



Renewable Energy Terms

Photovoltaic Cell— Semiconductor device that converts light into electrical energy

Ian Woofenden

©2000 Ian Woofenden

Derivation: "Photo" is from Greek "phos, photos"—of or produced by light. "Voltaic" is from "volt," named after Alessandro Volta—producing electrical pressure or voltage.

A photovoltaic (PV) cell directly converts light energy into electrical energy. It is *light* from the sun—not heat—that is used; crystalline cells are actually more effective when cool. Each cell develops about half a volt of DC electrical potential. The maximum amperage of the cell is proportional to its surface area. We most often see series strings of about 36 cells put together to charge a 12 volt system. We call these "modules" or "panels."

The photovoltaic effect was first discovered in the late 1800s. Scientists noticed that light shining on crystalline selenium produced a current. Later, researchers found that silicon was more effective as a base material. In our present day PVs, the silicon is doped with boron, phosphorous, gallium, arsenic, or other materials. This creates loosely bound electrons, easily liberated by incoming photons (energized light particles). It also forms the "p-n junction," a region that naturally pushes those freed electrons through an electrical circuit to do useful work.

The photovoltaic cell is overlaid with a grid of conductive wires which are connected together and eventually go to the battery terminals or the load. When the photons bump the electrons through the p-n junction, the electrons follow the rest of the circuit set up by the wires and battery.

Hugh Piggott says PV is "the energy shortcut—from the source to the ultimate goal in one conversion." There

are no moving parts in this beautiful system. Only the photons and electrons move, and there are plenty of them to go around. One of my favorite demonstrations of this technology is the pump in the bucket. Connect a small PV module to a bilge pump that's in the bottom of a five gallon bucket full of water. Put the PV in the sun and watch the pump run. I've enjoyed seeing young children, scientific folk, and even my local backhoe operator become excited about PV's potential after seeing this simple demonstration.

One closing note on the word: While we in the industry are very comfortable saying "photovoltaic" and "PV," the terms seem mysterious to many people. I think it's often better to say "solar-electric" when speaking to the uninitiated. When we say "solar panels," lots of people think of solar thermal panels, an entirely different technology which gathers the sun's energy in the form of heat. "Solar-electric" is a much easier phrase for most people to understand, and it clearly distinguishes the two different technologies.

Access

Author: Ian Woofenden, PO Box 1001, Anacortes, WA 98221 • Fax: 360-293-7034
ian.woofenden@homepower.com



Integrate Your Balance of System



New PC250 & PC500
Power Centers from:

TRACE
ENGINEERING

UL Listed PC250 & PC500 Power Centers Include:

- Single or Dual 250 Amp Inverter / Battery Main Breaker
- DC Rated Photovoltaic Array Input Circuit Breaker
- AC Section with Input / Output / Bypass Breaker
- 60 Amp PWM Photovoltaic Array Charge Controller

Trace Inverter / Power Center Combo Packages Now Available!
Call ETA Engineering Toll-Free at 1-877-964-4188
or visit us on the web at: www.etaengineering.com

ETA
ENGINEERING

RENEWABLE ENERGY SYSTEM
DESIGN & DISTRIBUTION

2010 E. University Dr., #11, Tempe, Arizona, 85281
Toll-Free: 1-877-964-4188 Fax: 1-480-966-1516