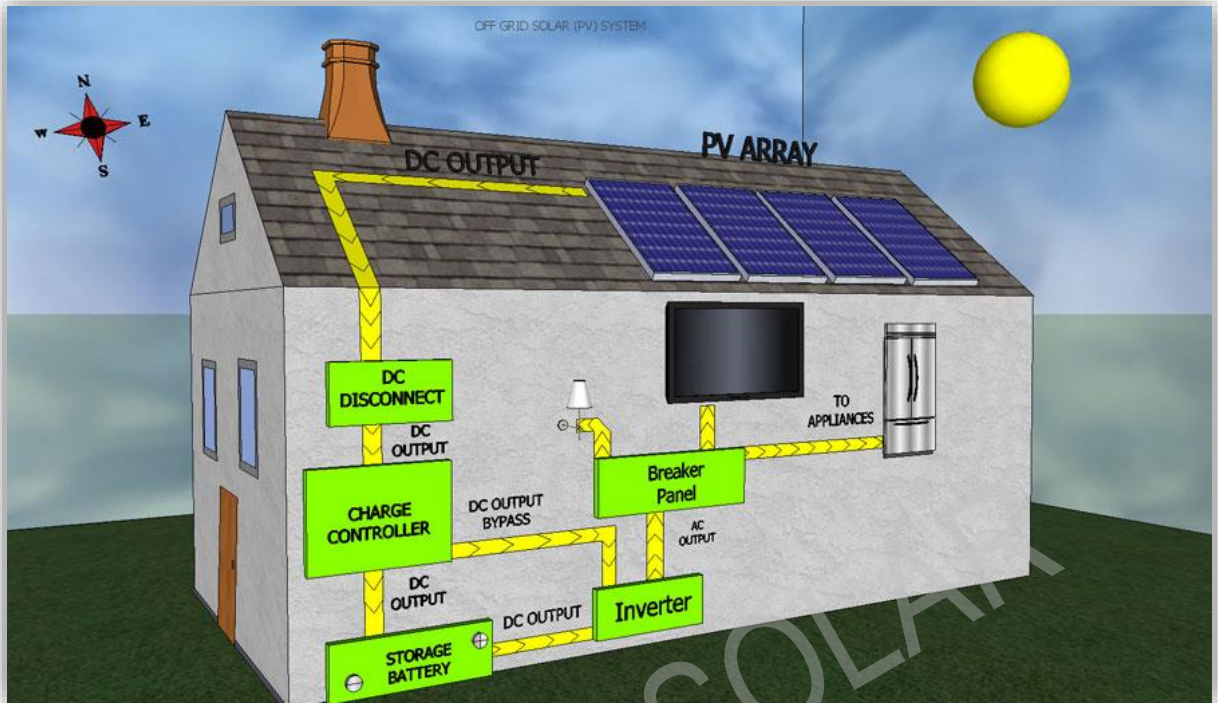


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Your Solar System Explained

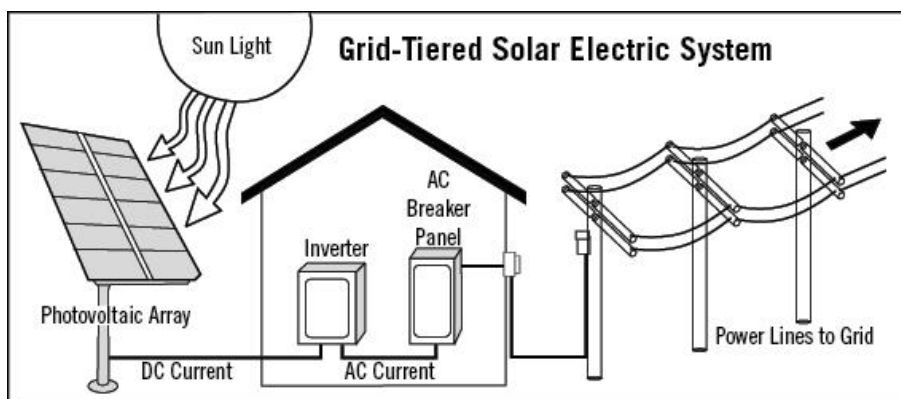
In principle there are three types of solar photovoltaic (PV) systems. These systems are defined as follows:

Grid Tie System

Grid-tied systems are connected to the electrical grid, and allow residents of a building to use solar energy as well as electricity from the grid. When there is no demand for energy, the solar system can send excess electricity back out into the grid for use.

