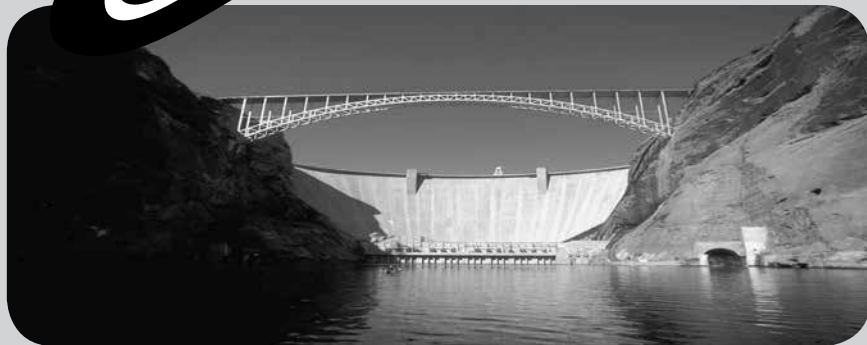


**FOCUS
ON
SCIENCE**

Energy Resources

On Level



Physical Science
Forces and Motion on Earth

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Scientific Inquiry

The central purpose of scientific inquiry is to develop explanations of natural phenomena in a continuing, creative process.

Construct explanations independently for natural phenomena, especially by proposing preliminary visual models of phenomena.

Represent, present, and defend their proposed explanations of everyday observations so that they can be understood and assessed by others.

Physical Science

Energy exists in many forms, and when these forms change energy is conserved.

The Sun is a major source of energy for Earth. Other sources of energy include nuclear and geothermal energy.

Fossil fuels contain stored solar energy and are considered non-renewable resources. They are a major source of energy in the United States. Solar energy, wind, moving water, and biomass are some examples of renewable energy resources.

Most activities in everyday life involve one form of energy being transformed into another. For example, the chemical energy in gasoline is transformed into mechanical energy in an automobile engine. Energy, in the form of heat, is almost always one of the products of energy transformations.

Most activities in everyday life involve one form of energy being transformed into another. For example, the chemical energy in gasoline is transformed into mechanical energy in an automobile engine. Energy, in the form of heat, is almost always one of the products of energy transformations.

Different forms of energy include heat, light, electrical, mechanical, sound, nuclear, and chemical. Energy is transformed in many ways.

Electrical energy can be produced from a variety of energy sources and can be transformed into almost any other form of energy.

Electrical circuits provide a means of transferring electrical energy. Energy cannot be created or destroyed, but only changed from one form into another.

Energy can change from one form to another, although in the process some energy is always converted to heat. Some systems transform energy with less loss of heat than others.



English Language Arts

The following is a selective listing of the competencies and indicators addressed in this book.

Word Recognition

- Use word recognition skills and strategies quickly, accurately, and automatically when decoding unfamiliar words


Background Knowledge and Vocabulary Development

- Use self-monitoring strategies to identify specific vocabulary difficulties that disrupt comprehension, and employ an efficient course of action, such as using a known word base or a resource such as a glossary to resolve the difficulty

Comprehension Strategies

- Use a variety of strategies (e.g., summarizing, forming questions, visualizing, and making connections) to support understanding of texts read

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Energy Resources

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How to Help Your Students Make the Best Use of This Book

Encourage students to develop nonfiction literacy skills by completing the Active Reader activities. Also encourage them to . . .

- Underline main ideas in paragraphs.
- Circle details that support the main ideas.
- Write down questions as they read.
- Circle key words as well as unfamiliar words.

Printing Instructions

Student Book: print pages 5–32

Assessments: print pages 33–36

Answer Key: print pages 37–40

**FOCUS
ON
SCIENCE**

Energy Resources



How does human consumption of resources impact the environment and our health?

Our lives depend on how we use natural resources. Some of these resources are likely to last forever. But some will not.

If we use up these resources, some are gone forever. Because we need natural resources to survive, it is important that we learn about them. Then, we can make good decisions about how to use them.

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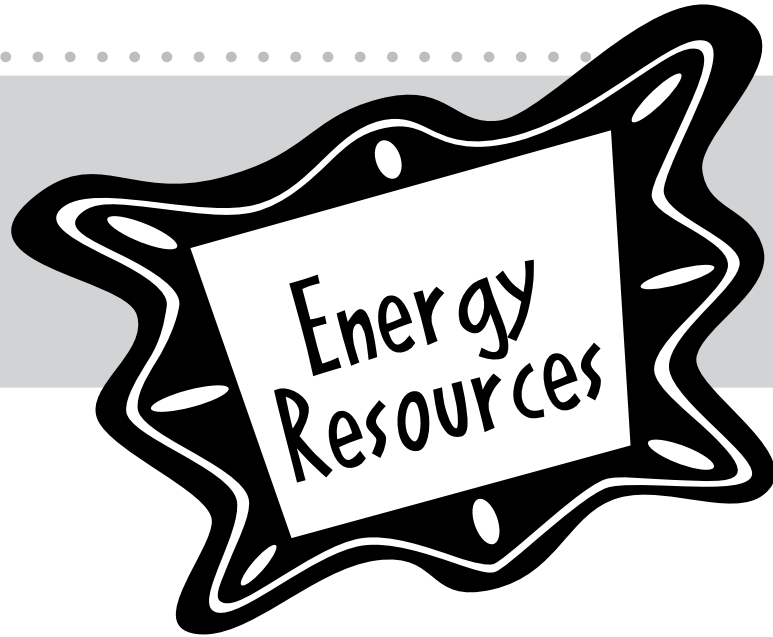


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Build Background

Label It

People use energy in many different ways. Think about the different ways you can heat a building, your home, or your school. Write a sentence or two telling how you think buildings are heated.

