FOCUS ON SCIENCE

Energy Resources

Advanced Level

Physical Science
Forces and Motion on Earth

FOCUScurriculum

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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.

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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 decodingunfamiliar 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 asusing a known word base or a resource such as aglossary 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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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

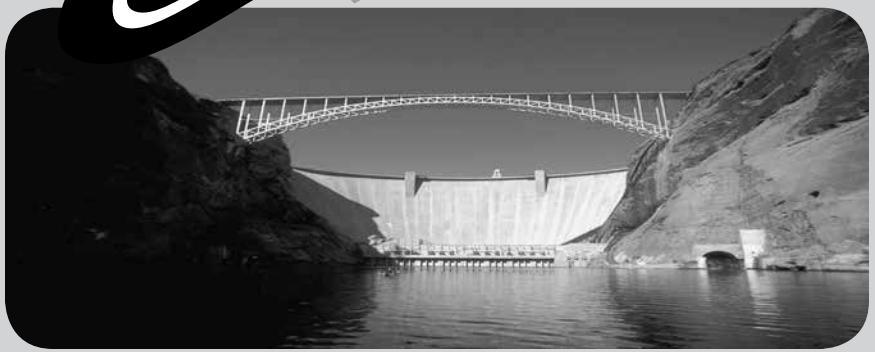
Student Book: print pages 5–32

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 are dependent on the natural resources of the world around us. Some of these natural resources are likely to last indefinitely, but some are more limited.

If we use up these limited resources, they will be gone forever. Because of our dependence on natural resources, it is very important that we learn about them. When we are well informed, we can make good decisions about how to use our precious resources.

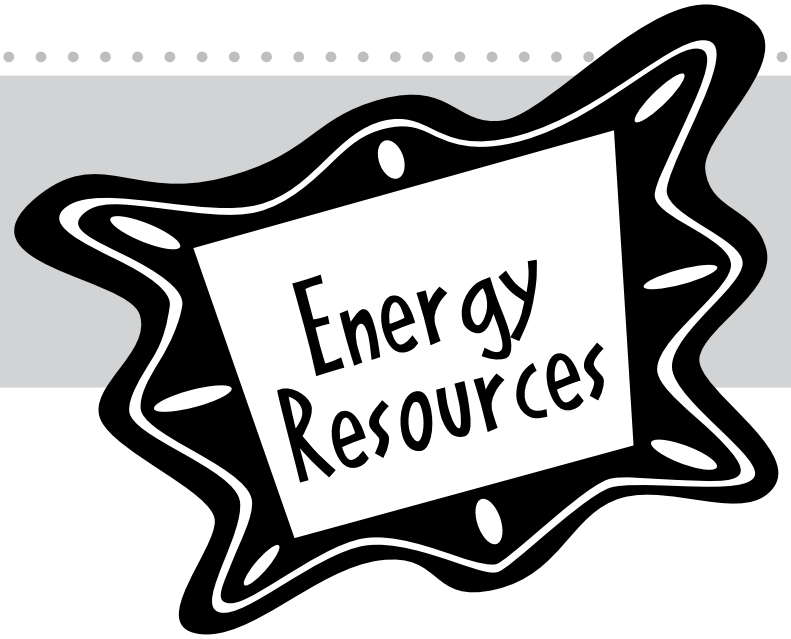


Table of Contents

Starting Points

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

Hands On Science

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

Things That Use Energy	Where the Energy Comes From

Starting Points

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: _____

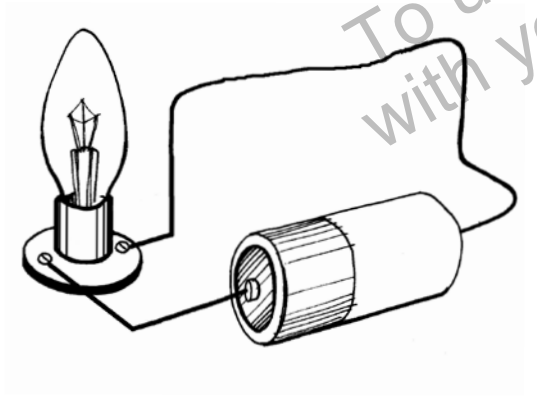
Starting Points

Key Concepts

Electricity

Electricity is a common type of energy we use in our homes and schools. There are many different ways to produce electricity. For example, when the chemicals in a battery mix together, they produce electricity. When coal burns, it produces electricity. When wind or water spins a big fan called a turbine, the force generates electricity. When the sun shines on solar panels, they convert the sunlight into electricity. The electrical energy is then stored in a power plant or battery. But how does electricity get from the power plant to your house?

