
SYNOPSIS:

Alternative energy sources are being researched and developed to improve efficiency and reduce costs. Fluctuating costs of oil, coal and natural gas, along with their possible negative effects on the environment, has made energy sources such as wind and solar more cost-competitive with fossil fuels. More energy strikes the Earth in an hour than humans need in a year. We are now hard at work developing a variety of technologies to convert its power into energy that we can use to heat, cool and light our homes and businesses. This program sheds some light on photovoltaic cells and concentrated solar power as well as how they are able to convert the sun's energy into electricity.

CURRICULUM UNITS:

Biology
Chemistry
Ecology
Physical Science
Physics

CAREER OPPORTUNITIES:

Chemist
Engineer
Utilities Management
Materials Specialist

PROGRAM OVERVIEW:

The Sun provides natural energy that fuels biological processes for all life on earth. More energy from the sun falls on the earth in one hour than is used by everyone in the world in one year. It is no wonder that a variety of technologies have been created and more are being researched to convert the sun's energy - to heat, cool, and light our homes and businesses.

Our energy needs are supplied to us mostly by coal, oil, and natural gas. These commodities have fluctuating costs, a finite supply, and possible negative effects on our environment. These factors have driven scientists and engineers all over the world to look for ways to increase efficiency and decrease costs of power generated by solar means.

ISSUES & CRITICAL THINKING:

- 1) Ask students to research the efficiency levels of solar cells over the past several decades. What contributing factors have allowed for advances in efficiencies and reduction in costs?
- 2) Have students identify how much solar energy is generated in their state of residence. How does it compare to other states? What kinds of technology are used to generate the solar power?
- 3) There are two big issues with solar energy: it can't be generated at night and the limited efficiency of solar cells. Discuss whether or not solar power can ever be a complete replacement for fossil fuels.
- 4) Compare concentrated solar power to photovoltaics. Identify strengths and weaknesses of each system.

GLOSSARY:

Direct Current- An electric current of constant direction, having a magnitude that does not vary or varies only slightly.

Doping- A method of adding a dopant to a pure semiconductor to change its electrical properties.

Heliostat- An instrument consisting of a mirror that automatically moves to track the sun, for reflecting the sun's rays in a fixed direction.

Photon- The subatomic particle that carries the electromagnetic force and is the quantum of electromagnetic radiation. It has a rest mass of zero, but has measurable momentum, exhibits deflection by a gravitational field, and can exert a force. It has no electric charge, has an indefinitely long lifetime, and is its own antiparticle.

Photovoltaics- A semiconductor technology involving the direct conversion of sunlight (electromagnetic radiation) into electricity.

PV effect- The creation of voltage in a material from exposure to sunlight.

Silicon- A metalloid element that occurs in both gray crystalline and brown non-crystalline forms. It is the second most abundant element in the Earth's crust and can be found only in silica and silicates.

Solar cell- A photoelectric cell that converts sunlight into electrical energy, usually consisting of layers or sheets of specially prepared silicon. Electrons, displaced through the photoelectric effect by the Sun's radiant energy in one layer, flow across a junction to the other layer, creating a voltage across the layers that can provide power to an external circuit.

Voltage- A measure of the difference in electric potential between two points in space, a material, or an electric circuit, expressed in volts.



SOLAR POWER-AN ALTERNATIVE ENERGY SOURCE

K4547DVD



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