Rate Your Knowledge

Here are two groups of words that have do to with energy. Add a word to each list. Then, write a label in the gray box that describes the words in the list.

car	solar
computer	electrical
stove	coal



Energy Use Many things we use every day take energy to make them work. Anything that we plug into an outlet on the wall uses electricity. Anything that uses batteries is using energy from the batteries.

1. On the next page, draw a rough sketch of your room at home.
2. Include a picture of everything in your room that uses energy.
3. Complete the table to tell the name of each object that uses energy and the source of the energy that object uses.



My Room

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Things That Use Energy	Where the Energy Comes From



Key Vocabulary

Use Roots to Unlock Meaning

The words listed below have to do with energy and natural resources. Each word is important to know, but some of them may be new to you. Rate your knowledge of each one by checking the appropriate column. Give the definition, if you know the word.

	I don't know it.	I've seen it, but I'm not sure what it means.	I know it well, it means...
circuit			
transformer			
renewable			
nonrenewable			
hydropower			

Making Electricity

Many science words come from Greek or Latin. Knowing Greek and Latin prefixes and roots can help you unlock the meaning of many science terms. The prefix re- means "to do again." Use your knowledge to discover the meanings of the following words.

1. *Renew*

possible meaning: _____

2. *React*

possible meaning: _____

3. *Review*

possible meaning: _____



Key Concepts

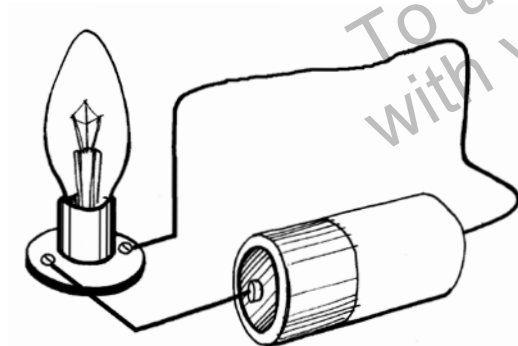
Electricity

Electricity is a common type of energy used in our homes and schools. There are many different ways to create electricity. When the chemicals in a battery mix together, they make electricity. But how does this electricity get out of the battery? The heat from burning coal can be used to make electricity. How does it get from the coal plant to your house?

Electricity travels along closed loops of wire called **circuits**. These circuits might be short. For example, energy travels from a battery to a light bulb along a short circuit.

But electricity can travel long distances, too. A machine called a **transformer** helps electricity to travel many miles. The transformer changes it from low voltage to high voltage. Voltage is the force or strength of an electric current. High voltage electricity can be moved long distances. And it can move fast. But houses and businesses need low voltage to power such things as lights, stoves, and televisions.

So, the electricity goes through another transformer. This transformer changes the energy back into low voltage. Now people can use the energy.



Wires connect the battery to the light bulb creating an electric circuit.

ACTIVE READER

1 Monitor Find the word *circuit* in the text. Underline the words in the same sentence tell you what circuit means.

2 Infer Find the word *transformer* in the text. What words before and after **transformer** tell you what the word means? Write a definition.

Chapter 1 Renewable and Nonrenewable Energy

FOCUS

The underlined sentences tell important ideas about energy resources. As you read, find out more about renewable resources.

There are two kinds of natural energy sources: renewable and nonrenewable. Renewable resources naturally replace themselves. This means that the resources replace themselves as fast as, or faster than, they are used up by humans.

Renewable Energy Resources

Solar Energy

Solar energy is energy from the sun. It is a renewable energy resource. The sun comes up every day. In fact, scientists forecast that during the next five billion years, there is sure to be plenty of sunlight.

The sun creates **thermal energy**, or heat energy. Think about how the sun heats up the inside of a car on a hot day. That's the effect of solar energy.

However, energy from the sun can be converted into other forms. For example, solar energy can be captured using a type of collector. Then it is converted to chemical energy in a battery. There, it is stored for later use. The stored energy can be later converted to electrical energy. It can then be used to run appliances or provide light at night.

ACTIVE READER

1 Synthesize What is the main idea of the first paragraph and of this chapter?

2 Infer Find the phrase thermal energy in the text. What words in the same sentence tell you what thermal energy means in this context?

Web Quest

There are many different products you can buy that capture solar energy.

Use the phrase solar energy product when searching the Internet to find out more about what kinds of solar-powered products are available.

Wind Energy

Wind is another renewable energy source. Wind is created by the uneven heating of the air by the sun. Hot air rises while cold air falls. So, the air is always moving. Just like solar energy, wind energy will last a very long time. In fact, as long as we have sunshine, that sunshine will create wind.

Wind turbines capture the wind's energy so that we can use it in our homes. The turbines use blades to collect the wind's energy. The wind flows over the blades causing lift, like the effect wind has on airplane wings. This makes the blades turn. The turning blades are connected to a drive shaft. The drive shaft turns an electric generator to make electricity. This is an example of converting mechanical energy, which turns shaft of the windmill, into electrical energy.

The Conservation of Energy

The Law of Conservation of Energy states that energy cannot be created or destroyed, but it can change form. However, when mechanical energy is converted to electrical energy by a wind turbine, a small amount of the energy is converted to heat. It escapes into the atmosphere and is not captured as electricity. In this way, the process of converting energy can be a source of pollution in the environment. Some systems are more efficient than others in converting energy so that it can be stored or used.



A typical wind turbine has blades, a generator, and a computer system to control the blades.

ACTIVE READER

1 Compare and Contrast

How are solar and wind energy alike and different?

