ENERGY ALTERNATIVES: THE COOL FUEL ROADTRIP
An Introduction to Clean and Green Fuels
Teacher's Guide

Grade Level: 6–12 **Curriculum Focus:** Science **Running Time:** 16 minutes

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Program Description

Trying to drive a stretch Hummer from Los Angeles to San Francisco would normally run up a hefty tab at the gas pump. But Shaun Murphy and the Cool Fuel Crew have taken the ultimate gas-guzzler and turned it into a clean, green, cool fuel machine. You'll be amazed by what you can use to keep this super-sized SUV humming down the highway.

Learning Objectives

After viewing the program and participating in discussion, students will be able to:

- Identify alternative fuels and explain how they are produced;
- Describe the economic benefits of alternative fuel production;
- Note the positive environmental impact of using biodiesel and ethanol;
- Consider advantages and disadvantages of each alternative fuel;
- Utilize energy-saving techniques in their everyday lives.

Classroom Connections

How many different fuel sources did the team use to power the Hummer? What unique features did each fuel contribute?

How do the solar panels generate power? How can cow manure be converted into a cool fuel?

Visit ThinkQuest.org (http://library.thinkquest.org/C006011/english/sites/diesel.php3?v=2) to view an animated illustration of a diesel engine. How do diesel engines convert fuel into energy? How does this relate to alternative fuels?

In addition to using alternative fuels, what other steps did Shaun, his team, and the featured drivers take in order to reduce their reliance on fossil fuels?

Classroom Activities

For the last leg of their 16,000-mile journey, Shaun and his team chose a Hummer—not exactly the most fuel-efficient car on the road today. Which cars get the best gas mileage (MPG)? Have students research the top five best and worst vehicles by MPG, greenhouse gas emissions, and air pollution score (helpful Web site: http://www.fueleconomy.gov). Make a chart of their findings and calculate how much it would cost to fuel each car for 20,000 miles with current gas prices. Is there a correlation between MPG and greenhouse gas production?

Give students the following scenario: it's the year 3000, and all coal and oil reserves have been exhausted. You have been asked to design a vehicle that seats four people and runs only on alternative fuels. Which fuel would you choose and why? What are the advantages and disadvantages of each "cool fuel"? Would the car need any special modifications? Ask students to draw a model of their future car and explain why they chose a specific fuel. Encourage the class to be creative with their explanations; the writing portion can be in the form of an advertisement, press release, or newspaper article.

Break the class into five groups and assign a different alternative fuel to each group (biodiesel, food, solar power, corn whiskey, and manure). After researching a specific fuel, each group will write a three-to-five minute television commercial promoting one of the five "cool fuels." Have the groups present their commercials to the class.

Target Vocabulary*

biodiesel - a fuel that is similar to diesel fuel and is derived from usually vegetable sources (as soybean oil)

diesel engine - an internal combustion engine in which air is compressed to a temperature sufficiently high to ignite fuel injected into the cylinder where the combustion and expansion actuate a piston

fuel cell - a device that continuously changes the chemical energy of a fuel (as hydrogen) and an oxidant directly into electrical energy

gasify - to convert into gas

methane - a colorless odorless flammable gaseous hydrocarbon CH_4 that is a product of decomposition of organic matter and of the carbonization of coal, is used as a fuel and as a starting material in chemical synthesis, and is the simplest of the alkanes

viscosity - the property of resistance to flow in a fluid or semifluid

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Academic Standards

National Academy of Sciences

The National Academy of Sciences provides guidelines for teaching science in grades K–12 to promote scientific literacy. To view the standards, visit this Web site: http://books.nap.edu/html/nses/html/overview.html#content.

This guide addresses the following standards:

- Physical Science: Chemical reactions
- Physical Science: Transfer of energy
- Science in Personal and Social Perspectives: Natural resources
- Science in Personal and Social Perspectives: Science and technology in local, national, and global challenges

AAAS Benchmarks

Benchmarks for science literacy, developed by the American Association for the Advancement of Science (AAAS), state what all students should know and be able to do in science, mathematics, and technology by the end of grades 2, 5, 8, and 12.