

What is solar energy?

Energy from the sun can be categorized in two ways: (1) in the form of heat (or thermal energy), and (2) in the form of light energy (using photovoltaic cells). Solar thermal technologies use the sun's heat energy to heat substances (such as water or air) for applications such as space heating, pool heating and water heating for homes and businesses. Often the products used for this application are called solar thermal collectors and can be mounted on the roof of a building or in some other sunny location. The sun's heat can also be used to produce electricity on a large utility-scale by converting the sun's heat energy into mechanical energy (Katie—not sure what you mean by this sentence—is there yet another way to harness the energy of the sun here? Is this sentence essential?).

Photovoltaics (PV) is a technology often confused with solar thermal and is in fact what many people mean when they refer to "solar energy". Photovoltaic (photo=light, voltaics=electricity) technology (similar to the microchip) converts light energy directly into an electric current that can either be used immediately or stored, such as in a battery, for later use. A photovoltaic cell is a nonmechanical device usually made from silicon alloys. Sunlight is composed of photons, or particles of solar energy. These photons contain various amounts of energy corresponding to the different wavelengths of the solar spectrum. When photons strike a photovoltaic cell, they may be reflected, pass right through, or be absorbed. Only the absorbed photons provide energy to generate electricity.

Advantages

Photovoltaic conversion is useful for several reasons. Photovoltaic panels are versatile and can be mounted in a variety of sizes and applications; e.g. on the roof or awning of a building, on roadside emergency phones or as very large arrays consisting of multiple panels. Currently they are being integrated into building materials (such as PV shingles, which replace conventional roofing shingles). Conversion from sunlight to electricity is direct, so that bulky mechanical generator systems are unnecessary. The modular characteristic of photovoltaic energy allows arrays to be installed quickly and in any size required or allowed.

Also, the environmental impact of a photovoltaic system is minimal, requiring no water for system cooling and generating no by-products and the operation of the panels does not require fossil fuels that generate greenhouse gases. Once installed, the operational costs and maintenance costs are low (Katie—is this true? Need to check out). Once in operation, the higher initial costs are recovered over a period of time.

Disadvantages

The major drawbacks (problems, or issues to overcome) of solar energy are: (1) the intermittent and variable manner in which it arrives at the earth's surface The performance of a PV array is dependent upon sunlight. Climate conditions (e.g., clouds, fog) have a significant effect on the amount of solar energy received by a PV array and, in turn, its performance. (2), The large area required to collect it at a useful rate. Most current technology photovoltaic modules are about 10 percent efficient in converting sunlight with further research being conducted to raise this efficiency to 20 percent. As a result large collection surfaces are required. (3), The high initial installation costs, often

several times that of the cost of fossil-fuel based heating systems and other many times the cost required to connect to the local power grid.