

How Do Solar Energy Systems Work :

The word solar is derived from the Roman word Sol (the god of the sun), therefore, the word solar refers to the sun meaning solar power is power from the sun. When we say something is solar powered, we mean that the energy it uses was converted directly from solar energy

The sun provides Earth with 2 major forms of energy, heat and light. Some solar powered systems utilize the heat energy while others transform the light energy into electricity and we call them Photovoltaic systems.

The history of solar energy dates as far back as the Greek and Roman empires, during a time when myth and reality were intertwined. To the Greeks, Romans, and the Egyptians of that time, nature and the environment around them was seen as the home of the gods.

The Egyptians followed the rising sun for guidance to the tombs of their kings and queens. Both the Greeks and the Egyptians used the sun as part of the mummification process in drying the dead bodies. Both the Egyptians and the Greeks used passive solar power to help them in their daily lives. The Greeks used a technique that incorporated mirrors reflecting the sun light toward Roman ships prepared for war. The Greeks won that war due to the sun resilient power.

Solar energy dates back to the times of ancient Egypt when Egyptians built rooms to store the energy from the sun.

Edmond Becquerel, a French physicist, first described the photovoltaic (PV) effect in 1839 when he found certain materials produced small amounts of electric current when exposed to light.

Photoelectric Effect :

The photoelectric effect and quantum mechanics resulting in present day photovoltaic and solar cells were first studied by Albert Einstein in the early 20th century. Einstein observed that when light hit a metal surface an electric current could be observed.

The world's first solar power collector was built by Horace de Saussure, a Swiss scientist. Solar cells were developed in the 1950 and 1960 for the space program as an ideal power source for satellites, but were too costly for general use.

The first practical solar cells were produced in the 1970 as a response to increased interest in alternative power sources. Much of this interest came from the oil embargos enforced in the Middle East. In the 1990 the Gulf War also produced a renewed interest in solar power.

Improvements in the design and manufacture of photovoltaic modules have been incorporated so modules now can produce up to 320 Watts per panel, and for less than 1/100 of the compared cost 40 years ago.

Solar Photovoltaic Systems are composed of five main components:

- Solar Panels
- Charge Controllers
- Batteries and
- Inverters.
- Accessories (ex. Mount System, DC Cables, Connectors, DC Fuses and Combiner Boxes)

These components are necessary to have a Solar system that functions as Designed.

Solar Panels :

Solar panels are the main components of the system. The solar panels charge the batteries. Several solar panels wired together create what is called a solar array or solar string. The overall capacity and size of the solar array will determine the amount of power or energy that will be produced from a solar electric system.

The location and orientation of a solar electric system plays a major role in the overall energy output of a solar power system. Geographic areas such as South of Egypt tend to produce more solar energy than do locations like North of Egypt in Alexandria. Systems located closer to the equator will be the most efficient.

Charge Controllers :

Charge controllers electronic devices come in many different sizes and types, they all perform a similar function. Charge controllers prevent the solar panel or array from over-charging the battery(s) and over-discharging the battery(s).

Batteries :

Batteries store energy for solar PV electric systems. Batteries play a major role of storing the energy your solar panels produce during the day. Batteries will provide you with the energy you need at night. Components that are powered by solar electric systems receive their power from batteries rather than directly from the output of a solar panel.

Batteries come in different DC Voltage ex. 2V, 6V, 12V and different capacities ex. 30Ah, 60Ah, 100Ah. Connecting your solar panel directly to your load can damage your appliances if loads are powered directly. Batteries used in Solar PV systems should be Deep Cycle Batteries.

Inverters :

The inverter converts the DC energy stored in your batteries and turns it into the AC power you use in your home. Inverters are rated by wattage and the quality of their output. You can use a 300 watt inverter that plugs into your home to power your Lights or Laptop or TV and you could have a 5000 Watt inverter system that powers your home.

Accessories :

The last major component Interconnect your complete system together in many different ways as per your design and you need always to select the right components with the correct Voltage and Current rating to protect your investment.