

Expository  
Text

# The Fuel of the *Future*

by Vanessa York



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READ

Saving Energy

## STRATEGIES & SKILLS

### Comprehension

**Strategy:** Ask and Answer Questions

**Skill:** Cause and Effect

### Vocabulary

energy, natural, pollution, produce, renewable, replace, sources, traditional

### Vocabulary Strategy

Homophones

### Content Standards

Science

Earth and Space Science

Word count: 1,110\*\*

**Photography Credit:** Cover Earthrace Conservation.

\*\*The total word count is based on words in the running text and headings only. Numerals and words in captions, labels, diagrams, charts, and sidebars are not included.



**Education**

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Send all inquiries to:  
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**Essential Question**

**What are different kinds of energy?**

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# Introduction

Fuel is any material that stores energy that can be **extracted** and then used. We use fuel to run vehicles, machines, and appliances. We also use it to make the electricity that powers our homes, schools, and offices.

We use gasoline to fuel our cars.





Many trucks run on diesel fuel, which is made from oil.

People have been using **fossil fuels**, such as coal, natural gas, and oil, for hundreds of years. These are fuels that we find in the ground. There are some big problems with them. Fossil fuels cause pollution. They also produce **greenhouse gases**. Some scientists think that an increase in greenhouse gases may be one of the causes of **global warming**. Fossil fuels are also running out.

What are the alternatives? Scientists are working hard to come up with some answers.

# Biofuels

Biofuel is a type of fuel that is made from renewable resources, such as soy bean plants or corn. Biofuel can also be made from treated natural waste products, such as animal fat and used vegetable oil. It produces far less pollution than traditional fuels.

## *Plant Sugars and Ethanol*

Plants are full of sugar. This sugar can be used to make the biofuel ethanol. The sugars are extracted from the plant. Then they are mixed with yeast. The sugars turn into ethanol. Ethanol can be used as a replacement for gasoline in cars.

This plant in Iowa makes ethanol from corn.



David Nunuk/Photo Researchers, Inc.

Henry Ford's Model T was first designed to run on ethanol.



Biofuel is not a new idea. Rudolf Diesel invented the diesel engine in 1898. Gasoline was not easily available at the time. Diesel knew that his engine would run on vegetable oil. He demonstrated it running on peanut oil. Henry Ford also thought his Model T car would run on ethanol produced from corn. Today, people are turning to biofuels again.



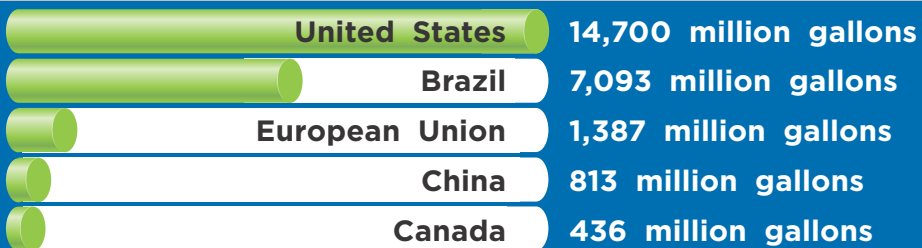
Some city buses run on biofuel, helping to cut pollution.

Ethanol is the most commonly used biofuel. It is made from plants, such as corn and wheat. Ethanol can also be made from seaweed.

Ethanol is often mixed with gasoline to make a fuel that is cleaner than plain gasoline. In Brazil, more than 60% of all cars run on ethanol.

(t) Wu Kaixiang/Xinhua Press/CORBIS

## Ethanol Fuel Production in 2015





Not everyone thinks biofuel is good for the environment. Ethanol does not pollute the environment as much as gasoline. However, that's only part of the story. It takes seven acres of corn to produce enough ethanol to run one car for one year. That's a lot of land that could also be used to produce food. In some places, rain forest has been cut down to make way for biofuel crops.

It may be possible to grow seaweed in the ocean in large enough quantities to make ethanol. Scientists are working on this idea.



Corn is grown for biofuel as well as food.



This scientist is researching plant bacteria that may be useful in making biofuel.

Biobutanol is made from plant material. Scientists are excited about this biofuel because it can be made using bacteria such as *E. coli*. *E. coli* is a bacteria that causes upset stomachs!