Alike _____

Different _____

Good to Know

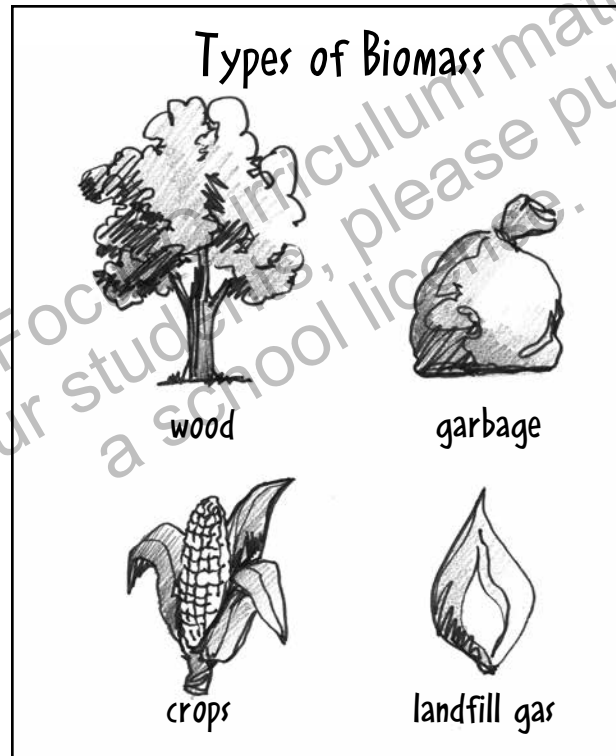
A wind turbine is usually as tall as a 20-story building and has three blades that are 200 feet across. It would be much taller than your school. The largest wind turbines in the world have blades longer than a football field. These turbines are built tall and wide to capture more wind.

Biomass

Biomass is another name for organic material made from plants and animals. Logs, sticks, and crops are all kinds of biomass. Biomass is used to create renewable energy. This energy is renewable because plants can grow as fast as people use them up.

Some biomass is burned to heat our houses. This is called direct combustion. For example, people burn logs in fireplaces or wood stoves. Other biomass is used to power our cars and trucks. Some companies change sugar cane or corn into ethanol. This fuel can be used in cars. Still others convert soybean and canola oil to bio diesel which can be used to power some cars and trucks.

Energy created from biomass is usually fairly clean. Most people agree that using biomass for electricity is cleaner than using **fossil fuels**. But burning biomass does create some air pollution.



Fuels for energy can be created from various biomass sources.

ACTIVE READER

1 Hypothesize Why do you think people have chimneys for fireplaces and wood stoves? Think about the smoke made when burning wood.

2 Infer Find the word ethanol in the text. What words in the next sentence tell you what ethanol means?

Good to Know

Some other countries get a lot of their energy from biomass. For example, Brazil grows sugar cane. It is very inexpensive to grow this plant, and it is fairly easy to turn the sugar cane into ethanol. As a result, about 50 percent of the fuel used in cars and trucks in Brazil is ethanol.

Hydropower Energy

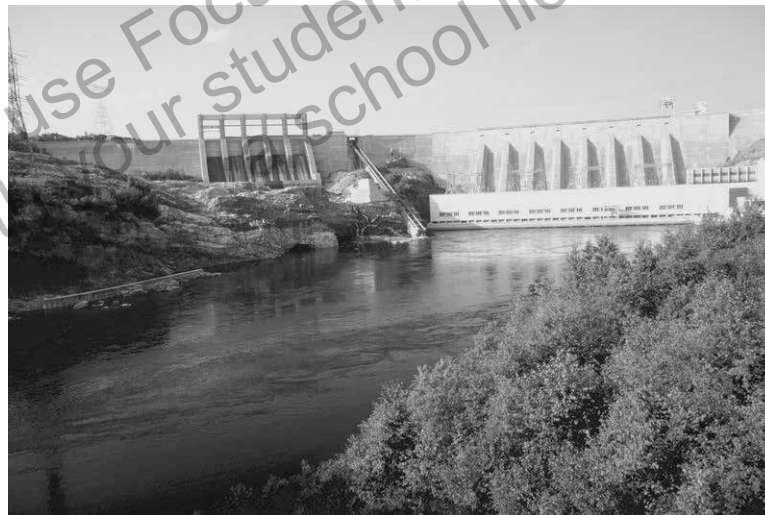
Another kind of renewable energy comes from water. **Hydropower** is energy created by running water. It is an unending resource. As long as there is sun, air, and water, there will be hydropower.

Why are sun and air important? In the water cycle, the sun's energy heats the water in rivers, lakes, and oceans. This heat makes the water **evaporate**. The water vapor forms clouds. Then, as it cools and condenses, it falls back to earth as rain, snow, or sleet. The water then flows into rivers, lakes, and oceans. There, it evaporates because of the sun. The cycle begins again.

People can collect the energy of moving water by using water turbines. These turbines are similar to wind turbines. The water pushes against the turbine blades and turns them. The turbine spins a generator. This produces electricity.

One way to make water move more rapidly is to build a dam across a river. When the water pours out of the dam, the turbines spin faster. The dam allows people to control how much water is released and how much energy is produced.

A hydropower plant harnesses the power of moving water to create electricity.



ACTIVE READER

1 Infer Find the word *hydropower* in the text. What words in the same sentence and the following sentence tell you what *hydropower* means?

2 Recall What are the steps in the water cycle?

Good to Know

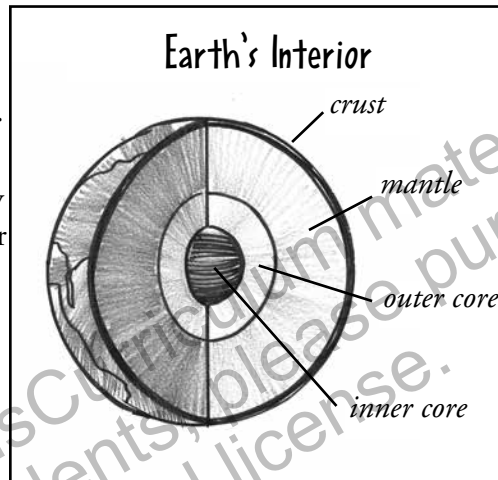
Not all hydropower is high tech. American settlers often used the power of moving water. They built flour mills beside streams. Water from the stream turned a big wheel that turned the flour grinding stones inside the mill. This is a very simple use of hydropower.

