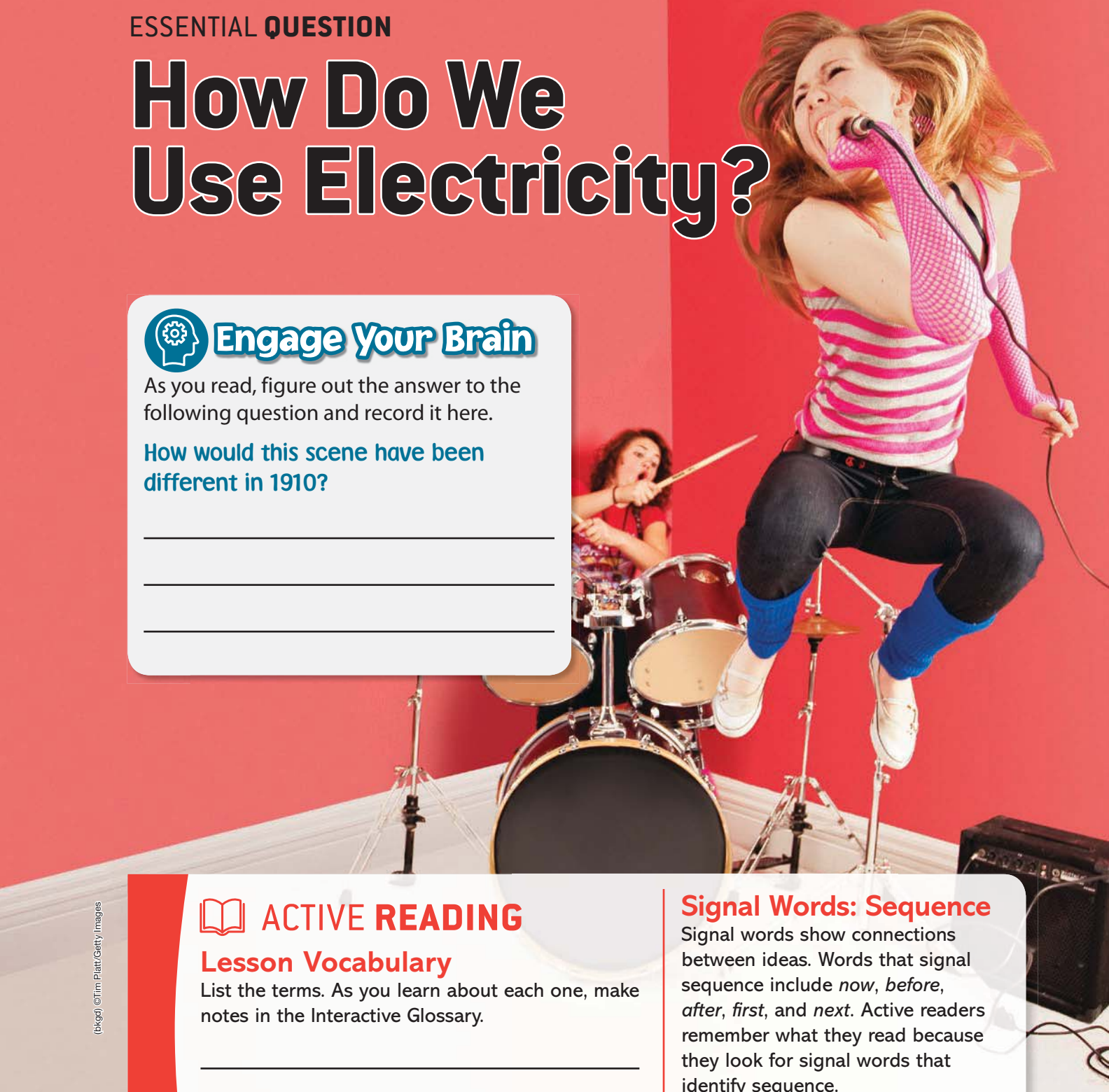
SC.5.P.10.4 Investigate and explain that electrical energy can be transformed into heat, light, and sound energy, as well as the energy of motion.

LESSON 5

ESSENTIAL **QUESTION**

How Do We Use Electricity?



Engage Your Brain

As you read, figure out the answer to the following question and record it here.