Right now, biobutanol costs a lot of money to produce. Scientists hope that they will be able to improve the process and make it a renewable fuel that can replace fossil fuels.

Biodiesel is the most common biofuel in Europe. Biodiesel is made from oils or fats, such as soy, palm oil, and algae. Scientists have even managed to make biodiesel from used coffee grounds!

Biodiesel looks a lot like ordinary diesel. Diesel is a fuel made from oil. Unlike ordinary diesel, biodiesel is **non-toxic** and **biodegradable**. It can also be used in just about any diesel engine.

Diesel is used to run heavy machinery as well as many cars and trucks.



Biodiesel is available in many places. There are some problems with biodiesel, however. It causes less pollution than ordinary diesel, but it still produces fumes that cause smog. Biodiesel is also expensive to make. Scientists are looking at ways to improve this fuel.

## *Earthrace*

### *Around the World*

In 2008, *Earthrace*, a cool-looking powerboat that ran entirely on biodiesel, broke the world speed record for circumnavigating the globe.



Earthrace Conservation

# Hydrogen Fuel

Imagine a car that runs on water! Maybe in the future, cars will. Hydrogen is a colorless, odorless gas. When hydrogen is burned as a fuel, it produces almost no pollution at all.

Hydrogen is found in water in combination with oxygen. It is also found in **hydrocarbons**. Hydrocarbons are present in many fuels, such as gasoline and natural gas.



Stocktrek/age fotostock

NASA uses hydrogen fuel to launch spacecraft into orbit.

One way to make hydrogen fuel involves separating hydrogen from oxygen in water. This can be done with an electrical current. Hydrogen fuel can also be made by using heat to separate it from hydrocarbons.

However it is done, separating hydrogen takes a lot of energy. It also costs a lot of money. Scientists hope that their research will make hydrogen fuel more easily available.

Michelangelo Gratton/Digital Vision/Getty Images

## Hydrogen Power

Italy already has a hydrogen power plant supplying power to 20,000 homes. It prevents thousands of tons of greenhouse gases every year.

Hydrogen power helps provide electricity to the city of Venice, Italy.

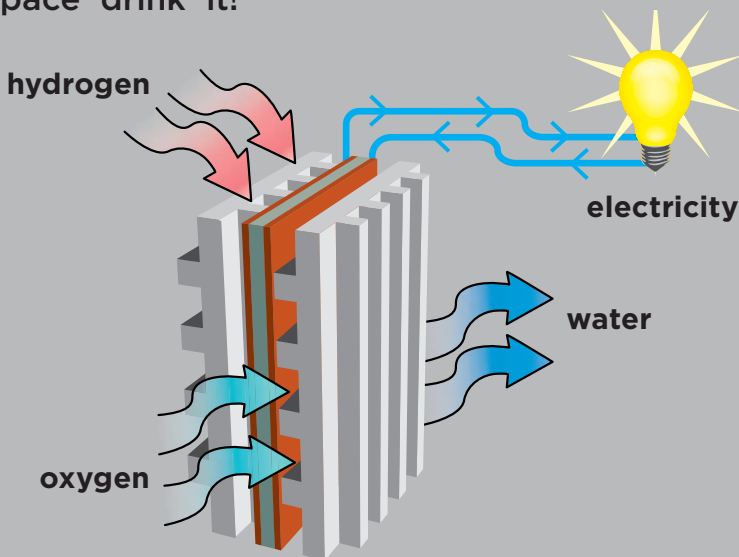


Today, hydrogen fuel is mostly used in fuel cells. Fuel cells combine hydrogen and oxygen. This causes a chemical reaction. Fuel cells change the energy of this chemical reaction to electricity that can be used.

Hydrogen fuel has a lot of potential as a fuel of the future. Unlike biofuel, it causes almost no pollution at all. Scientists want to use hydrogen fuel to run cars and airplanes.

## *A Hydrogen Fuel Cell*

Hydrogen and oxygen are combined in a fuel cell. Electricity is generated. Water is also released. This water is so clean that astronauts in space drink it!



# Conclusion

Scientists are working hard to find the fuel of the future. They are working to improve biofuels and hydrogen fuel. They want to find better and less costly ways to make these fuels so that more people can use them.