Geothermal Energy

Like hydropower, **geothermal** energy comes from a natural cycle. Earth is made of layers. These layers change slowly.

The crust and part of the mantle is broken into large plates. These plates ride on a layer of molten lava. The plates move around creating places where the crust is thin. Heat from deep inside Earth rises toward the surface. The energy that we get from this heat is called geothermal energy. It will never be used more quickly than it is produced. This makes geothermal energy a renewable resource.

To collect geothermal energy, people use water. First, they find places where Earth's crust is thin and where there is water underground. Next, they dig deep wells and pump the heated underground water or steam to the surface. This energy can heat their homes and also make electricity.



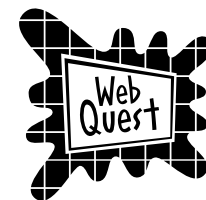
ACTIVE READER

1 Interpret The word geothermal comes from two Greek words. Geo means "earth," and therme means "heat." What do you think geothermal means?

FOCUS QUESTIONS

- List four sources of renewable energy.

- What makes these energy sources renewable?



What places on our planet have the thinnest crust?

These places have many volcanoes. To find out, search the Internet using the phrase ring of fire.

FOCUS

The underlined sentence tells an important idea about nonrenewable resources. As you read, look for explanations that tell how these resources were formed.

Nonrenewable Energy Resources

Nonrenewable resources are those that take a long time for nature to make. These resources can be used up by people before they are replaced. Most oils, coal, and natural gases are nonrenewable resources. These resources are often called fossil fuels because they are formed from fossil plants and animals.

Fossil Fuels

Here's how these nonrenewable resources form:

1. Long ago, plants and animals died.
2. Over millions of years, layers of mud covered the dead plants and animals.
3. These tons of mud, earth, and rock pressed down on the dead plants and animals.
4. This pressure caused heat and turned the plant and animal fossils into crude oil or natural gas.

Today people drill into the earth and remove the crude oil or natural gas. These resources are then changed into fuels that people can use in cars.

Crude oil is still being created today. But we are using crude oil much faster than the earth can make it. This is why oil and other natural gases are called nonrenewable resources.

ACTIVE READER

1 Synthesize *What is a nonrenewable resource?*

2 Hypothesize *How long might it take for the earth to make more nonrenewable resources if people used them all up in the next few years?*

Good to Know

Saudi Arabia, Russia, and the United States have a lot of oil. But, the amount of oil in the United States is shrinking each year. At the same time, the use of oil is growing. This makes it necessary to buy more oil from other countries.

Coal

Coal is another nonrenewable resource. Have you ever had a barbecue? We use a kind of coal, called charcoal, to cook the food. Other types of coal can be burned to heat buildings or to create electricity.

Like oil and natural gas, people are using coal faster than nature can make it. The process of making coal is a lot like the process of making oil and natural gas.

Here's how the earth makes coal:

1. Long ago, parts of the earth were covered with swampy forests.
2. When plants in the forests died, they sank to the bottom of the swamps.
3. Over millions of years, these plants were covered with more water and mud.
4. Heat and pressure from the layers of mud turned the dead plants into coal.

Today people dig mines to get coal out of the earth. Then, the coal goes to a plant. At the plant, people clean the coal. This makes the coal better for burning to create energy.

FOCUS QUESTIONS

1. Explain how fossil fuels are formed.

2. How are fossil fuels taken out of the earth?

ACTIVE READER

1 Compare *What is one way coal is like oil and natural gas?*

2 Contrast *What is one way coal is different from oil and natural gas?*

Good to Know

For hundreds of years, people burned coal in open fires to heat their homes. Coal dust can make a house very dirty. It often made people sick. Today coal is usually turned into energy for our homes in a power plant. This makes it a lot cleaner, although burning coal still creates some pollution.

Stop and Think

This page will help you summarize what you have read so far.

1. Why are fossil fuels considered nonrenewable?

- | | |
|--|--|
| (1) They can never ever be replaced. | (3) They are not made by nature. |
| (2) People use them faster than nature creates them. | (4) People do not want to use them up. |

2. Which is a renewable resource?

- | | |
|-----------------|-----------------|
| (1) gasoline | (3) crude oil |
| (2) natural gas | (4) wind energy |

3. Which is a nonrenewable resource?

- | | |
|------------------|----------------|
| (1) solar energy | (3) crude oil |
| (2) wind energy | (4) hydropower |

Base your answers to questions 4 and 5 on your knowledge of science.

4. Identify whether trees are a renewable or nonrenewable resource.

5. Explain why trees are the type of resource they are.

Dear Ms. Understanding,

Is water always a renewable resource?

I've heard about water becoming so polluted that you can't drink it or swim in it. Isn't that water nonrenewable?



Baffled in Brooklyn

Dear Baffled,

Water pollution is a problem we need to solve. If we pollute our water, we will not be able to use it.

But, nature will eventually renew the water, so water is still a renewable resource. So, the lesson here is that we need to be careful with our resources even when they are renewable.



Ms. Understanding



Classify Organize the energy resources into two groups by writing each one in the correct column. Then label the columns.

coal oil geothermal
hydropower natural gas solar wind

Understanding the Water Cycle The water cycle has four steps. Look at the diagram. Then write a number next to each step to show the correct order.



- 1 _____ Water evaporates.
- _____ Water cools and falls as rain or snow.
- _____ Water forms clouds.
- _____ Water returns to oceans, seas, and lakes.

Chapter 1 Electricity

FOCUS

The underlined sentence states an important idea about electricity. As you read, find out more about what kinds of resources can be used to create electricity.

Making Electricity

Electricity is used for many things. It can turn on a lamp. It can light a football field. We use electricity every day.