Electricity travels along closed loops of wire called **circuits**. These might be short distances. Look at the illustration below. Energy travels a short distance from a battery to a light bulb. But electricity can travel long distances, too. A machine called a **transformer** allows electricity to travel over many miles. First, it travels short distances along cables to a transformer. Then, the transformer changes the electricity from low voltage to high voltage. Voltage is the force or strength of an electric current. High voltage electricity can move long distances. But houses and businesses need low voltage to power their appliances. So before the electricity goes into a home or business, it goes to another transformer. This transformer changes the energy back into low voltage. Now the electricity is ready for us to run our televisions, air conditioners, lights, and game systems.



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 state important ideas about energy resources. As you read, find out more about renewable resources.

Scientists sort natural energy sources into two types: **renewable** and **nonrenewable**. Renewable resources are resources that naturally replace themselves. In order for a resource to be considered renewable, it must replace itself through natural processes as fast as, or faster than, it is used up.

Renewable Energy Resources

Solar Energy

Solar energy is energy from the sun. It is a renewable energy resource. The sun comes up every day. One day, of course, the sun will use up most of its energy and it will get cooler. But scientists forecast that this will not happen for more than five billion years. During our lifeimes, and those of our great, great grandchildren, 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 passive solar energy.

However, heat energy from the sun can be converted into other forms of energy, such as chemical or electrical energy and used for various purposes. For example, solar energy can be captured using a type of collector and then converted to chemical energy in a battery where it is stored for later use. The stored chemical energy can be later converted to electrical energy and used in various ways. For example, it can 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

Wind is another type of renewable energy source. Wind is created by the uneven heating of the air by the sun. Hot air rises while cold air falls, creating air that is constantly circulating over Earth's surface. Just like solar energy, wind energy will last almost indefinitely. In fact, as long as we have sunshine, solar power will warm Earth's atmosphere and create wind.

Since ancient times, people have used wind for energy. A sailboat underway is an example of a very simple kind of wind energy because the boat's sails capture the wind energy to move the boat.

Today, **wind turbines** capture the wind's energy so that we can use this energy in our homes. The turbines use three long blades to collect the wind's kinetic energy. Turbines work because they slow down the speed of the wind and turn the force of the wind into energy. As the wind flows over the blades, it causes lift, like the wind's effect on an airplane wing. Lift makes the blades of the turbine turn. The turning blades are connected to a drive shaft that turns an electric generator to produce electricity. This is an example of converting mechanical energy, which turns shaft of the windmill, into electrical energy.

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

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, for example, a wind turbine, some of the energy is converted to heat instead of being 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 creating usable energy.

ACTIVE READER

1 Compare and Contrast

How are solar and wind energy alike and different?

Alike _____

_____

_____

Different _____

_____

_____

Good to Know

A typical wind turbine is about as tall as a 20-story building and has three blades that are about 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.

