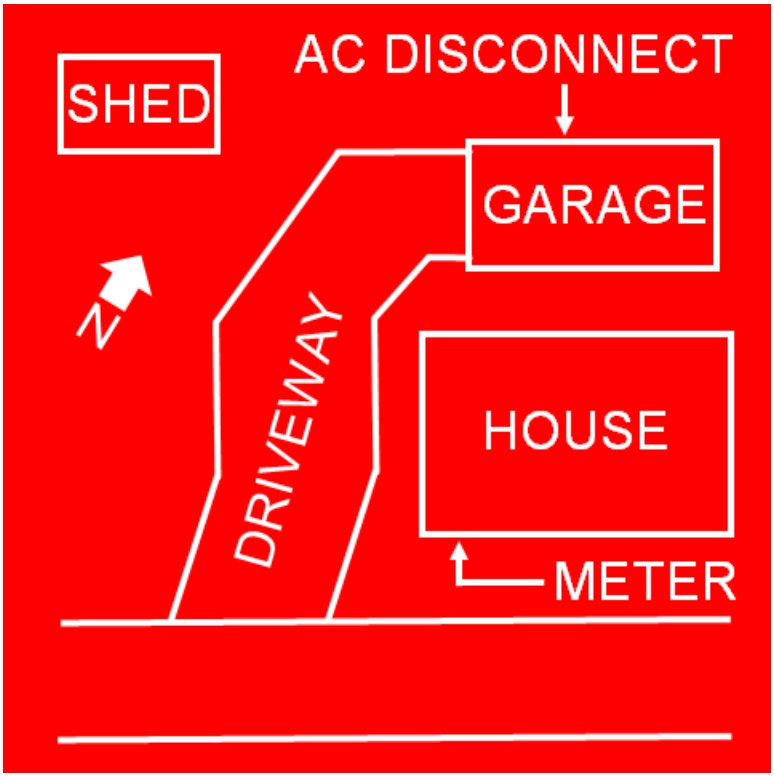


Figure 1 - Single AC Disconnect Switch (5"x5" background)

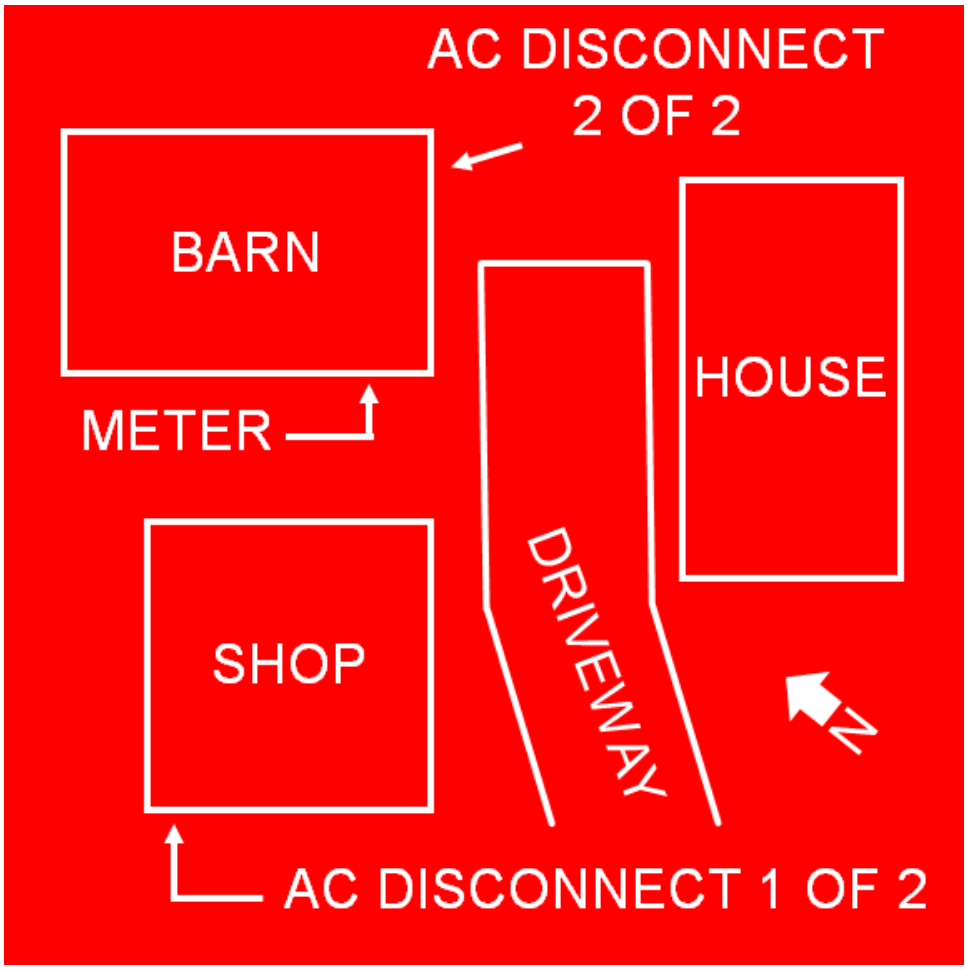


Figure 2 - Dual AC Disconnect Switches (6"x6" background)

Transient Overvoltage Management

If there were a fault (short-circuit) on the energy grid, customer generation systems can drive an overvoltage condition which could damage customer's appliances and equipment. Customer generation systems are not allowed to contribute to overvoltage conditions. There are two methods available to manage transient overvoltage events.

The first is to utilize an inverter which complies with the transient overvoltage limits of the IEEE 1547-2018 standard (section 7.4.2, figure 3). Testing data from the inverter manufacturer may be required. The second is to effectively ground the generation facility by means of a grounding transformer and relay system. For further information on how to effectively ground your system, please see the Transient Overvoltage Management section of the resources page.

The requirement for transient overvoltage management can be waived if the total generation on a distribution circuit is less than 10% of that circuit's minimum load (daytime minimum load for solar generation).

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