Electricity is made from many different renewable and nonrenewable resources. For example, coal is burned to make electricity. Coal is nonrenewable. Other renewable resources, such as wind power, are never used up.

The chart below shows what energy resources were used to make electricity in the United States in 2016.

Energy Resource	Amount of U.S. Electricity Made in 2016
Natural Gas	33.8%
Coal	30.4%
Nuclear	19.7%
Hydropower	6.5%
Wind	5.6%
Biomass	1.5%
Solar	0.9%
Oil	0.6%
Geothermal	0.4%

ACTIVE READER

1 Interpret According to the chart, how clean are our current methods of making electricity?

2 Hypothesize What is likely to happen if a natural resource becomes less expensive?

Good to Know

Energy is measured in units called watts and kilowatts. There are 1,000 watts in a kilowatt. A 40 watt bulb uses 40 watts of electricity in an hour. Use multiplication to find out how many watts a 40 watt bulb uses in 3 hours.

Renewable Energy: Promise and Problems

For a long time, it was cheap to use coal, oil, and natural gas. In the future, the price of coal and oil will rise as the supply runs out. On the other hand, electricity made from renewable resources may get cheaper in the future. This is because new inventions will make electricity cheaper. It is also because there is growing demand for clean, renewable energy.

There are good and bad things about using different resources to create electricity. It is important to understand these advantages and **disadvantages**. One good thing about renewable resources is that they will not run out. Many of these resources are also very clean. They do not cause pollution that makes our air or water dirty.

But, there are also disadvantages. The amount of solar energy made can change. This is because some days are cloudy. Solar collectors cannot capture as much of the sun's energy. Wind energy also changes. The wind is not always blowing. This is one reason why it is important to get electricity from more than one resource.

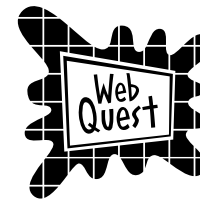


Solar panels like these harness the renewable energy of the sun to heat homes and buildings.

ACTIVE READER

1 Infer Find the word *pollution* in the text. What words in the same and the following sentence tell you what *pollution means*?

2 Generalize The prefix *dis-* often makes a word mean its opposite. If an advantage makes things easier, what does a disadvantage do?



There are many ways to fight pollution. To find out more use the phrase "pollution prevention" when you search the Internet.

There are also good and bad things about using hydropower and geothermal energy. Like all renewable resources, energy from water and the earth will last for a long time. Also, using these resources often causes less pollution.

But we cannot get energy from water and from Earth everywhere in the world. To get geothermal energy, you need to be in a place where Earth's crust is thin. Then you can reach the steam and magma just below Earth's surface. However, if the earth's crust is thin, it means that this area also has a lot of earthquakes.

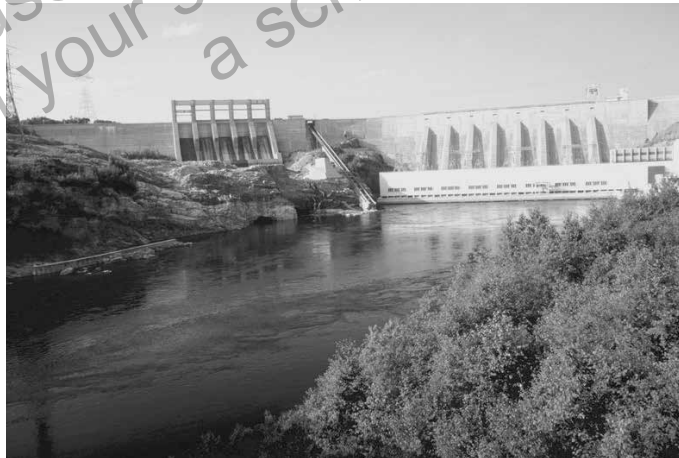
To harness hydropower, you have to be near running water. To capture the energy in the water, people need to build large dams. Building dams can be expensive and can injure wildlife.

Nuclear Energy

Nuclear energy is renewable. But like nonrenewable energy, it creates dangerous pollution. Nuclear energy is created by splitting a uranium atom in a special machine called a nuclear reactor.

Unfortunately, energy is just one thing that's created. Dangerous waste is also created when we split atoms. This nuclear waste is harmful to plants, animals, and humans. It has to be buried deep in the earth. It will take millions of years for the waste to stop being harmful.

Nuclear power plants create renewable energy. However, they create harmful wastes which need to be stored carefully.



ACTIVE READER

1 Compare How are the disadvantages of hydropower and geothermal power alike?

2 Contrast How are the disadvantages of hydropower and geothermal power different?

Good to Know

Because magma lies under Earth's crust, geothermal power should be available everywhere. Right? Well, the magma is often buried too deep to reach, and it would cost too much to drill down to the magma. You may be surprised to learn that one place on Earth that uses a lot of geothermal energy is Iceland.

Nonrenewable Energy: Advantages and Disadvantages

Nonrenewable energy resources are still cheap. But, all nonrenewable resources have the same major disadvantage. We are using them very quickly and the earth is producing them very slowly. In the future, the coal, oil, and natural gas will run out. Even before this happens, the price of coal, oil and natural gas will become very high.

Another problem with these nonrenewable resources is that using them creates more pollution. Crude oil, for example, is turned into gasoline and heating oil. But when we burn these fuels, poisonous gases are released that pollute our air. Also, when these fuels are spilled they can pollute our water or land. Even a small amount can be harmful to animal and human life.

Finally, burning coal also creates air pollution. Plus, mining coal disturbs the landscape and destroys animal's homes. Scientists have discovered ways to mine that disturb the landscape less.

Oil is a nonrenewable resource. We are using it up faster than it can be replaced.



FOCUS QUESTIONS

1. How is energy from water and the earth like solar and wind energy?

2. Why are some sources of energy nonrenewable?

ACTIVE READER

1 Generalize The suffix *-tion* can turn a verb into a noun. We know that *pollution* is something that makes air, land, or water dirty. What do you think *pollute* means?