Grid-tied systems do not provide protection from power outages.

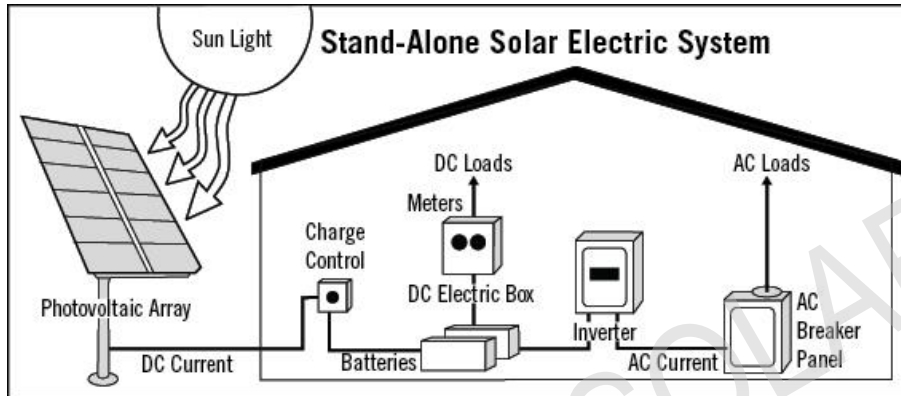
When the electrical grid fails, grid tied systems will automatically shut off and will not continue to operate for safety reasons.



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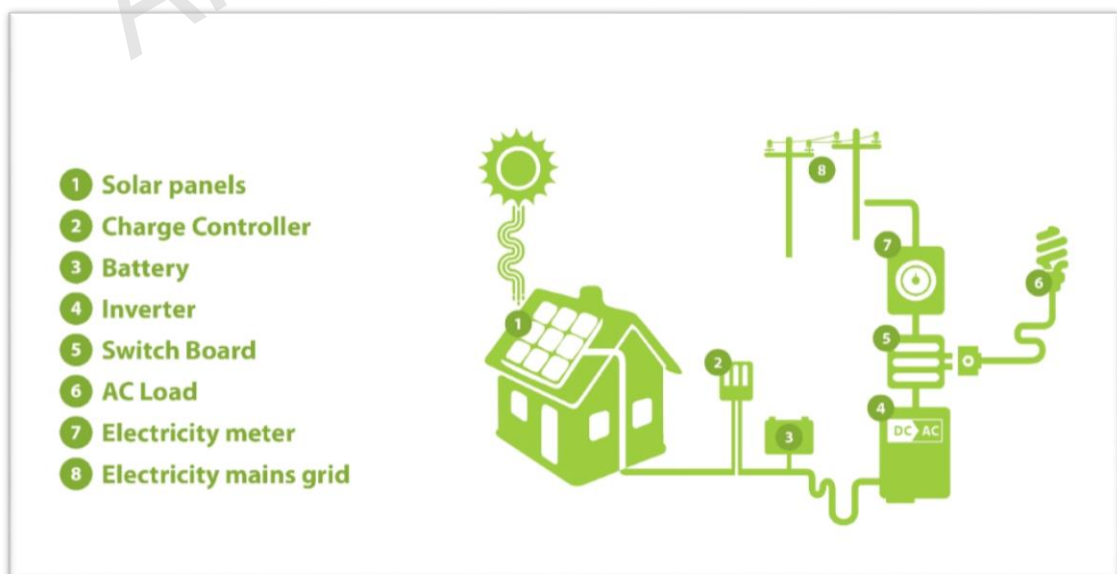
Off-Grid Systems

Off-grid solar-electric systems operate independently from the local utility grid to provide electricity to a home. Off-grid systems usually incorporate a battery bank to store energy produced during the day. If you have a solar battery system as well as a solar PV system, your power will continue to work.