How would this scene have been different in 1910?

_____

_____

_____

ACTIVE **READING**

Lesson Vocabulary

List the terms. As you learn about each one, make notes in the Interactive Glossary.

_____

_____

_____

Signal Words: Sequence

Signal words show connections between ideas. Words that signal sequence include *now*, *before*, *after*, *first*, and *next*. Active readers remember what they read because they look for signal words that identify sequence.

Electricity Has Many Uses

Suppose you had lived in 1900 rather than today. The pictures show how different your day might have been.

ACTIVE **READING** As you read this page, write *before* or *after* in the box next to each object to indicate the sequence.

Does a clock radio wake you up in the morning? Do you use an electric toothbrush or hair dryer? How do you cook your breakfast?

Electrical appliances do work. They perform useful tasks by converting electrical energy into other forms of energy, such as sound, thermal, and mechanical energy. Some appliances run on batteries. Others are plugged into a socket, which provides greater electrical energy. Think about the appliances you use each day. How would your day change if there were no electricity?

The only light came from candles or oil-burning lamps. Now we can turn on lamps with the flick of a switch.

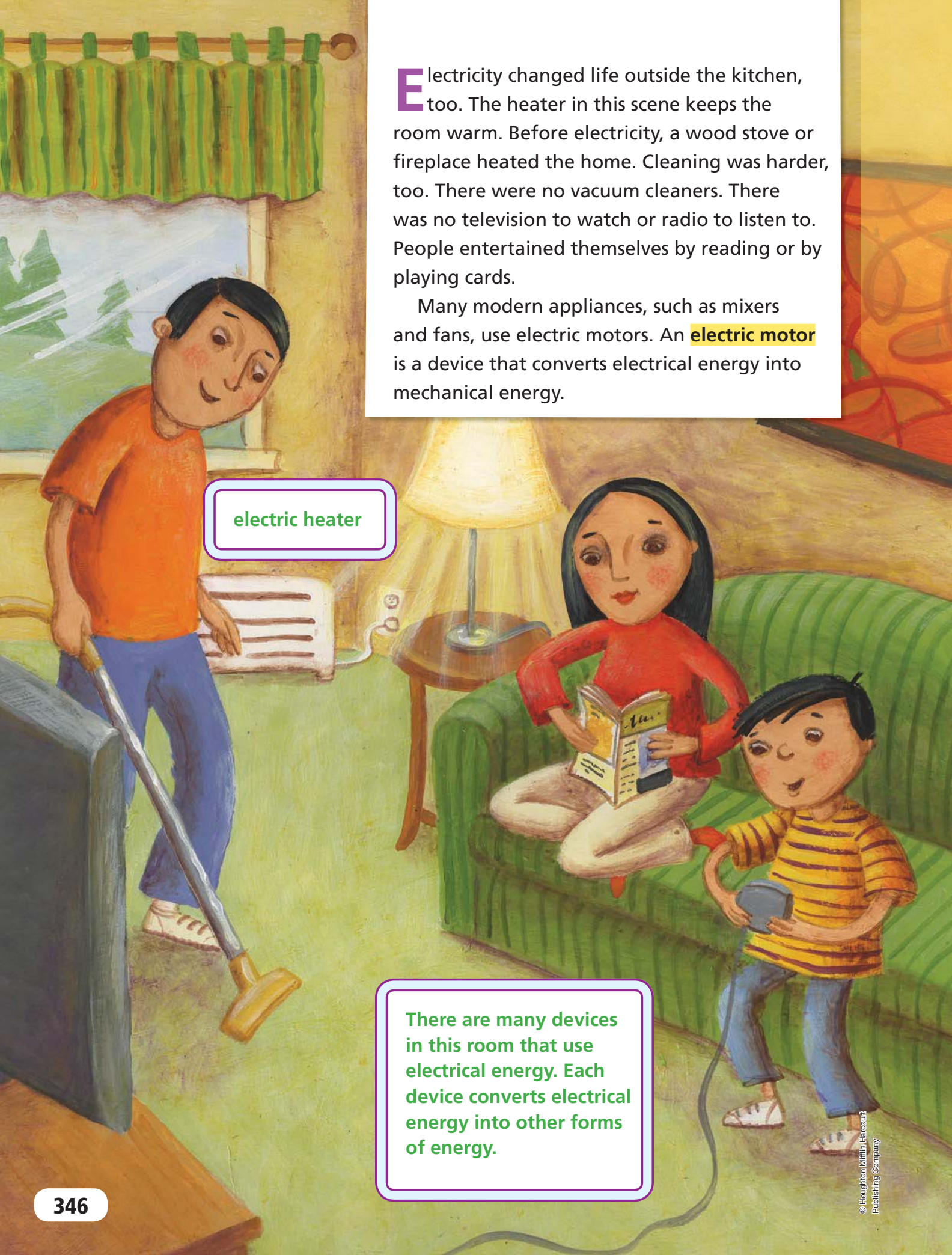
Before electricity, food was kept cold in an icebox. Ice was delivered daily to keep food cold.

