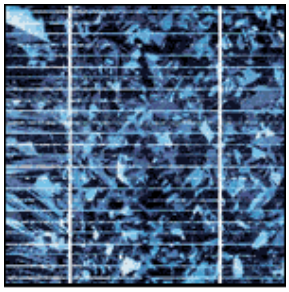
Photovoltaics … How it works?



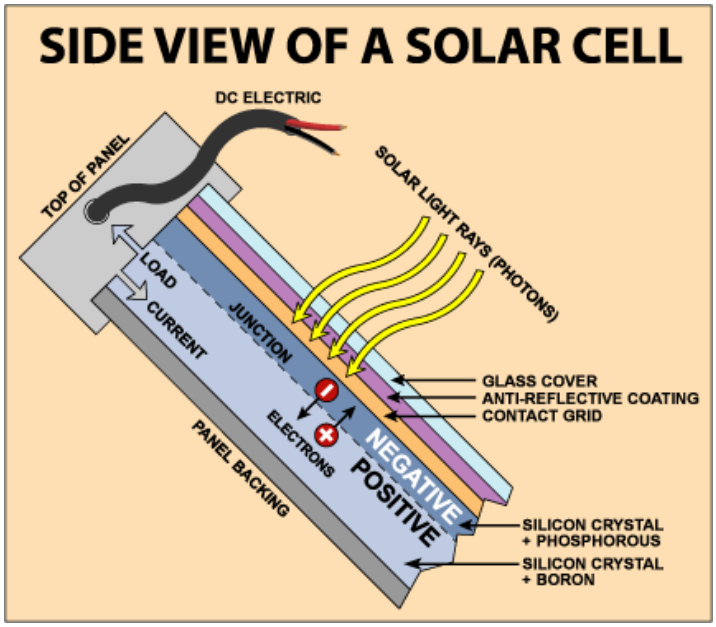
SOLAR CELL CLOSE-UP

Photovoltaics (or Solar Cells) are solid-state semiconductor devices that convert light into direct-current electricity. These semi-conductors are most commonly made out of silicon crystal, which are used in many electronics and computer components. The top layer of the silicon portion of a solar panel is made from a mixture of this silicon and a small amount of phosphorous, which gives it a negative charge. The inner layer, which constitutes the majority of the panel is a mix of silicon and a little bit of boron, giving it a positive charge. The place where these two layers meet creates an electric field called a junction. When light (or photons) hits the solar cell, before it gets to the silicon crystal to make electricity it passes through a glass cover on the panel and an anti-reflective coating, which stops photons from reflecting off of the panel and being lost. The photons are absorbed into the junction, which pushes electrons in the silicon out of the way (**See illustration below**). If enough photons are absorbed, the electrons are pushed past the junction and flow freely to an external circuit. When converted to Alternating Current electricity using what is called an inverter, this energy can be used to power anything that uses electricity.

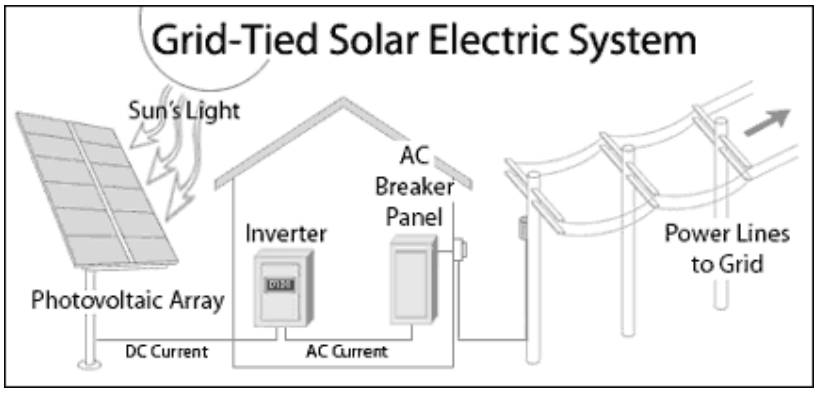
SOLAR PANEL ARRAY

How a Photovoltaic Electric System Works

To generate electricity for homes and buildings two different types of solar electric systems can be used: A Grid-Tied system is connected to your utility's transmission lines so that you can use power from the grid as well as produce your own. The other type of solar electric system is called a Stand-Alone system, which uses batteries to store electricity for use anytime.



Grid-Tied Solar Power - In this type of setup an inverter in a building converts Direct Current (DC) Electricity into Alternating Current (AC) Electricity so that it can be used by the building it is connected to and other consumers on the power grid. When the demand for power in the building is low, excess photovoltaic power flows to the grid and the utility's meter turns backwards, essentially selling electricity back to the utility. One disadvantage to this type of system is that if utility power goes out you cannot use solar power for backup. On the other hand, the only maintenance with a grid-tied system is adjustment of panels due to the changing angle of the sun during different seasons, and even this is optional.



Stand Alone Solar Power - This kind of system uses batteries to store electricity produced by photovoltaic cells. There is no connection to the utility power grid so a building can operate completely independently. A stand-alone system is more complicated and expensive, as well as requiring a little more maintenance, like refilling water in your batteries every so often.