

Chapter 3: Energy from Earth and Water

Lesson 3

Topic

Where is electricity produced and how does it reach your community?

Duration

40 minutes

Objectives

Students will be able to:

- Describe where hydroelectricity is produced
- Explain how electricity travels from a dam to the community: to homes, schools and businesses
- Develop thinking (relationships and ideas)
- View and demonstrate comprehension of visual materials

Materials

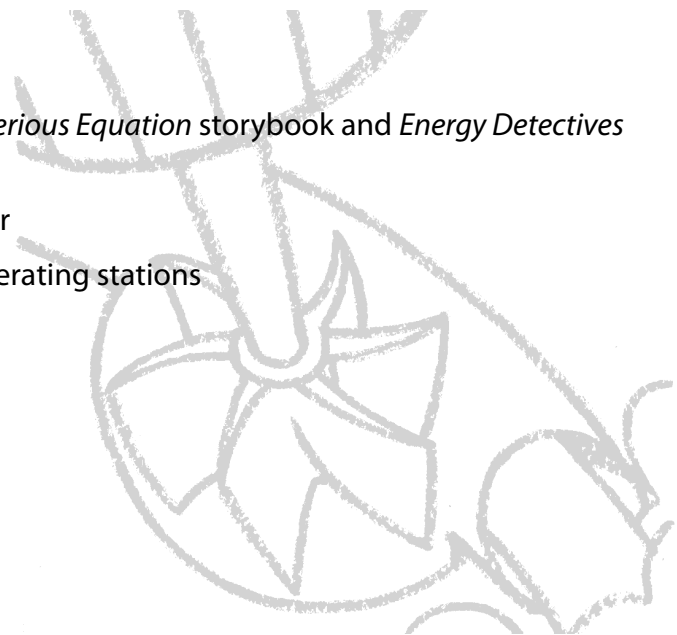
- Red and blue crayons
- *Smarty and the Energy Detectives: The Mysterious Equation* storybook and *Energy Detectives Student Handbook* (pages 4 to 7)
- *How Electricity Gets to You* classroom poster
- Photo transparencies of hydroelectric generating stations
- Turbine model as outlined on BLM 3.1

Preparations

- Display the classroom poster.
- Set up the overhead projector.
- Make the turbine model.

Background Information

- It is recommended that students stop reading after the first four pages.
- The classroom poster is an enlarged, expanded version of the illustration in Chapter 3. This illustration is reproduced as an activity, in black and white, in the *Energy Detectives Student Handbook* (pages 14 and 15).



- The cross-section on page 6 in the *Energy Detectives Student Handbook* is a simplified version of a hydroelectric dam.
- The turbine activity is a model of this cross-section. Models are often created to explain processes that are difficult to observe directly, such as planets orbiting around the Sun.

BACKGROUNDER: HYDROELECTRICITY (refer to *How Electricity Gets To You* poster and BLM 10.1 *Electricity From River to You*)

A hydro dam holds back the water in a reservoir and then channels it through large pipes to large wheels called turbines. The energy of the falling water is used to turn the turbines. Electricity can also be created by burning natural gas or coal. The energy from burning gas or coal heats water (creating steam), which spin turbines. Most electricity in B.C. is generated inside hydroelectric power plants.

The electricity from power plants travels for many miles over high-voltage wires called transmission lines. These transmission lines are held away from the ground by giant wood or metal transmission towers. When the electricity gets near a town or city, it goes into a substation. A substation often has many wires and metal containers in it and is surrounded by a wire fence. The substation divides the electricity and sends it in different paths over wires called distribution lines. These distribution lines take the electricity to your home.

Students may notice grey cylinders on power poles, called transformers. These reduce the voltage in the transmission lines to an amount that can be safely used by consumers. Pad-mounted transformers (metal boxes) are used in some residential areas and serve the same function as transformers mounted on hydro or telephone poles.

As the electricity enters homes, businesses and schools, it passes through a meter. The meter measures the amount of electricity used. The electricity then flows through wires to electrical outlets. Electricity is used when appliances or machines are plugged into the outlets.

Vocabulary

Dam: Anything built to stop the flow of water.

Generate: To create or make something.

Lesson Development

Activity 1

- Guide the students through reading the first four pages of Chapter 3.