▶ Draw a picture of the electrical appliance that does the same work as this object.

People used muscles rather than electricity to mix cake batter!

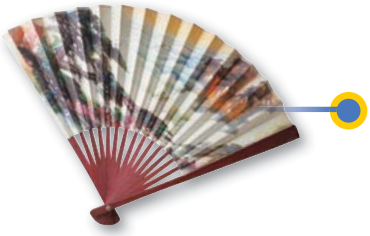
Electricity changed life outside the kitchen, too. The heater in this scene keeps the room warm. Before electricity, a wood stove or fireplace heated the home. Cleaning was harder, too. There were no vacuum cleaners. There was no television to watch or radio to listen to. People entertained themselves by reading or by playing cards.

Many modern appliances, such as mixers and fans, use electric motors. An **electric motor** is a device that converts electrical energy into mechanical energy.



Then and Now

Match the objects that do the same kind of work. Draw a picture of the missing appliance. Then describe the energy change that takes place in each electrical appliance.



Electromagnets

Electricity and magnetism are related. One can produce the other.

ACTIVE **READING** As you read this page, circle the sentence that explains how magnetism produces an electric current.

Suppose you slide a coil of wire back and forth around a bar magnet. When the ends of the wire are attached to a light bulb, the bulb lights! Moving a magnet and a wire near each other produces an electric current.

Turning the handle on the device below turns a coil of wire inside three U-shaped magnets. Electricity flows through the wire and lights the lamp.

Hand-cranked light bulb

Modern hand-cranked flashlight

If magnets produce electricity, can electricity make magnets? Yes! Wrapping a coil of current-carrying wire around an iron nail makes the nail a magnet. You can use it to pick up small iron objects such as paper clips. A device in which current produces magnetism is called an **electromagnet**.

Huge electromagnets are used in junk yards. They separate iron and steel objects from other objects. The operator swings the electromagnet over a pile of junk. He turns on the current. All the iron pieces jump to the magnet. The operator then swings the magnet over a container and turns off the current. The magnetism stops, and the iron drops into the container.

Electromagnets have become very important and useful. Every electric motor today contains at least one electromagnet. You can also find electromagnets in telephones, doorbells, speakers, and computers. Doctors can use electromagnets to make pictures of the inside of the body.

▶ **In the first box, write the cause of the action in the second box. Then figure out what that effect can cause, and fill in the third box.**

