

## Alternative Energy

### NEW MODULE ADDITION

#### Objectives

1. Gain an understanding of the current use of energy and the resources now being expended.
2. Contrast and compare the environmental effects of non-renewable and renewable energy sources
3. Use mathematics in application to determine the efficiency of wind powered energy sources.
4. Explore the science and chemistry of hydrogen fuel cell powered vehicles
5. Determine through experimentation the efficiency of photo-voltaic energy sources.
6. Explore the careers associated with alternative energy industries.



Our continuing dependence on non-renewable energy sources is pushing research and development on alternative energy to new heights. Students need to understand that their generation will face far higher energy costs and shortages unless practical methods are developed to generate power cheaply and safely.

Our new Alternative Energy module for middle school science and technology places emphasis on the three most promising alternative energy technologies of hydrogen fuel cell, solar and wind power. Students will gain an understanding of these three technologies through hands-on experimentation and discovery using benchtop training equipment.

#### Module Synopsis

Using the PAXTON/PATTERSON multimedia software students will first explore the current use of energy and compare and contrast the benefits and consequences of both renewable and non-renewable energy sources. Using a model wind generator students will set-up experiments to determine efficiency and use mathematics to calculate voltage output.



Next the students will use a solar panel and either a light source or sunlight to gain an understanding of the solar photovoltaic process. Using worksheets they will calculate the number of solar panels needed to power a typical household.

Fuel cell technology represents the cutting edge of alternative energy research. Students will explore the inner workings of a hydrogen fuel cell then will generate hydrogen gas to power a model fuel cell vehicle.



Additionally students will learn about other forms of alternative energy sources including nuclear, biomass and geothermal.

In the design brief section of the module students will engineer the construction of a Savonius Vertical Electric Turbine. This inexpensive project ties together many of the foundational aspects of the module.

#### Standards

- NSES 1.1 Abilities necessary to do scientific inquiry.
- NSES 1.2 Understandings about scientific inquiry.
- NSES 2.1 Properties and changes of properties in matter
- NSES 2.3 Transfer of Energy



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