Activity 2

- Lead a discussion about dams using the poster, overhead photos and the storybook as references. Suggested prompts:
 - Where do you think the electricity starts?
 - Where does the electricity go?

- How does the electricity get to the toaster?
- What do you notice about the dam?

Activity 3

- Demonstrate the turbine activity, explaining how it models the illustration on page 6 in the *Energy Detectives Student Handbook*.
- Reinforce the concept that the power (energy) of falling water is used to spin the turbines, which creates electricity.
- Describe the use of models in other situations to help explain scientific concepts:
 - The model of a human body shows how the bones connect to each other.
 - A tree drawing shows the root system below ground.
 - A diorama of the jungle shows how creatures blend into their environment.

Activity 4

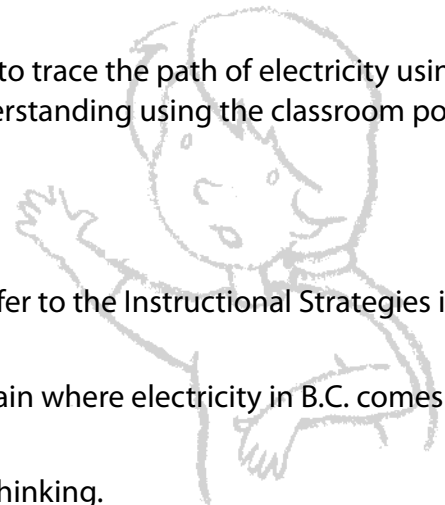
- Have students complete pages 4 and 5 in the handbook. Have them use a red crayon to colour the path of electricity from the dam, along the transmission wires, to the buildings (include the underground paths).
- Have students complete page 6 in the handbook. Have them use a blue crayon to colour the path of water as it moves from the reservoir through the dam, and continues as a river. Then have them use the red crayon to show where the electricity begins, then moves along the transmission lines.
- Reinforce that the blue crayon traces the path of water (one form of energy) and the red crayon traces the path of the electricity, a more useful form of energy.

Assessment

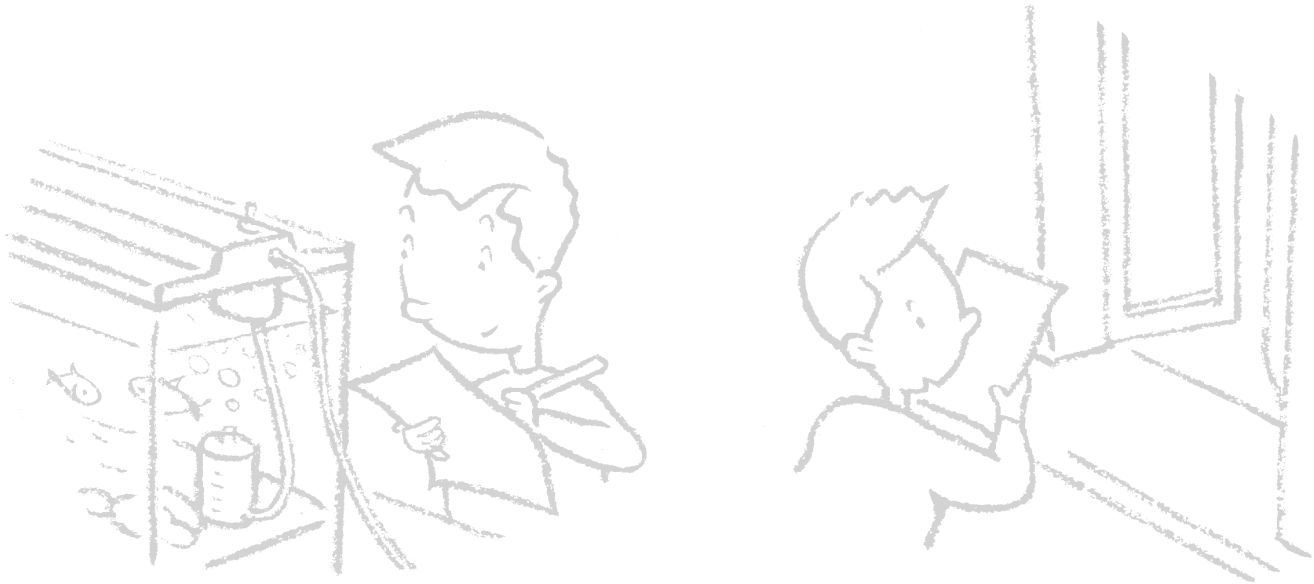
- Circulate during the handbook activity and ask students to trace the path of electricity using their fingers. Students could also demonstrate their understanding using the classroom poster.
- Evaluate the students' handbook diagrams.