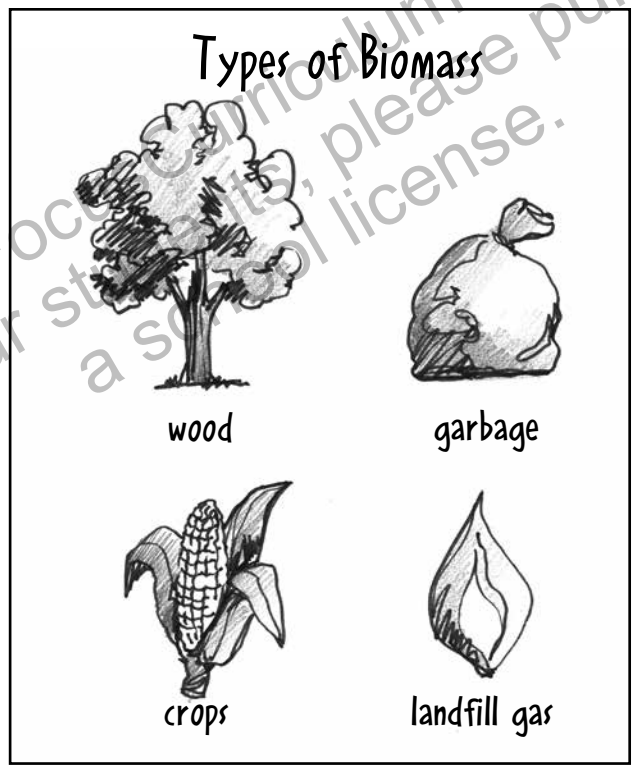
Biomass

Biomass is another name for organic material made from plants and animals, such as logs, sticks, and crops. Biomass can be used to convert to forms of energy. This energy is renewable. Why? Because if used responsibly, new plant material is growing as fast as people are using it up.

Some biomass is burned directly to heat our houses. This is called direct combustion. For example, people burn logs in fireplaces or wood stoves.

Some biomass is used to create energy that is stored. For example, some companies convert the methane gases released by landfills into electricity. Other 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, but direct burning can create some air pollution. Most people agree that using biomass for electricity is cleaner than using **fossil fuels**. Still, some people think that biomass is better used for food than for creating energy. Turning biomass into energy uses lots of plants that could otherwise be used for food. This creates higher demand and higher prices for those plants, corn for example. Therefore, using biomass to create electricity can be more expensive than just growing plants for food.



Fuels for energy can be created from various biomass sources.

ACTIVE READER

1 Hypothesize *Based on what you just read, why do you think people have chimneys for fireplaces and wood stoves?*

_____

_____

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

_____

_____

Good to Know

Some countries get a lot of their energy from biomass. For example, Brazil grows sugar cane. It is very inexpensive to grow this plant in Brazil and 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.

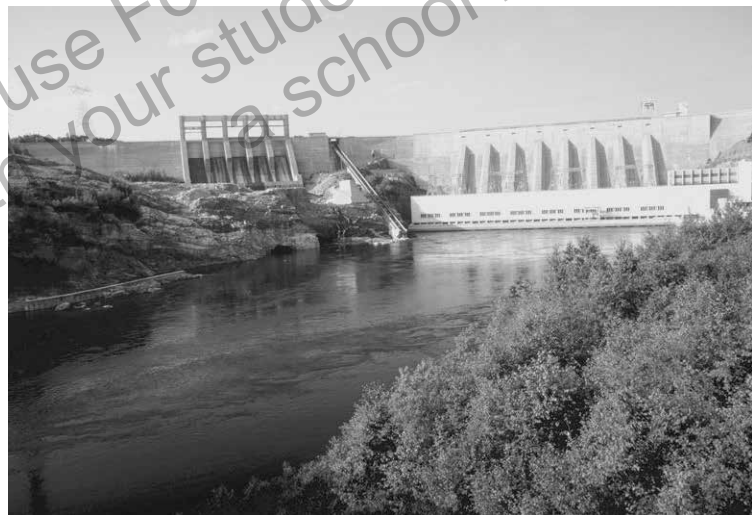
Hydropower

Another type of renewable energy is **hydropower**. Hydropower is energy created by running water or waves. Hydropower is virtually unending. As long as there is sun, air, and water on Earth, there will be hydropower.

Why are sun and air important to hydropower? In the water cycle, the sun heats the water and causes it to **evaporate**. This water condenses into clouds and falls back onto the surface as rain, snow, or sleet. The water flows into rivers, lakes, and oceans. There it evaporates and begins the cycle over again. The water cycle constantly renews the water on Earth.

People can harness the energy of moving water by using turbines that are similar to wind turbines. The moving water pushes against and turns the blades in the turbine. The turbine spins a generator to produce electricity.

