Energy Savers

How Small Solar Electric Systems Work

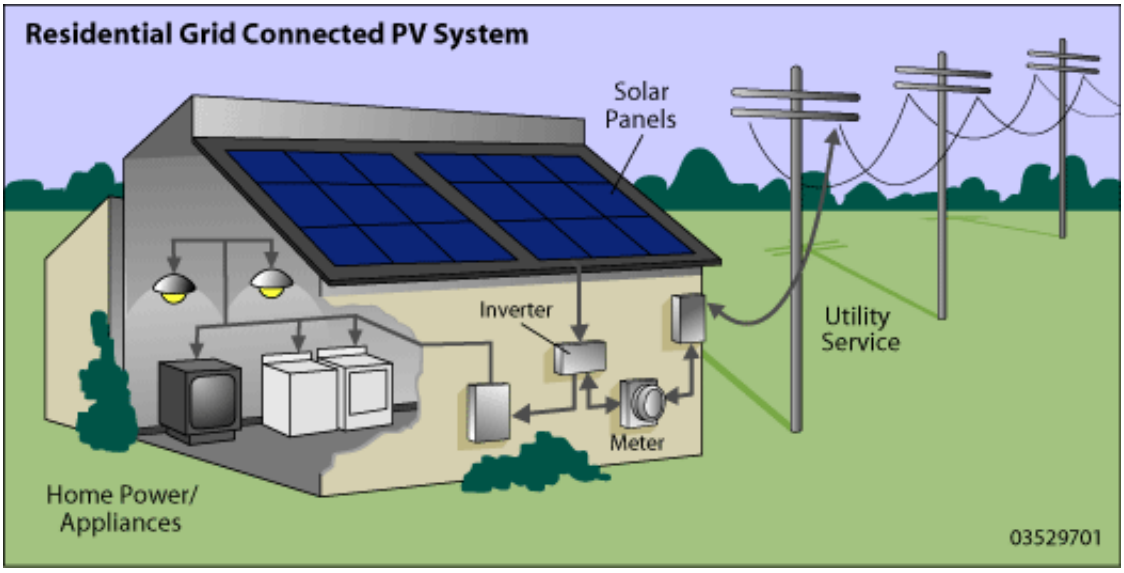
Solar electric systems, also known as photovoltaic (PV) systems, convert sunlight into electricity.

Solar cells—the basic building blocks of a PV system—consist of semiconductor materials. When sunlight is absorbed by these materials, the solar energy knocks electrons loose from their atoms. This phenomenon is called the "photoelectric effect." These free electrons then travel into a circuit built into the solar cell to form electrical current. To see a simulation of the photoelectric effect, please view our animation. Only sunlight of certain wavelengths will work efficiently to create electricity. PV systems can still produce electricity on cloudy days, but not as much as on a sunny day.

The basic PV or solar cell typically produces only a small amount of power. To produce more power, solar cells (about 40) can be interconnected to form panels or modules. PV modules range in output from 10 to 300 watts. If more power is needed, several modules can be installed on a building or at ground-level in a rack to form a PV array.

PV arrays can be mounted at a fixed angle facing south, or they can be mounted on a tracking device that follows the sun, allowing them to capture the most sunlight over the course of a day.

Because of their modularity, PV systems can be designed to meet any electrical requirement, no matter how large or how small. You also can connect them to an electric distribution system (grid-connected), or they can stand alone (off-grid).



Download high-resolution diagram: JPG (ZIP 124 KB) | EPS (ZIP 541 KB)

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Evaluation Tools

- PV Watts
  National Renewable Energy Laboratory
- In My Backyard Solar and Wind Estimator
  National Renewable Energy Laboratory

Financing & Incentives

- Find Federal Tax Credits for Energy Efficiency
  Energy Savers

Professional Services

- Find a Solar Pro
  Solar-Estimate.org

Department of Energy Resources

- Photovoltaic Basics
  Solar Technologies Program

Related Links

- PV Fundamentals
  Florida Solar Energy Center

Reading List

- *A Consumer's Guide: Get Your Power From the Sun* (PDF 763 KB). (December 2003). U.S. Department of Energy.
- *Own Your Power! A Consumer Guide to Solar Electricity for the Home* (PDF 3.4 MB). (January 2009). U.S. Department of Energy.