Reinforcement/Extension

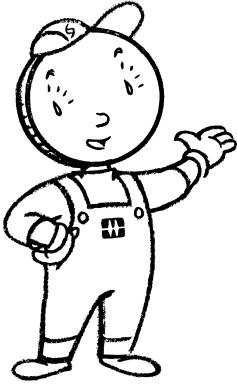
- Use the Think/Pair/Share strategy to close the lesson. (Refer to the Instructional Strategies in Appendix 2 for more information.)
 1. Have students think to themselves about how to explain where electricity in B.C. comes from and how it reaches their home and school.
 2. Then have students turn to a partner to discuss their thinking.
 3. Debrief as a whole group.
- Have students draw a picture to show how electricity reaches them (*Energy Detectives Student Handbook*, page 7).
- Send home copies of the turbine activity for parents.



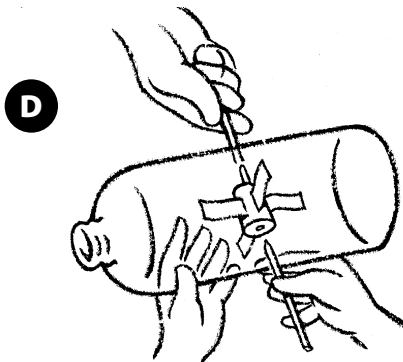
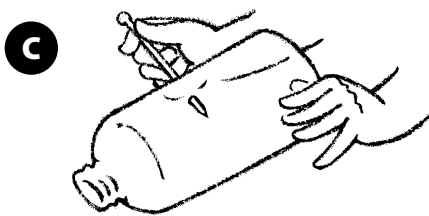
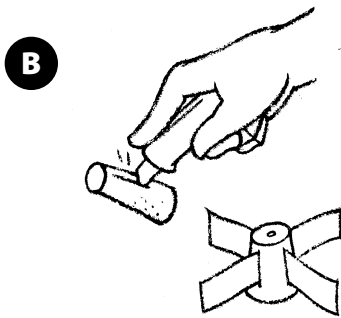
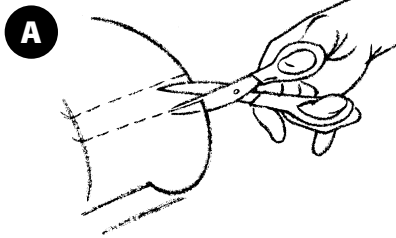
- Have students complete the Dear Smarty Response (*Energy Detectives Student Handbook*, page 7). Use the B.C. Performance Standards Quick Scales (see the Assessment Tools in Appendix 1) to assess whether they understand where electricity comes from and how it reaches homes and businesses. Explanations should refer to the following points, but not necessarily use the exact language:
 - Water spins the turbine.
 - The electricity moves from the dam to the wires.
 - The wires go to a substation.
 - Energy moves through wires on hydro poles.
 - Electricity travels through transformers before reaching homes, businesses and schools.
 - Electricity is used when plugging into an outlet or turning on a switch.



Make A Water Wheel



Scientists often create models to explain concepts. This activity is an example of how the energy of falling water is used to turn a wheel. The wheels that turn inside hydro dams are called turbines.



You need:

- An adult to help
- A two-litre pop bottle
- 2 bamboo skewers
- 2 corks
- A knife
- Scissors
- A nail

What to do:

Carefully cut 4 pieces out of the bottom part of the bottle (A). Each piece should be about 5 cm long and 2 cm wide.

Cut 4 slits in the cork so that each plastic strip fits in to become a blade (B).

Make two holes on opposite sides of the pop bottle, at the half-way point (C).

Put one skewer through the hole, into the cork. Fit the second skewer through the hole, into the other side of the cork (D).

Now stick the second cork on a skewer. Attach a piece of string to the cork and tie an object, such as an eraser, to the other end.

Pour water through the model and watch what happens!