The most common way to harness water is to build a dam across a river. When the water is released over the dam, it spins the turbines. 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?*

_____

_____

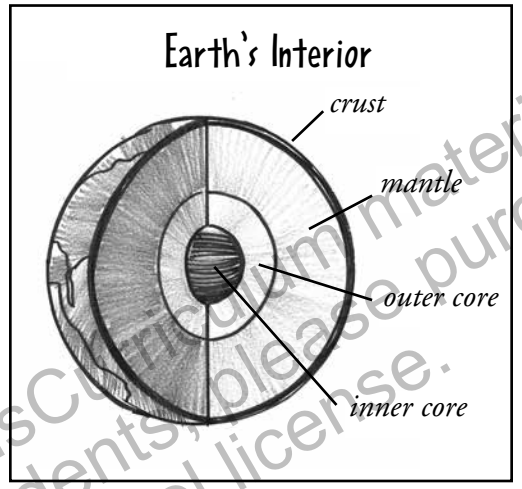
Good to Know

Not all hydropower is high tech. American settlers often captured 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

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 which ride on a layer of molten lava. The plates move around creating places where the crust is thin. Heat from deep inside the earth rises toward the surface. The natural heat of the inner Earth is a resource that will never be used more quickly than it is produced. This makes geothermal energy a renewable resource.



People can use the heat within Earth as well as water to create geothermal energy. To do this, they find special places where Earth's crust is thin and where there is also plenty of water. To capture geothermal energy, people dig deep wells and pump heated underground water or steam to the surface. This energy can heat their homes and also produce 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

1. **List four sources of renewable energy.**

_____

_____

2. **What makes these energy sources renewable?**

_____

_____

Web Quest

What places on our planet have the thinnest crust? This is where there are many volcanoes. To find out, use the phrase "ring of fire" to search the Internet.

FOCUS

The next section describes nonrenewable resources. The underlined sentence states an important idea about these resources. As you read, look for explanations about how these resources were formed.

Nonrenewable Energy Resources

Nonrenewable resources are those that take a long time for nature to produce and 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 decayed plants and animals.

Fossil Fuels

Here's how these nonrenewable resources form over time:

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

Today people drill into the earth and remove this crude oil or natural gas. These resources are then refined. This means they are changed into fuels that people can use. The gasoline we use in cars is one of these fuels. In an automobile engine, the chemical energy in gasoline is converted to the mechanical energy of the wheels turning on their axle to move the vehicle forward.

Crude oil is still being created today, but this natural process is very slow. People are using crude oil much faster than the Earth can produce it. This is why oil and other natural gases are considered nonrenewable resources.

ACTIVE READER

1 Synthesize *What is a nonrenewable resource?*

2 Hypothesize *Crude oil, coal, and natural gases are nonrenewable. How long might it take make more of these resources if people used them all up in the next few years*

Coal

Coal is another nonrenewable resource. Have you ever had a barbecue outside where people burned charcoal to cook food? This is one type of coal. Other types of coal can be burned to heat whole buildings or to create electricity.

Like oil and natural gas, people are using coal at a rate faster than nature can create it. The process of creating coal is similar to the process of creating oil and natural gas.

Here's how the process works:

1. Long ago, the earth was partly 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 water and dirt.
4. Heat and pressure from the top layers of mud helped the dead plants turn into the black rock called coal.

Today people dig deep mines and use huge machines to get this coal out of the earth. Then, the coal goes to a plant. At the plant, people clean the coal to remove dirt, rock, ash, and other unwanted materials. This makes the coal better for burning to create energy.

ACTIVE READER

1 Compare *What are two ways coal is similar to oil and natural gas?*

_____

_____

_____

_____

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

_____

_____

_____

_____

FOCUS QUESTIONS

1. Explain how fossil fuels are formed.

_____

_____

2. How are fossil fuels extracted from the earth?

_____

_____

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.
(2) People use them faster than nature creates them.
(3) They are not made by nature.
(4) People do not want to use them up.