The fuels of the future must also come from sources that are renewable. Here, too, scientists are working to discover new technologies. We must make wise use of Earth's resources. Not all of them are renewable.

This racing car is powered by hydrogen fuel.





# Respond to Reading

## Summarize

Use details from the text to summarize what you have learned about fuels of the future. Your graphic organizer may help you.

Cause	→	Effect
First	→	
Next	→	
Then	→	
Finally	→	

## Text Evidence

1. *The Fuel of the Future* is an expository text. This type of text gives information about a topic. Find two pieces of information about biofuels in the text. **GENRE**
2. How does using fossil fuels affect the environment? **CAUSE AND EFFECT**
3. Homophones are words that sound the same but have different meanings. Find the homophones on page 5. **HOMOPHONES**
4. Write a paragraph about the effects hydrogen would have if it became a popular fuel.

**WRITE ABOUT READING**

## **Compare Texts**

Read about ways you and your family can save energy.

# **Saving Energy**

We need energy in our homes. We use it to heat our homes in the winter and cool them in the summer. It takes energy to run our televisions, computers, and appliances.

There are, however, many simple ways we can save energy. Using less energy means that we save money. It is good for the planet, too.

Keeping doors and windows tightly closed when it is cold saves energy in heating. Keeping doors and windows open in warmer weather helps cool the air without using energy.

Turn off the tap while you are brushing your teeth. That will not only save water, it will save energy, too. The greatest use of electricity in most cities comes from supplying water and taking away wastewater.

It's not just taps that should be turned off whenever possible. Light switches should, too. If you are leaving a room, don't forget to switch off the lights. Appliances such as televisions should also be turned off at the wall when they are not in use.



When you leave a room, switch off the light behind you.

# TOP TIPS TO SAVE ENERGY

1. **Turn it off!** That means the light switch, the television, the stereo—if you’ve finished with it, switch it off.
2. **Keep it closed!** The refrigerator and the oven both work much more efficiently when the door is closed. Closing doors inside the house helps keep heat in.
3. **Look for the label!**  
Appliances such as washing machines, refrigerators, and dryers that are energy efficient have a special “energy star” label. Energy-efficient lightbulbs help save energy, too.



Mike Kemp/Rubberball/Getty Images



An energy-efficient lightbulb uses 75% less energy.



## Make Connections

What do you think is the main idea of *Saving Energy*? **ESSENTIAL QUESTION**

What theme does *The Fuel of the Future* share with *Saving Energy*? **TEXT TO TEXT**

# Glossary

**biodegradable** (*BIGH-oh-di-GRAY-duh-buhl*) able to break down, or decompose naturally (**page 9**)

**extracted** (*eks-TRAKT-uhd*) taken out of something or from somewhere (**page 2**)

**fossil fuels** (*FOS-uhl FEW-uhlz*) fuels that form from the remains of ancient plants and animals (**page 3**)

**global warming** (*GLOH-buhl WAWRM-ing*) the increase in Earth's surface temperature due to the greenhouse effect (**page 3**)

**greenhouse gases** (*GREEN-hows GAS-uhz*) gases, such as carbon dioxide, that get trapped in Earth's atmosphere, making it hotter (**page 3**)

**hydrocarbons** (*HIGH-droh-KAHR-buhnz*) an organic compounds of hydrogen and carbon, found in crude oil (**page 11**)

**non-toxic** (*non-TOK-sik*) safe, harmless to the environment (**page 9**)

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# Focus on Science

**Purpose** To find out how a gas (carbon dioxide) rises from liquid

## What You Need

- a bottle of soda
- a balloon
- a watch or clock

## What To Do

**Step 1** Open a bottle of soda.

.....

**Step 2** Put the end of the balloon over the neck of the bottle. Make sure it fits tightly.

.....

**Step 3** Check the balloon every ten minutes for changes.

.....

**Step 4** Record what you see.

**Conclusion** What happened to the balloon?

# Thinkmark

## The Topic

What is *The Fuel of the Future* mostly about?

## Vocabulary

Find three key words in the text that relate to the topic.

What new words did you learn?

## Author's Purpose

What is the author's purpose in writing *The Fuel of the Future* and *Saving Energy*?

## Conclusions

What is the most important thing you learned in *The Fuel of the Future*?

What is the most important thing you learned in *Saving Energy*?

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