

GLOSSARY

BIOMASS

Organic matter, especially plant matter, that can be converted to fuel and is therefore regarded as a potential energy source.

ETHANOL

An alcohol obtained from the fermentation of sugars and starches or by chemical synthesis. It can be used as an additive to or replacement for petroleum-based fuels.

FUEL CELL

A device that produces electricity by combining a fuel, usually hydrogen, with oxygen. In this reaction, electrons are freed from the hydrogen in the fuel cell by a catalyst and gain energy from the chemical reaction binding hydrogen and oxygen; this provides a source for electric current. The exhaust of hydrogen fuel cells consists of only water. Fuel cells are currently used in spacecraft and increasingly in ground transportation.

PHOTOVOLTAICS

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

May be reproduced for use in the classroom.

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Show Me Science

ENERGY Transforming Renewable Resources

~ Biomass & Solar Energy ~

*Exploring the World Of Science
for High School and Beyond*

Advanced Teachers Guide

SYNOPSIS:

This program stresses the importance of caring for our environment and provides an overview of multiple energy sources such as biomass and solar energy. Documents how some states are trying to enact laws that require local power plants to increase their power provided by renewable energy.

To preserve our planet's health, scientists explore green projects involving ecologically friendly architecture and sustainable communities with solar homes and green housing developments.

CURRICULUM UNITS:

- Ecology
- Engineering
- Environmental Science
- Physical Science
- Physics

CAREER OPPORTUNITIES:

- Civil Engineer
- Electrician
- Engineer
- Environmental Engineer
- Physicist

PROGRAM OVERVIEW:

For the first time in U.S. history, a renewable energy portfolio standard was put directly before voters rather than processed through a state's legislature. The initiative requires Colorado's largest utilities to harvest 10 percent of their electricity from renewable energy resources by 2015. It also calls for the state to establish a standard net metering system for homeowners and ranchers with small photovoltaic, or PV systems to connect to the power grid. The measure requires that 4 percent of the mandated amount of renewable energy will come from solar resources.

Biochemical engineers propose that biomass is the technology we need to invest in. Other renewable resources will help with energy demands, but biomass can help create fuels, materials, and chemicals. Corn stover is the above ground residue after you harvest the corn plant. Corn happens to be the most abundant crop growing in the United States, making it a prime candidate for biomass ethanol production. As the simplest and most abundant element, hydrogen is rarely found alone in nature because it is usually bonded with other elements. It is found in water, hydrocarbons, and other organic matter. Engineers have developed fuel cells that are powered by hydrogen. Fuel cells are electrochemical devices that convert chemical energy into electrical energy. Hydrogen fuel cell vehicles are highly efficient and their only emissions are heat and water.

ISSUES & CRITICAL THINKING:

- 1) Why are scientists interested in searching for alternative energy sources?
- 2) Predict how biomass may change the agricultural industry in the future. Outline the pros and cons of using corn as a source for biomass.
- 3) Judge the value of different alternative energy sources. Do you agree with biochemical engineers that biomass fuel is the most promising for future fuel needs? Explain which alternative energy source you would choose to support if you were deciding which to fund as a priority.