

Solar Energy Basics

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Solar panels, or photovoltaic (pv) panels are made of silicon, a natural element. When subjected to natural sunlight they become electrically charged. The PV array, or set of solar panels, is connected to a structure and directed in a way that will receive a proper solar charge. The electrical charge is consolidated, and then transferred to the output terminals. Standard output is 12 volts although it can reach as high as 24 volts.

The US Department of Energy estimates the amount of solar energy produced in one hour, is roughly equivalent to the amount of energy the entire country uses in one year. However, the intensity of the sun varies drastically based on location, time of day and time of year. Averaging Peak Sun Hours for a specific area determines the number of solar panels necessary to fill energy needs.

A full system requires solar panels, a charge converter, a battery and an inverter. The solar panels charge the battery. The controller ensures the battery receives the proper charge. The battery provides DC voltage to the inverter, which in turn converts that voltage to AC voltage. The proper installation determines the total output of energy. PV panels can be wired individually, in panels, or singly to increase the total yield. By connecting the positive terminal of one panel to the negative panel of another, you increase the voltage. Conversely, connecting negative-to-negative, and positive-to-positive, increases amperage. But, you can actually do both and increase your overall net yield.

Charge controllers are an essential part of the system. It ensures the battery is neither over, nor under charged. Advanced models include Maximum Power Point Tracking (MPPT) and actually maximize the amount of current flowing into the battery from the solar panels.

Deep cycle batteries are used in most systems and are designed to charge and discharge thousands of times during their lifespan. They're measured in Amp Hours (ah), which refers to the number of amps that can be supplied by each battery over the course of so many hours. For example, a 350ah battery can supply 35 amps over the course of 10 hours. Like the PV panels, batteries can be wired in a variety of ways to increase the amp hours.

Because solar power is collected as DC voltage, and most appliances operate on AC voltage, the inverter is an integral part of every system. Inverters are generally sine wave or modified sine wave. Most common electrical devices can operate on modified sine wave, but not all operate as effectively. Fluorescent lights for example, produce an audible hum when using this form of inverter.