Stop and Think

This page will help you remember what you have read.

1. Which resources are used to make electricity?

- | | |
|---------------------------------|--|
| (1) renewable resources only | (3) both renewable and nonrenewable resources |
| (2) nonrenewable resources only | (4) neither renewable nor nonrenewable resources |

2. What is one good thing about renewable resources?

- | | |
|---|--|
| (1) They create pollution. | (3) They are very inexpensive. |
| (2) The earth is renewing them quickly. | (4) The earth is never damaged by their use. |

3. What is one bad thing about renewable resources?

- | | |
|--|---|
| (1) We cannot find them everywhere. | (3) We do not know where to find them. |
| (2) They can pollute the air, land, and water. | (4) We are using them faster than the earth creates them. |

4. What is one bad thing about nonrenewable resources?

- | | |
|--|---|
| (1) We do not know where to find them. | (3) We do not know how to turn them into electricity. |
| (2) We do not know how to collect the resources. | (4) We are using them faster than the earth makes them. |

Dear Ms. Understanding,

I don't understand why people don't stop using nonrenewable resources. Renewable resources are cleaner and will last forever. So, why does the United States still use coal and oil?



Surprised in Schenectady

Dear Surprised,

In the past, nonrenewable resources were cheaper. Often, this is still true today. But things are changing. Nonrenewable resources are getting more expensive. People are worried about pollution. Scientists are learning ways to make renewable resources cheaper. I wonder how the United States will create electricity when you are an adult.



Ms. Understanding



Summarizing and Evaluating You have read about the advantages and disadvantages of using different types of resources to create electricity. Summarize what you have read by writing the advantages in the Pros column and the disadvantages in the Cons column.

Resource	Pros	Cons
Solar	It is clean.	
Wind		
Hydropower		
Geothermal		
Oil		
Natural Gas		
Coal		
Nuclear		

Chapter 3 Managing Energy Resources

FOCUS

This section tells how we can manage our energy resources. The first paragraph summarizes two ways to manage resources. What are they?

Wise Choices

Every person in the world can help better manage, or control how we use, our resources. This means you! There are two ways to manage our resources. First, we can conserve, or use less, energy. Second, we can use clean energy.

Use Less Energy

The United States uses nearly \$1 million worth of energy every minute. That's more per person than any other country. About a fifth of this energy is used in homes. But you can easily save energy everyday. Try these tips to save energy.

1. Turn off and unplug all the appliances when you aren't using them.
2. Turn off the lights when you leave a room.
3. When it's cold, put on another sweater, and ask your family to turn down the heat.
4. When it's hot, wear shorts and a T-shirt, and ask your family to turn down the airconditioner or open the window.

There are other things that you can do to save energy. New appliances such as stoves and refrigerators can save energy than older ones. Also, insulating a home helps it stay cool in summer and warm in winter. These things cost a bit more to begin with, but they save money and energy over time.

ACTIVE READER

1 Words in Context Find the word conserve in the text. What words tell you what conserve means?

2 Extend What could you do tomorrow to save energy?

Good to Know

You've heard it before—Reduce, Reuse, Recycle. We know that it is better for Earth if we use less paper, water, and other products. Did you know that using less also saves energy? It takes energy to make every piece of paper we write on or gadget we buy. If we use less, that saves energy.

Choose Clean Energy

You can also choose to use cleaner energy. Some of these choices are easy to make. For example, don't ask for a ride in a car to your friend's house. Instead, ride your bike or walk. Walking or biking does not cause pollution. But riding in a car does.

To find other sources of clean energy will need some detective work. Find out about how your community gets electricity. Do you get your electricity from wind, solar, hydropower, or geothermal power? If your electric company doesn't offer these clean energy options, write a letter to the company and ask them to consider using them. You can also write to people in government and ask them to bring renewable energy companies to your community.

FOCUS QUESTIONS

1. What are the two main ways to manage our resources?

2. What is one thing you could do now to help better manage our resources?

ACTIVE READER

1 Interpret According to the first paragraph, what is the effect of riding a bike or walking? Complete the graphic organizer below.

Cause:

Riding a bike or walking

Effect:

2 Synthesize What is the main idea of the second paragraph on this page?

Stop and Think

This page will help you remember what you have read.

1. Why is it important to use less energy and use clean energy?

- (1) to save money and decrease pollution
- (2) to help energy companies make more money
- (3) to make our lives more comfortable and easy
- (4) to help scientists inventing new ways to create energy

2. What would be a good way to save energy in the winter?

- (1) Leave most of the lights on when you leave a room.
- (2) Leave all the appliances on when you aren't using them.
- (3) Put on a sweater and ask your family to turn down the heat.
- (4) Wear shorts and ask your family to turn up the air conditioner.

3. Why are new appliances sometimes better for the environment?

- (1) They are less expensive.
- (2) They are smaller than before.
- (3) They use less energy.
- (4) They come in more colors.

4. Which would NOT help save energy?

- (1) insulating your home
- (2) buying renewable energy
- (3) replacing old appliances
- (4) keeping appliances plugged in

Dear Ms. Understanding,

Is riding a bus better than taking a car? I know that a bus uses gasoline and it pollutes, but many people can ride in a bus. Only a few people can ride in a car. Doesn't that save energy and pollute less?



Bus Rider in Buffalo

Dear Bus Rider,

You are correct. Buses do save energy and pollute less. It's true you can fit more people in a bus than in a car. Some cities even buy buses that use less fuel or use a fuel that makes less pollution. Find out if your city's buses are this good.



Ms. Understanding



Draw Conclusions from Data Students have found out how much it costs to heat a home using different energy sources. They want to figure out which is the cheapest. Here is the information they found. But some information is still missing. Study the chart and answer the questions that follow.