Hybrid Systems

Hybrid systems is a combination of Grid Tie and Off Grid systems and can be configured to use grid energy, solar energy and battery backup. The backup battery is charged by both the grid and the solar panels. In the event of an outage, the backup battery will switch on automatically to provide backup power to the building.



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Basic building blocks for a solar system

A solar system consist of the following components as depicted in the Figures below.



Figure 1: Solar PV Panels

The first component is the solar generation part. This component is called a solar array, consisting of individual solar panels in series and parallel. Photovoltaics (PV) is a method of converting solar energy into direct current electricity using semiconducting materials that exhibit the photovoltaic effect.

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Figure 2: Inverters

The second important component is the charge regulator or controller/inverter which converts the energy generated by the sun to usable energy. An inverter, is an electronic device or circuitry that changes direct current (DC) to alternating current (AC). First the charge controller charges the batteries (DC) then the inverter converts it to usable electricity (AC).



Figure 3: Battery bank with battery rack

The battery bank is used to store the energy harvested during the day for night time use. There are different technologies to use when it comes to batteries. The three main lead-acid batteries are:

- Flooded (FLA) → **unsealed** with **liquid** electrolyte
- Absorbed Glass Matt (VRLA) → **sealed** with electrolyte **held captive** by glass mat
- Gelled (VRLA) → **sealed** with **gel** electrolyte
- *if well cared for
- Rating: 1 - poor 2 – good 3 - excellent

	Lifespan*	Minimal Gassing	Spill Proof Rating	Flexibility in Mounting	Charging Voltage Sensitivity	Maintenance	Price
Flooded	3	1	1	1	3	1	3
Gelled	2	3	3	2	1	3	2
AGM	2	3	3	2	2	3	1

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Figure 4: Solar System Distribution Board with circuit breakers

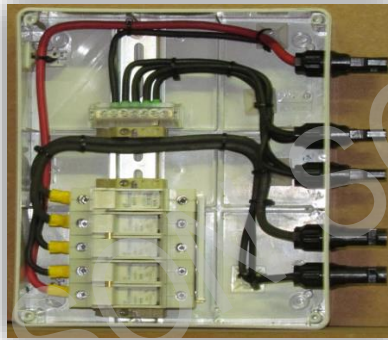


Figure 5: Solar panel combiner box

Protection mechanisms –Figure 4 & 5 are in no way less significant than the other components as they are protecting the overall system and protect your family against electrocution, short circuits, over current faults in wiring.

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How does my system work?

Your system will be classified as one of the following :

Off Grid

A system making use of solar panels to harvest solar irradiation in the form of DC power to charge the batteries. The stored energy in the batteries is then converted by an inverter into usable AC power for the house / factory / farm. The grid can also be connected to the system as a backup.

Grid Tie

A system making use of panels to harvest solar irradiation in the form of DC power but this power is converted into AC power and pushed into the grid or load without any batteries being used.

Grid Interactive

A system making use of solar panels to harvest solar irradiation in the form of DC power to charge batteries. This power is then converted to usable AC power by an inverter. The difference between this system and an Off Grid system is that the inverter used in this scenario is capable of selling back or pushing back onto the grid. In other words this inverter is an off grid inverter that can be used to power the load from the solar energy and the batteries and it can now sell the energy or push it back to the grid as well where as an off grid inverter can only power the load but not sell back to the grid.

Hybrid

This type of system is a combination of Off Grid, Grid Tie and a Grid Interactive system. It can work with or without batteries and can sell back to the grid as well. The batteries can be configured to be used like a UPS or a primary source of energy or both.