HOW DO SOLAR PANELS WORK

They have been around for years. They can be seen on homes, on top of road signs and light posts offering a inexpensive means for powering objects. They are solar panels that harness the sun's natural energy and convert it into electricity. But how do they work?

Solar panels harness the sun's rays and convert them into electricity by using photovoltaic (PV) cells. These cells can power everything from small devices like a calculator, to a whole house. The cells have several components, starting with the ones we are all aware of and see everyday, two layers of silicon. The layers of silicon make up the majority of the cell and the plane where they meet is where most of the critical process takes place.

The cell also has metal strips running through it that conduct the flow of electricity which the cell produces, also known as electrons. Electrons flow into the object being powered and then back out of it and return to the cell through the cell's metal backing to close the loop. The cell also contains an anti-reflective coating, which ensures that the photons, or particles of sunlight, are absorbed by the silicon layers and not reflected away.

Silicon Layers

Silicon is a poor conductor of electricity, even though it is a strong and stable building material for PV cells. To account for silicon's poor conductive properties, manufacturers upgrade, or "dope", the cell's two silicon layers with trace amounts of additives, usually phosphorus and boron. The top layer is infused with phosphorus and contains more electrons, or negatively charged particles, than the pure silicon does. The bottom layer is infused with boron, contains fewer electrons. These infusions are critical to the process.

Electric Field

To generate electricity, you first need to establish an electric field. Similar to a magnetic field where the opposite poles of two magnets attract to each other, the positive and negative charges in an electric field do the same. This reaction to the electric field is first created in the cell when the two different silicon layers are attached to each other.

The added electrons in the phosphorus-doped top layer naturally move into the boron-doped bottom layer in a fraction of a second and only close to where the two layers meet. When the bottom layer has gained extra electrons, it becomes negatively charged at the same time the top layer has gained a positive charge. The cell is now ready to accept the sun's photons.

The sun's rays

When sunlight hits the cell, the photons begin to separate the electrons in both silicon layers. These active electrons dart around each layer but don't create electricity until they are able to reach the electric field at the junction of the two silicon layers. This is one of the reasons that solar cells are still relatively inefficient compared to fossil fuels and only account for a fraction of the energy used in the U.S. The electric field pushes the electrons that do reach the junction toward the top silicon layer. This process essentially catapults the electrons out of the cell to the metal conductor strips, generating electricity.

Powering a satellite

A satellite produces its own power by generating electricity from sunlight that is attracted by the solar panels. Batteries are used to store the energy, so the satellite can continue to work when the Sun is eclipsed or too far away to reach the panels. An example of this would be a mission to visit a comet or a distant planet. The more light that hits a cell, the more electricity it produces. This is why a satellite is usually designed with solar panels that can always be pointed at the Sun while the rest of the body moves.

Source : http://www.diyspaceexploration.com/solar-panels-work/