

AN INTRODUCTION TO SOLAR POWER (Photovoltaic Systems)

Introduction

Solar cells (also called Photovoltaics) 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.” Photovoltaics are often referred to as PV.

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 semi-conductor 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 (DC), which is the same kind of current that flows from a regular battery. A four-inch silicon cell can produce about one watt of DC electricity.

A number of cells (usually 20 or more) or a film can be mounted within a frame under a transparent glass or plastic covering to form a module. Modules can be connected to other modules to form an array. The larger the area of photovoltaics in each module, or the more arrays that are used, the more electrical power you will have.

Applications and Cost

PV cells power many of the small radios, cell phones, calculators and wrist watches in use every day. More complex systems provide electricity to pump water, power communications equipment, light homes, and run appliances. Beyond the utility power line, PV is often the lowest-cost means to provide electricity, and almost always the simplest and cleanest to operate.

The cost of PV has fallen by 90 percent since the early 1970s. Photovoltaics are producing electricity for critical loads from the polar ice caps to the tropics to satellites in outer space. There is a strong market today in developing countries to provide rural electrification with solar panels, which replace kerosene lamps, batteries, and wood fires at a far lower cost than the central station power plants.

The global photovoltaic industry is expanding rapidly, with production increasing more than 30% each year. Analysts believe that the photovoltaic industry will continue to see impressive gains in efficiencies and cost reductions as economies of scale come into play with larger production facilities.

Sources: Solar Electric Power Association, Northeast Sustainable Energy Association, Texas Solar Energy Society