2. Which is a renewable resource?

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

3. Which is a nonrenewable resource?

(1) solar energy
(2) wind energy
(3) crude oil
(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 careful with our resources even when they are renewable.

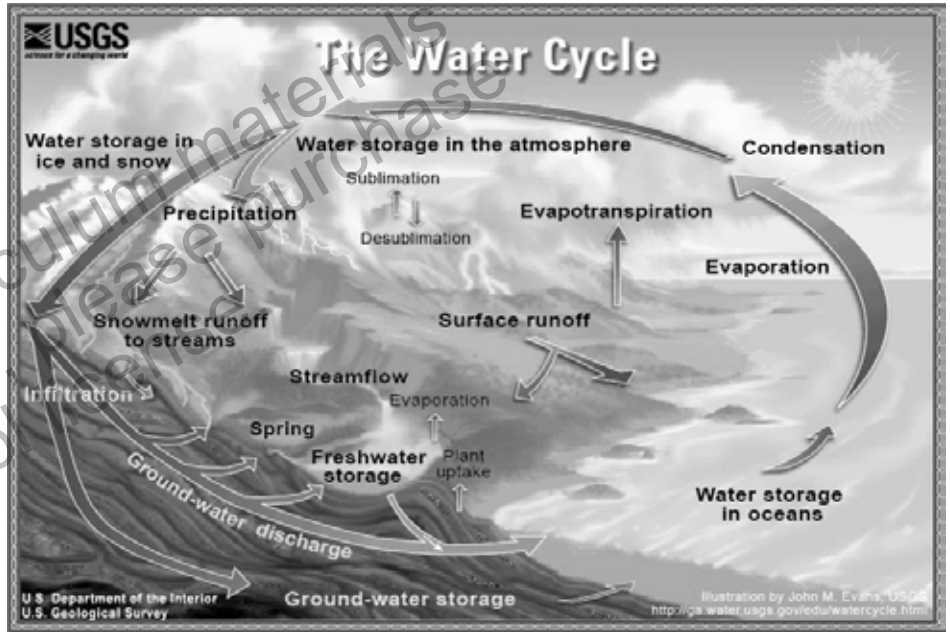
Ms. Understanding

Think Like A Scientist

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 2 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.

Use Your Knowledge

Electricity is power that can be used for many things from turning on a lamp to running super computers. Most people in America use electricity every single day.

The electricity we need to run our world comes from many different renewable and nonrenewable resources. Some resources like coal are burned to create electricity. Others like hydropower will never be used up.

The chart below shows the percentage of resources that were used to produce the total amount of 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 much of the twentieth century, it was very inexpensive to use nonrenewable resources like coal and oil to create electricity. However, as these resources become scarce, their prices rise. The price of oil, in particular, sky rocketed in the beginning of the twenty-first century.

In the future, the cost of producing energy from renewable resources may fall as new inventions are created and as there is greater demand for clean, renewable energy.

There are good things and bad things about using different resources to create electricity. It is important to understand these advantages and **disadvantages** when we decide how to create electricity.

One good thing about all renewable resources is that they will not run out for millions and millions of years. Many renewable resources are also very clean. This means that they do not result in any **pollution** that makes our air or water unclean.

However, there are also disadvantages to some renewable resources. For example, solar energy production will vary because the sun is not always shining. Wind energy will also vary because the wind is not always blowing. This is one reason it is important to get electricity from more than one resource.

Some people are also concerned that wildlife may be disturbed by wind turbines. For example, birds may fly into the turning blades and be killed. People are still researching this problem.

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 in this context?*

_____

_____

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

_____

_____

Web Quest

There are many ways to fight pollution and make our land, air, and water cleaner. To find out more search the phrase "pollution prevention."

There are also advantages and disadvantages to hydropower and geothermal energy. Like all renewable resources, these resources are advantageous because they will not run out for millions and millions of years. Also, as with creating energy from the sun and wind, using these resources to create usable energy tends to cause less pollution.

But hydropower and geothermal energy is not available everywhere in the world. To get to geothermal energy, you need to be in a place where you can reach the steam and magma below the earth. California has a lot of geothermal energy because a fault, or weak place in Earth's crust, runs through the state.

