



How Does Solar Work?



County Admin Building roof

Basics of solar energy (from [Scientific American](#))

The sun's light contains energy. When light hits an object, the energy turns into heat, like the warmth you feel while sitting in the sun. But when light hits certain materials, the energy turns into an electrical current instead, which we can then harness for power.

Old-school solar technology uses large crystals made out of [silicon](#), which produces an electrical current when struck by light. Silicon can do this because the electrons in the crystal get up and move when exposed to light instead of just jiggling in place to make heat. The silicon turns a good portion of light energy into electricity, but it is expensive, because big crystals are hard to grow.

Newer materials use smaller, cheaper crystals shaped into flexible films. "[Thin-film](#)" solar technology, however, is not as good as silicon at turning light into electricity.

Here comes the sun!



Solar panels on County Ag Building

Solar Panels (from [Solar Technologies](#))

Solar power panels are made from specially treated semiconductor materials composed mostly of silicon atoms. The panels - also called photovoltaic modules - are constructed with two sheets of silicon manufactured to take advantage of the photons bombarding the earth.

One sheet, called the N-layer, is constructed of silicon atoms that have "extra" electrons wandering freely within the layer. The other sheet, called the P-layer, has "missing" electrons, or "holes" that attract free electrons. The two layers are separated by an electrical field, created by the interaction of atoms from both sides.

When a photon of sunlight strikes an atom in either layer, it knocks loose an electron. In the P-layer, these free electrons easily cross through the electrical field and into the N-layer. But this movement of electrons is one-way; N-layer electrons aren't able to cross the electrical field into the P-layer. As a result, an excess of free electrons build up in the N-layer.

A metal wire attached to the N-layer gives the excess electrons somewhere to go. This circuit ultimately leads back to the P-layer, depositing free electrons where they

can begin the process again. Before returning to the P-layer, the electrons are used to power electrical appliances in homes, offices, schools and factories. The movement of electrons with energy is called an electric current. As long as the sun is shining, the electrical current in a solar-electric system continues.

Energy demand is called a load. In a standalone photovoltaic system, electricity in excess of the load can be stored in batteries for later use. A grid-tied solar power system, on the other hand, runs in tandem with power from the utility company. The excess solar power from a grid-tie system is fed into utility lines.

Silicon is shiny, and without countermeasures would reflect too much sunlight from the solar cells. For this reason PV modules are covered with an anti-reflection layer to maximize energy collection. The panel is covered in glass to seal the cell.

How Solar Cells Work

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