

Unit 3
How Can Work
Be Done with
Water Power?

Activity B

Can a water wheel be used to generate electricity?

Introduction

Students will learn that when a shaft is attached to a water wheel (turbine), a generator can be used to produce electricity. In this activity, students will design a hydroelectric project based on what they have learned so far and with some additional information.

Scientific Learning Goals and Objectives for this Activity:

(Goals from Washington State Commission on Student Learning — Essential Learning Requirements for Science)

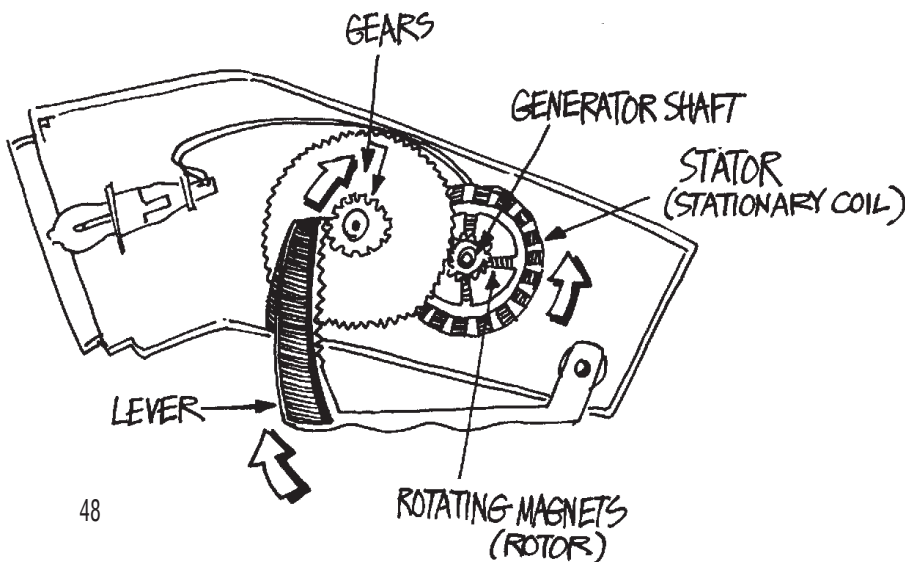
Goals

- Students will understand and apply scientific concepts and principles.
- Students will understand and apply technological concepts and principles as they relate to science.
- Students will communicate scientific understanding.
- Students will understand the interdependence among science, technology, and mathematics and their connections to the world beyond the science class.

Objectives

- Students will observe and demonstrate an understanding of how a generator produces electricity.
- Students will apply their knowledge of water wheels and water as a potential energy source to design a hydroelectric project.
- Students will identify and demonstrate an understanding of the parts used to generate electricity at a dam.

USING A GENERATOR TO LIGHT A FLASHLIGHT



Teacher Preparation

Preparation Time:
15 minutes

Materials

Prepare for the Entire Class:

- dynalite flashlight
- transparency of flashlight generator and parts
- transparency of hydropower dam and distribution

Prepare for Each Team:

- copy of hydropower puzzle parts
- copy of hydroelectric parts glossary
- scissors

Prepare for Each Student:

- copy of journal page

Student Involvement

Activity Time:
50 minutes

Activity Processes:

1. Teacher turns on dynalite flashlight by squeezing lever.

? What is making the light go on?

Pass around flashlight to teams as responses are discussed. Have students draw a picture in their journal of what they think is occurring inside the flashlight case.

2. Teacher places transparency of internal flashlight workings on overhead. Students identify generator, and through teacher-led discussion recognize that the generator is producing enough electricity to light the flashlight's bulb. See Teacher Notes for description of generation process.

? How can a water wheel be used to create electricity?

Discuss responses.

3. Provide each team with a black line master of hydropower parts used in a hydropower dam. Also provide students with a Hydropower Dam Parts Glossary.

4. Teams design a hydropower dam by either cutting out and ordering parts on the master or creating a sketch based on parts from the master. Definitions in the glossary provide the clues necessary to order the parts.

6. Each team shares their design with the class.

7. Students draw design in journal.

8. Teacher uses hydropower dam and distribution transparency to show detail of how electricity is generated and carried from the dam's powerhouse to communities.

VOCABULARY

Copper Coil

Dam

Generate

Generator

Penstock

Rotor

Shaft

Spillway

Stator

Tail Race

Turbine

Wicket Gates

Notes

Step 2:

The process of producing electricity occurs because when the flashlight lever is squeezed, it turns gears that are attached to a generator shaft. This spinning action turns the shaft. Inside the generator the shaft is rotating magnets past a stationary copper coil. This action induces an electric current because the copper coils are subjected to alternating magnetic fields.