To harness hydropower, you have to be near running water. There is not much hydropower in a desert. Also, people need to build large dams to capture the energy in the water, which can be expensive. Some people also worry that the dams will hurt wildlife. For example in some rivers, fish must swim upstream to lay eggs. But dams get in their way. People are still working on ways to make sure fish aren't hurt by dams.

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, electricity is just one thing that's created. Dangerous waste is also created during this atom-splitting process. This 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.

In April 1986, an explosion at the Chernobyl nuclear power plant killed 28 people from radiation or burns. The explosion sent radioactive gas and debris into the atmosphere. Wind carried this radiation across large areas of Belarus, Ukraine, and Russia. Since the accident, a total of 56 people have died due to the after effects of radiation exposure.

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 the crust of our entire planet, geothermal power should be available everywhere. However, the magma is most often buried too deep for us to reach. In many places on Earth, it would be very expensive to drill down to the magma. You might be surprised to learn that one place that has made extensive use of geothermal energy is Iceland.

Nonrenewable Energy: Advantages and Disadvantages

Nonrenewable energy resources are still relatively 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 and perhaps unaffordable for most people.

Another problem with these nonrenewable resources is that using them tends to create pollution. Crude oil, for example, is turned into gasoline for our cars and heating oil for our homes. 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. Using coal for energy also does more harm than good. Burning coal creates air pollution. Plus, mining coal disturbs the landscape and destroys animal habitats. Recently, scientists have discovered ways to mine that disturb the landscape less.

Scientists are constantly working to make these nonrenewable resources cleaner and thereby reduce their effect on the environment. For example, companies use scrubbers on power plants to reduce the amount of the pollution going into the air. However, the water used in this process can end up polluting our drinking water.

FOCUS QUESTIONS

1. **How are hydropower and geothermal energy like solar and wind energy?**

2. **Why are some sources of energy considered to be nonrenewable?**

ACTIVE READER

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

2 Apply *Use what you know about the suffix* -tion *to tell what the word* calculation *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

(2) nonrenewable resources only

(3) both renewable and nonrenewable resources

(4) neither renewable nor nonrenewable resources

2. What is one good thing about renewable resources?

(1) They create pollution.

(2) The earth is renewing them quickly.

(3) They are very inexpensive.

(4) The earth is never damaged by their use.

3. What is one bad thing about renewable resources?

(1) We cannot find them everywhere.

(2) They can pollute the air, land, and water.

(3) We do not know where to find them.

(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.

(2) We do not know how to collect the resources.

(3) We do not know how to turn them into electricity.

(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		
Wind		
Hydropower		
Geothermal		
Oil		
Natural Gas		
Coal		
Nuclear		

Chapter 3 Managing Energy Resources

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

Wise Choices

Every person in the world who uses energy can help better manage our resources. This means you! There are two ways to manage resources. First, we can **conserve**, or use less, energy. Second, we can choose to use clean energy whenever possible.

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. If you think about what you are doing, you can easily save energy every day. 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 a sweater, and ask your family to turn down the heat.
4. When it's hot, wear shorts and a T-shirt, ask your family to turn down the air conditioner, or even just open the window.

There are additional things that you can do to save energy. Often new appliances like stoves and refrigerators can save energy. 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 in the long run. Talk with your family about ways to save energy.

ACTIVE READER

1 Infer *Find the word* conserve *in the text. What words nearby tell you what* conserve *means in this context?*

_____

_____

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 the earth if we use less paper, water, and other products. You should also know that using less also saves energy. It takes energy to create every piece of paper we write on. It takes energy to create every gadget we buy. If we use less, that saves energy.

