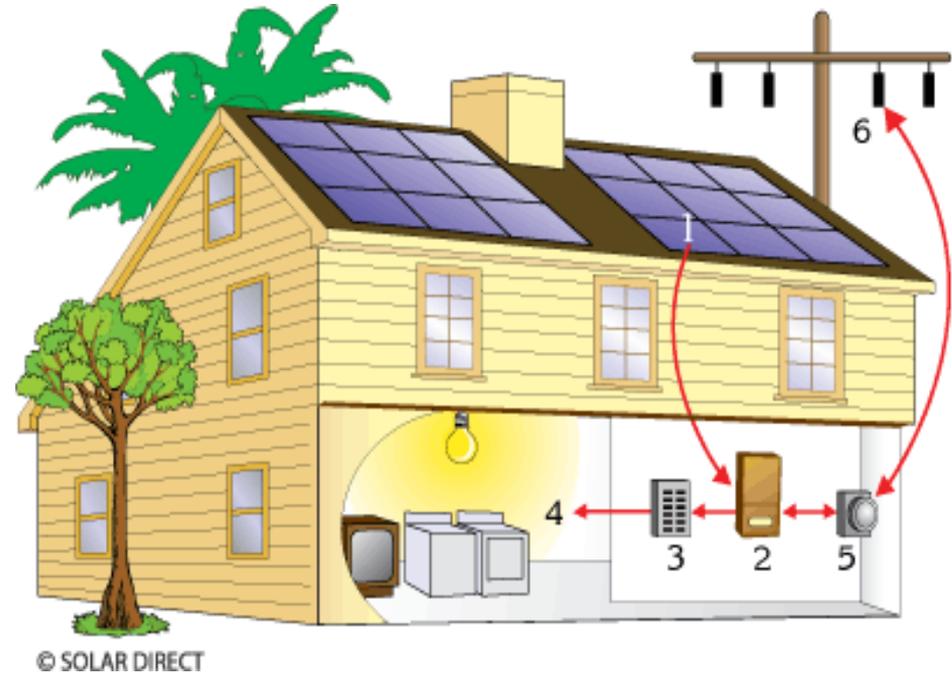


Photovoltaic System

- **HIGHLIGHTS**
- The energy needs of a typical home could be met by covering only half of its roof with solar electric panels.
- Photovoltaic (PV) cells convert sunlight directly into electricity without creating any air or water pollution.



INTRODUCTION

Photovoltaic offer consumers the ability to generate electricity in a clean, quiet and reliable way.

Photovoltaic systems are comprised of photovoltaic cells, devices that convert light energy directly into Electricity. Because the source of light is usually the sun, they are often called solar cells. The word photovoltaic comes from “photo,” meaning light, and “voltaic” which refers to producing electricity.

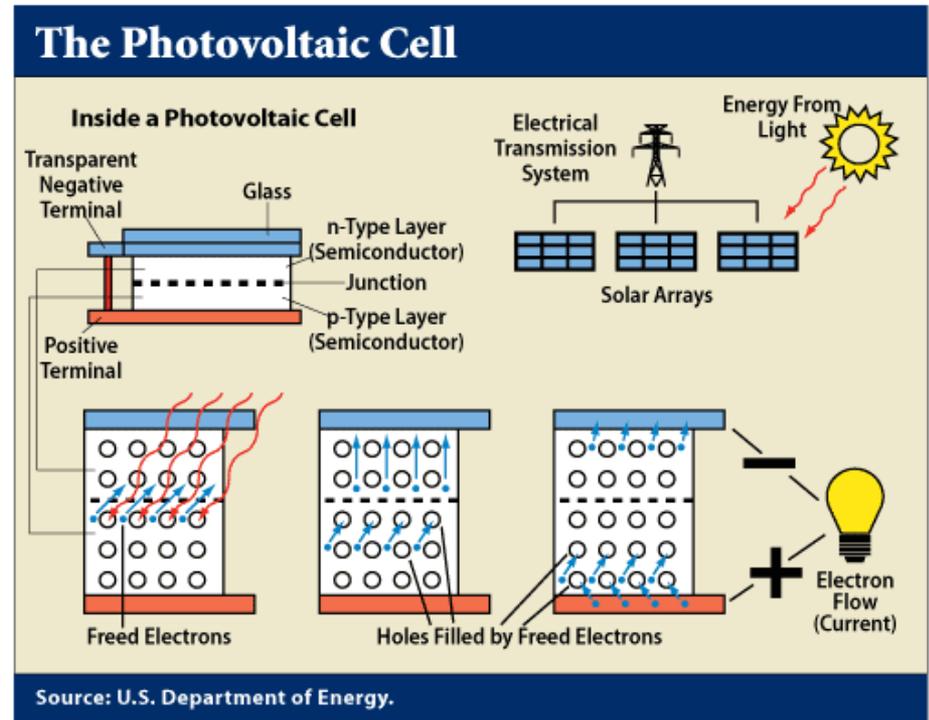
Therefore, the photovoltaic process is “producing electricity directly from sunlight”, Photovoltaic are often referred to as PV.