Location of Home	Size of Home	Age of Home	Energy Source	Yearly Cost
Tucson, Arizona	1200 sq. ft.	3 years	propane	\$356
Northern California	1600 sq.ft.	35 years	geothermal heat pump	\$504
Midwest	2300 sq. ft		electric furnace	\$1,319
Southeast		50 years	heating oil	\$649

1. The students thought an electric furnace would be the most expensive way to heat a home. Find electric furnace in the chart. Then look at the yearly cost. Is this true? Why?

2. What effect might the size and age of the home have on the yearly cost of heating?

3. What other information about the homes and their environment would help you draw conclusions?



Energy Audit Take a walk around your house. List all the things in each room that use energy. Then, list ways that you might save energy in each room. Don't forget heating and cooling.

Room	What Uses Energy	Energy Saving Ideas

Glossary

circuit – a closed loop

conserve – to prevent the waste or overuse of a resource

disadvantage – not an advantage

ethanol – fuel made from sugar cane or corn

evaporate – to change from water to water vapor in the air

fossil fuels – nonrenewable resources formed from decayed plants and animals

geothermal – energy from heat within the earth

hydropower – energy from flowing water or waves

nonrenewable – energy resources used at a faster rate than they are created by natural processes

pollution – something that makes land, air, and water unclean

renewable – energy resources created by natural processes faster at a faster rate than they are used

thermal energy – heat energy

transformer – a machine that let's electricity travel many miles

wind turbines – machines that capture the wind energy

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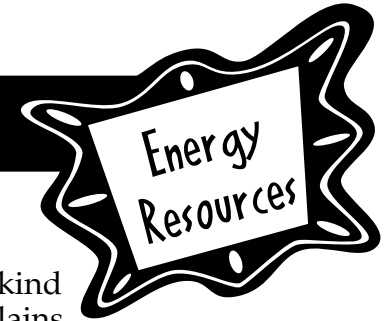
**FOCUS
ON
SCIENCE**

Energy Resources

Assessments

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Check Understanding



In the Answer Document on this page, mark your answer in the row of circles for each question by filling in the circle that has the same number as the answer you have chosen.

- Most electric power is made by burning coal and oil. A family living in central New York uses electricity for cooking and air conditioning. They use oil for heating.
How could this family use less nonrenewable resources?
 - buy a less expensive coal for heat
 - use natural gas as a fuel for cooking
 - raise the temperature setting on the air conditioner
 - install solar roof panels to generate additional electricity
- Why is natural gas a nonrenewable energy source?
 - Natural gas is difficult to find and capture.
 - The burning of natural gas could cause pollution.
 - Natural gas is everywhere, but it is expensive.
 - Once natural gas is used, it can take millions of years to be replaced.

- Which sentence tells about a kind of renewable energy and explains why it is renewable?
 - Coal: Once the coal is used up, there is no way to make additional coal.
 - Crude oil: There is a fixed amount of oil, and new oil takes millions of years to form.
 - Solar energy: There is only one sun in our solar system, and there is no replacement.
 - Hydropower: The water cycle moves water around the earth's surface, so the amount of water stays basically the same.
- Why is it a bad idea to get all of your heat using solar panels?
 - Solar energy makes pollution when it is used with wind energy.
 - Electricity from solar power is never strong enough to heat a house.
 - The sun does not always shine, so there might not be enough energy for heat.
 - The panels are expensive, so there might not be enough money to buy them.

Answer Document

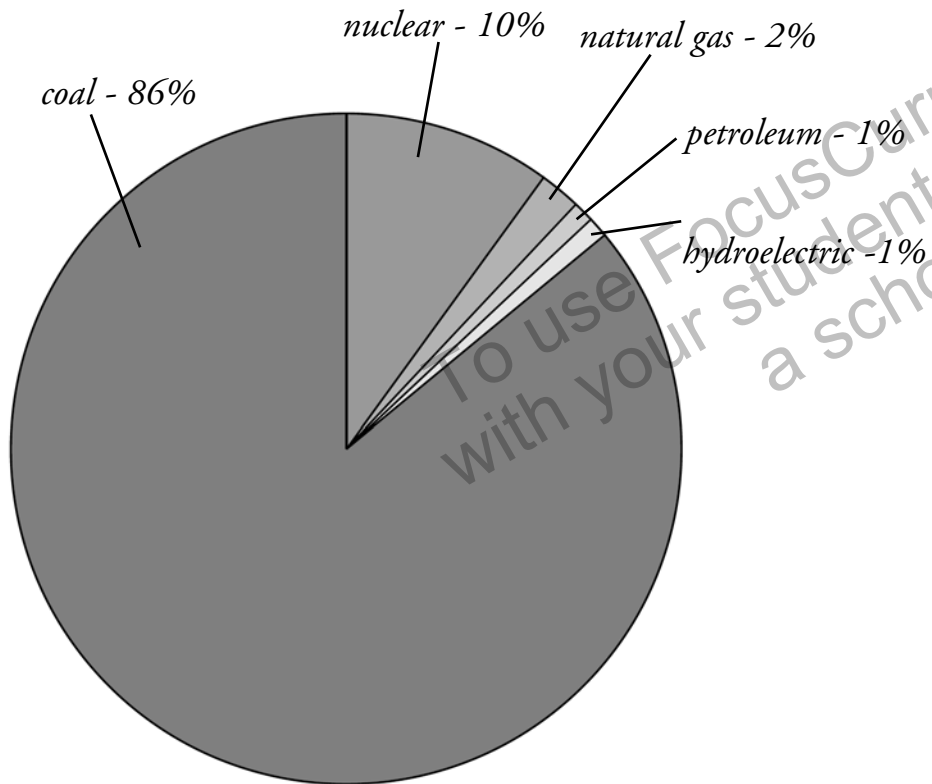
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|----|---|---|---|---|----|---|---|---|---|
| 1. | ① | ② | ③ | ④ | 3. | ① | ② | ③ | ④ |
| 2. | ① | ② | ③ | ④ | 4. | ① | ② | ③ | ④ |

Check Understanding



Use the chart below and your knowledge of science to answer questions 5, 6, and 7.