Choose Clean Energy

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

Some things are a bit more difficult to do, but could help others choose clean energy. For example, find out about how your community gets its electricity. Are there wind, solar, hydropower, or geothermal options? If your electric company doesn't offer these clean energy options, write a letter to the company and ask them to consider these options. 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 resources?**

2. **What is one thing you could do as an adult to help people better manage 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 then 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

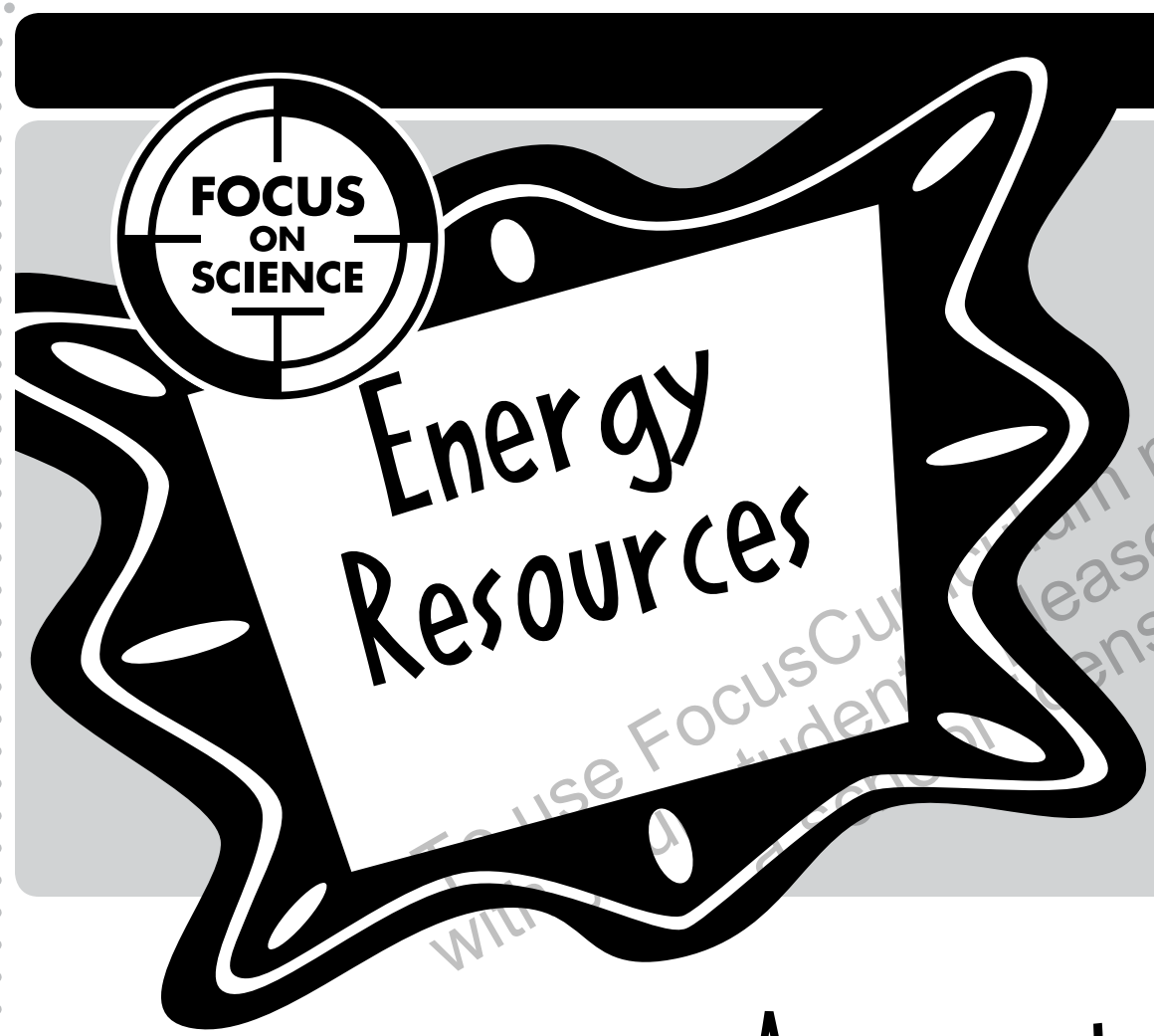
pollution – something that makes land, air, and water unclean

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



Assessments

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.

1. 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?

   (1) buy a less expensive coal for heat

   (2) use natural gas as a fuel for cooking

   (3) raise the temperature setting on the air conditioner

   (4) install solar roof panels to generate additional electricity

2. Why is natural gas a nonrenewable energy source?

   (1) Natural gas is difficult to find and capture.