PV systems are being installed by the people who already have grid—supplied electricity but want to begin to live more independently or who are concerned about the environment.

HOW IT WORKS

PV cells convert sunlight directly into electricity without creating any air or water pollution.

PV cells are made of at least two layers of semiconductor material. One layer has a positive charge, the other negative. When light enters the cell, some of the photons from the light are absorbed by the semiconductor atoms, freeing electrons from the cell's negative layer to flow through an external circuit and back into the positive layer. This flow of electrons produces electric current.

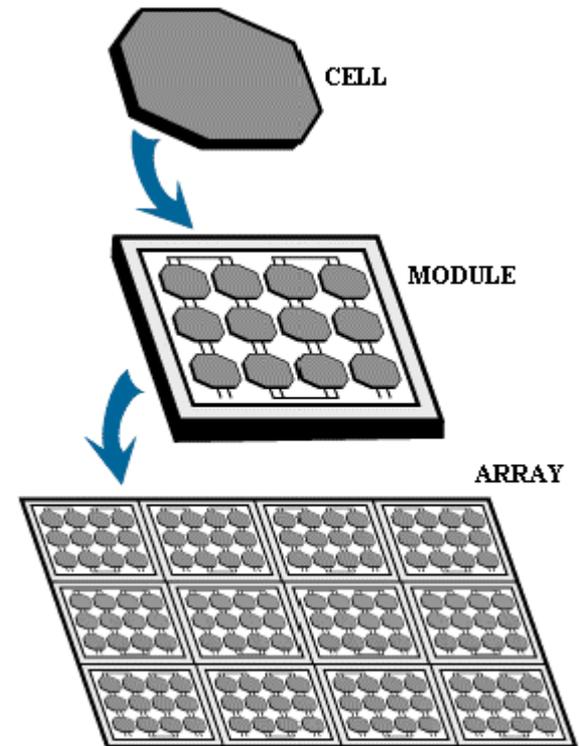


HOW IT WORKS

To increase their utility, dozens of individual PV cells are interconnected together in a sealed, weatherproof package called a module.

When two modules are wired together in series, their voltage is doubled while the current stays constant. When two modules are wired in parallel, their current is doubled while the voltage stays constant. To achieve the desired voltage and current, modules are wired in series and parallel into what is called a PV array.

The flexibility of the modular PV system allows designers to create solar power systems that can meet a wide variety of electrical needs, no matter how large or small.



Small PV System

For some applications where small amounts of electricity are required, like emergency call boxes, PV systems are often cost justified even when grid electricity is not very far away.

When applications require larger amounts of electricity and are located away from existing power lines, photovoltaic systems can in many cases offer the least expensive, most viable option.



Small PV System



In use today on street lights, gate openers and other low power tasks, photovoltaic are gaining popularity in Italy and around the world as their price declines and efficiency increases.