Sources of Electricity for the Town of Springfield



5. What is the source for most of Springfield's electricity?

6. What problems are associated with using this source of energy?

7. Identify a renewable energy source you would like your community to use and explain the reason.

**FOCUS
ON
SCIENCE**

Energy Resources

Answer Key

Answer Key

Page 8: Starting Points: Build Background
Use Your Knowledge: Answers will vary but could include electricity, gas, fireplaces, etc.

Label It: 1. Answers will vary, but headings can include: Energy Users and Energy Sources.

Hands on Science: Energy Use: Answers will vary, but should name both energy users and sources.

Page 10: Starting Points: Key Vocabulary
Rate Your Knowledge: Answers will vary according to student's prior knowledge.
Use Roots to Unlock Meaning: 1. To make new again; 2. To act again; 3. To look at again.

Page 11: Starting Points: Key Concepts
Active Reader: 1. closed loops; 2. Answers will vary, but students could hypothesize that their energy users would not work on the high voltage.

Page 12: Chapter 1
Active Reader: 1. Scientists categorize natural energy sources into two types: renewable and non renewable; 2. heat energy

Page 13: Chapter 1
Active Reader: 1. Wind and solar energy are alike because they are both renewable resources. They are different because solar energy comes from the sun and wind energy comes from wind.

Page 14: Chapter 1
Active Reader: 1. People have chimneys to carry air pollution from burning wood outside their houses.; 2. This fuel

Page 15: Chapter 1
Active Reader: 1. energy created by running water; 2. Water evaporates. Then, it forms clouds. Then, water falls back into lakes, rivers, and oceans. Then, the water cycle begins again.

Page 16: Chapter 1
Active Reader: 1. Power or heat from the Earth
Focus Questions: 1. Answers will vary, but could include solar, wind, biomass, hydro-power, and geothermal.; 2. The earth is renewing these resources faster than people are using them.

Page 17: Chapter 1
Active Reader: 1. Non renewable resources are those that are quickly used up by people but take a long time for nature to produce.; 2. If people use up these resources, it will take millions of years for the earth to create more.

Page 18: Chapter 1
Active Reader: 1. It is created after being buried deep in the ground for many years.;
2. It is a solid, while oil is a liquid and natural gas is a gas.

Focus Questions: 1. Plants die and are buried under pressure for millions of years.; 2. They are removed by deep drilling.

Page 19: Chapter 1
Stop and Think: 1. (2); 2. (4); 3. (3); 4. Trees are renewable.; 5. Trees will grow back, but people need to be careful to replant them.

Page 20: Chapter 1
Hands on Science: Classify: Renewable Resources: geothermal, hydropower, solar, wind; Nonrenewable Resources: coal, crude oil, natural gas, oil.
Understanding the Water Cycle: 1. Water evaporates.; 2. Water vapor forms clouds.; 3. Water falls as rain or snow. 4. Water returns to oceans, seas, and lakes.

Page 21: Chapter 2
Active Reader: 1. According to the chart, we use coal, natural gas, and nuclear energy the most; we use solar and wind power the least.; 2. People will use it more.

Page 22: Chapter 2
Active Reader: 1. Something that makes our land and water unclean; 2. A disadvantage makes things more difficult.

Answer Key

Page 23: Chapter 2

Active Reader: 1. Both are not available everywhere in the country.; 2. Hydropower can be dangerous for wildlife, but geothermal power is not.

Page 24: Chapter 2

Active Reader: 1. It is a verb that means “to make unclean.”

Focus Questions: 1. All are renewable resources.; 2. Some sources of energy will run out quicker than the earth can replace them.

Page 25: Chapter 2

Stop and Think

1. (3); 2. (2); 3. (2); 4. (4)

Page 26: Think Like a Scientist:

Summarizing and Evaluating

Resources	Pros	Cons
Solar	It is renewable. It is clean.	The sun doesn't always shine.
Wind	It is renewable. It is clean.	The wind doesn't always blow.
Hydropower	It is renewable. It is clean.	It is not available everywhere. It can endanger fish.
Geothermal	It is renewable. It is clean.	It is not available everywhere.
Oil		It is non-renewable. It creates pollution.
Natural gas		It is non-renewable. It creates pollution.
Coal		It is non-renewable. It creates pollution.
Nuclear	It is renewable.	It creates pollution.

Page 27: Chapter 3

Active Reader: 1. Use less; 2. Answers will vary, but students should suggest steps they could take to save energy.

Page 28: Chapter 3

Active Reader: 1. You use less energy and pollute less; 2. As an adult, you can use your votes to promote the use of cleaner energy.

Focus Questions: 1. We can conserve energy and choose clean energy.; 2. Sample answer: Vote for policies to encourage the use of renewable resources.

Page 29: Chapter 3

Stop and Think: 1. (1); 2. (3); 3. (3); 4. (4)

Page 30: Chapter 3

Think Like a Scientist: 1. The data supports this conclusion.; 2. Larger houses need more energy to heat. Older houses probably don't use modern insulation, and don't keep the house warm in winter.; 3. Answers will vary, but could include information on average temperatures in each location.

Page 31: Chapter 3

Think Like a Scientist: Energy Audit: Answers will vary.

Page 35: Assessments

Check Understanding: 1. (4); 2. (4); 3. (4); 4. (3)

Page 36: Assessments

Check Understanding: 5. This community gets most of its electricity from coal.; 6. This is a problem because coal is non-renewable and causes pollution.; 7. Answers will vary, but students should name renewable energy sources and give reasons why they chose them.

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