   (2) The burning of natural gas could cause pollution.

   (3) Natural gas is everywhere, but it is expensive.

   (4) Once natural gas is used, it can take millions of years to be replaced.

3. Which sentence tells about a kind of renewable energy and explains why it is renewable?

   (1) Coal: Once the coal is used up, there is no way to make additional coal.

   (2) Crude oil: There is a fixed amount of oil, and new oil takes millions of years to form.

   (3) Solar energy: There is only one sun in our solar system, and there is no replacement.

   (4) Hydropower: The water cycle moves water around the earth's surface, so the amount of water stays basically the same.

4. Why is it a bad idea to get all of your heat using solar panels?

   (1) Solar energy makes pollution when it is used with wind energy.

   (2) Electricity from solar power is never strong enough to heat a house.

   (3) The sun does not always shine, so there might not be enough energy for heat.

   (4) The panels are expensive, so there might not be enough money to buy them.

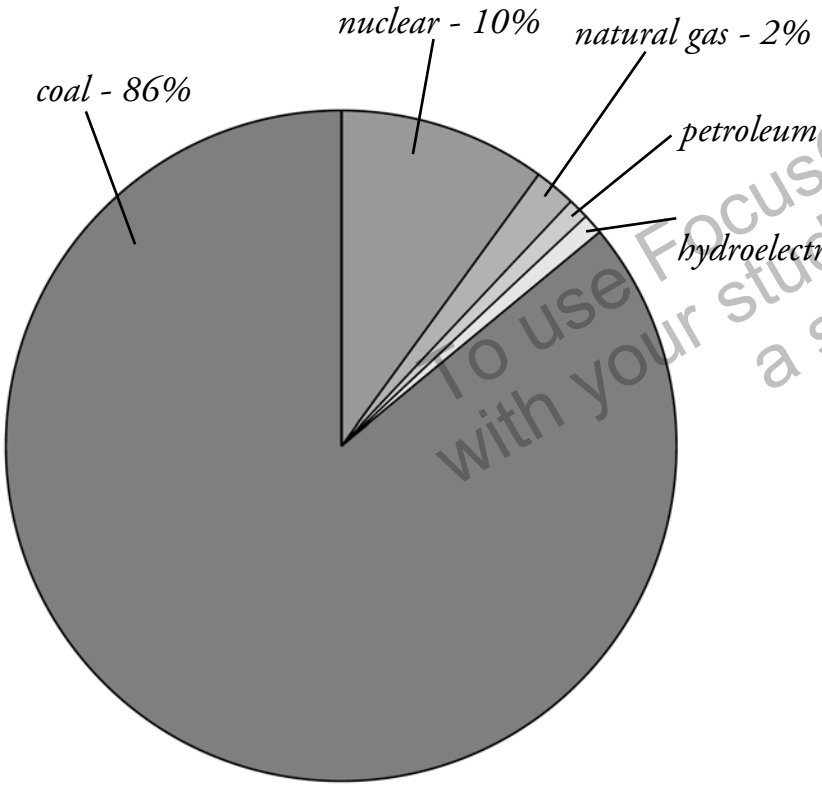
Answer Document

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.

_____

_____

_____

_____

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 students should list both objects that use energy 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. a machine that allows electricity to travel over many miles

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. Renewable energy created by waves or 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, 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 nonrenewable, and it is created after being buried deep in the grounds 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 intense 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; Non renewable resources: coal, crude oil, natural gas, oil.
Understanding the Water Cycle: 1. Water evaporates.; 2. Water forms clouds.; 3. Water falls as rain or snow.; 4. Water returns to oceans, seas, and lakes.

Page 21: Chapter 2
Active Reader: 1. Our current methods of making electricity are dirty because we use coal the most, and coal is dirty.; 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 fish, 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. Nonrenewable resources will run out.

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.

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 hypothesis. Scientists hypothesize so that they know what data they need to collect to test their hypotheses.; 2. Answers will vary.; 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.