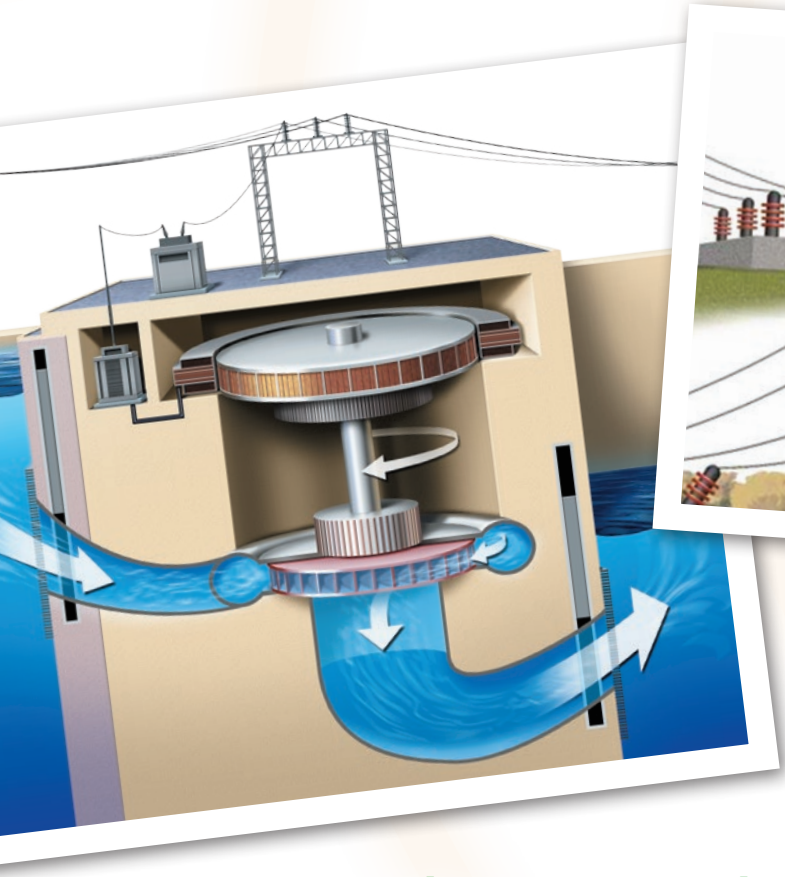
_____ _____ _____ _____	→ An electric current flows through the wire. →	_____ _____ _____ _____

Why It Matters

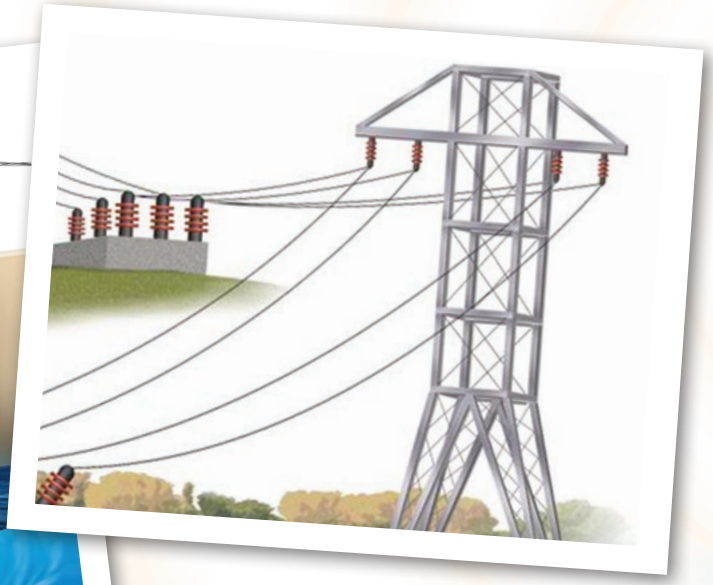
Conserving Electricity

You've probably been asked to conserve, or use less, electricity. Why is conserving electricity important?

ACTIVE **READING** As you read, underline a sentence that tells how you can conserve energy.



Inside a hydroelectric [hy•droh•ee•LEK•trik] dam, the mechanical energy of falling water is used to turn generators, which change mechanical energy into electrical energy.



Electricity generating stations, also know as energy stations, may use water, coal, or atoms to produce the electricity you use.

The electrical energy is transmitted through a network of substations, high voltage towers, and other comoponents to homes and businesses in the community.

Suppose you spin a magnet inside a coil of wire. A current flows through the wire. You've made a **generator**, a device that converts kinetic energy to electrical energy. Huge generators in energy stations change kinetic energy into electricity. The electricity travels through wires to homes, schools, and businesses.

Some energy stations use falling water or wind to turn generators. Other energy stations convert solar energy to electricity. These resources will never run out. They are called renewable resources.

Most energy stations burn coal or other fuels to heat water. The water rises as steam, which turns the generator. Coal is a limited resource. It will eventually run out. That's why it is important to conserve, or use less, electricity. For example, you can turn off the lights when you leave a room or use a towel instead of a hair dryer.

DO THE MATH

Solve a Problem

Sam's electric bill was $200 for the month of June. The air conditioner accounts for $\frac{1}{2}$ of the bill, and the water heater accounts for $\frac{1}{5}$ of the bill. How much did it cost to run each appliance in June?