THE GRID: ON OR OFF?

Some homeowners in Italy are turning to PV as a clean and reliable energy source even though it is often more expensive than power available from their electric utility.

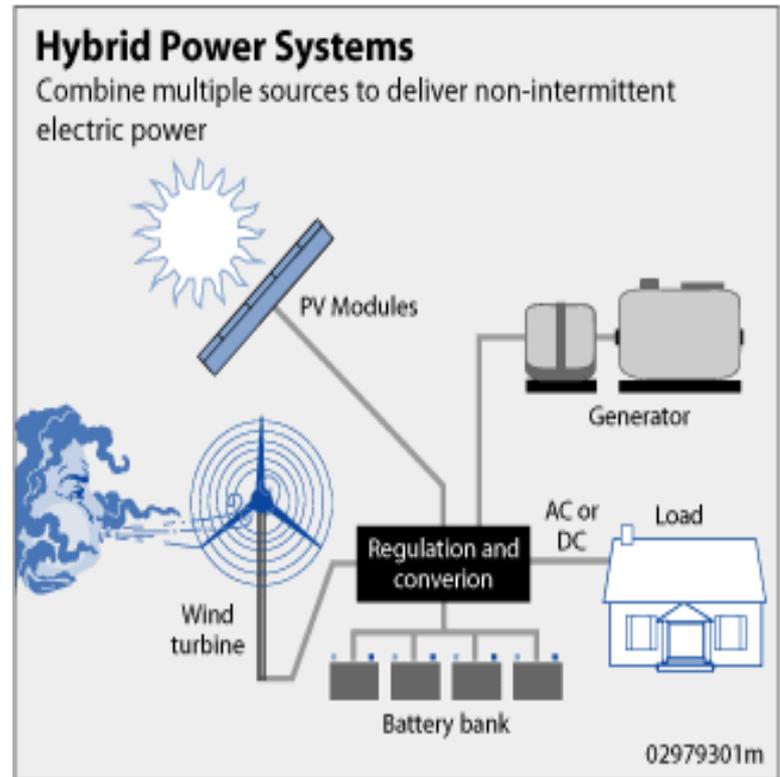
These homeowners can supplement their energy needs with electricity from their local utility when their PV system is not supplying enough energy (at nighttime and on cloudy days) and can export excess electricity back to their local utility when their PV system is generating more energy than is needed.



THE GRID: ON OR OFF?

For locations that are “off the grid” — meaning they are far from, or do not use, existing power lines — PV systems can be used to power Water pumps, electric fences or even an entire household.

While PV systems may require a substantial investment, they can be cheaper than paying the costs associated with extending the electric utility grid



THE RIGHT EQUIPMENT FOR THE JOB

A grid-connected PV system will require a utility interactive DC to AC inverter. This device will convert the direct current (DC) electricity produced by the PV array into alternating current (AC) electricity typically required for loads such as radios, televisions and refrigerators.

Utility interactive inverters also have built-in safety features required by electric utilities nationwide.

For an off-grid PV system, consumers should consider whether they want to use the direct current (DC) from the PV's or convert the power into alternating current (AC).

Appliances and lights for AC are much more common and are generally cheaper, but the conversion of DC power into AC can consume up to 20 percent of all the power produced by the PV system.



THE RIGHT EQUIPMENT FOR THE JOB

To store electricity from PV's, batteries will be needed. The batteries used for PV systems are different from car batteries. The batteries best suited for use with PV systems are called secondary or deep cycle batteries.

There are two types of deep cycle batteries: lead acid, which require the periodic addition of water, and captive electrolyte (or gelcell) batteries, which are maintenance free.

In addition, PV systems require proper wiring, switches and fuses for safety, controllers to prevent the batteries from being overcharged or overly discharged, diodes to allow current to flow in the right direction, and grounding mechanisms to protect against lightning strikes.



Photovoltaic Parking Canopies



PV system on the roof of a factory



PV Plant set on the ground



Photovoltaic Greenhouses