Journal 3B

Can a water wheel be used to generate electricity?

Name _____

Team Name _____

Date _____

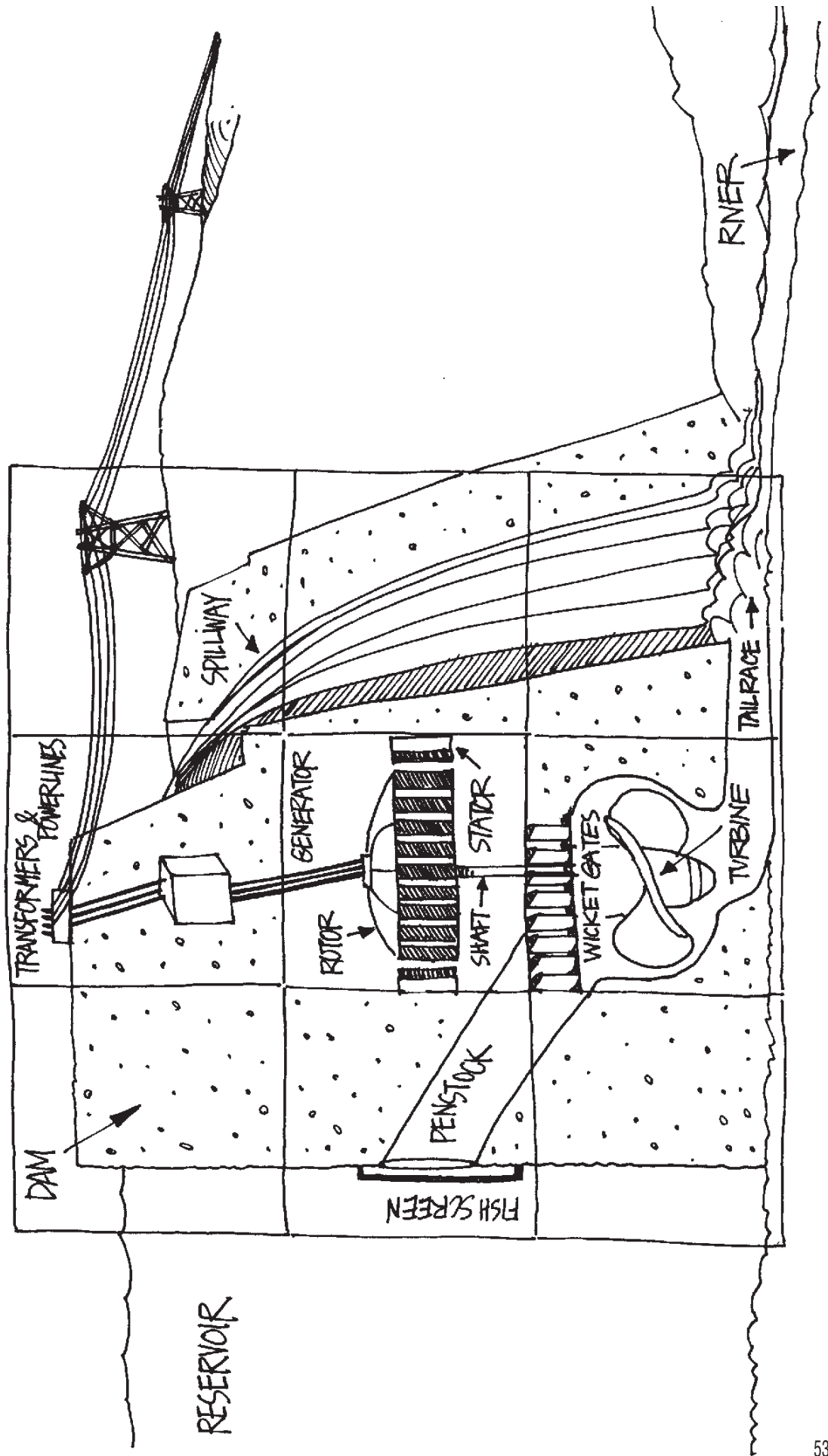
Draw a picture of what makes the light bulb go on. Label parts.

Draw your design for a hydropower dam. Remember to label parts such as turbine and use arrows to show the flow of water.

Hydro Dam Parts Glossary

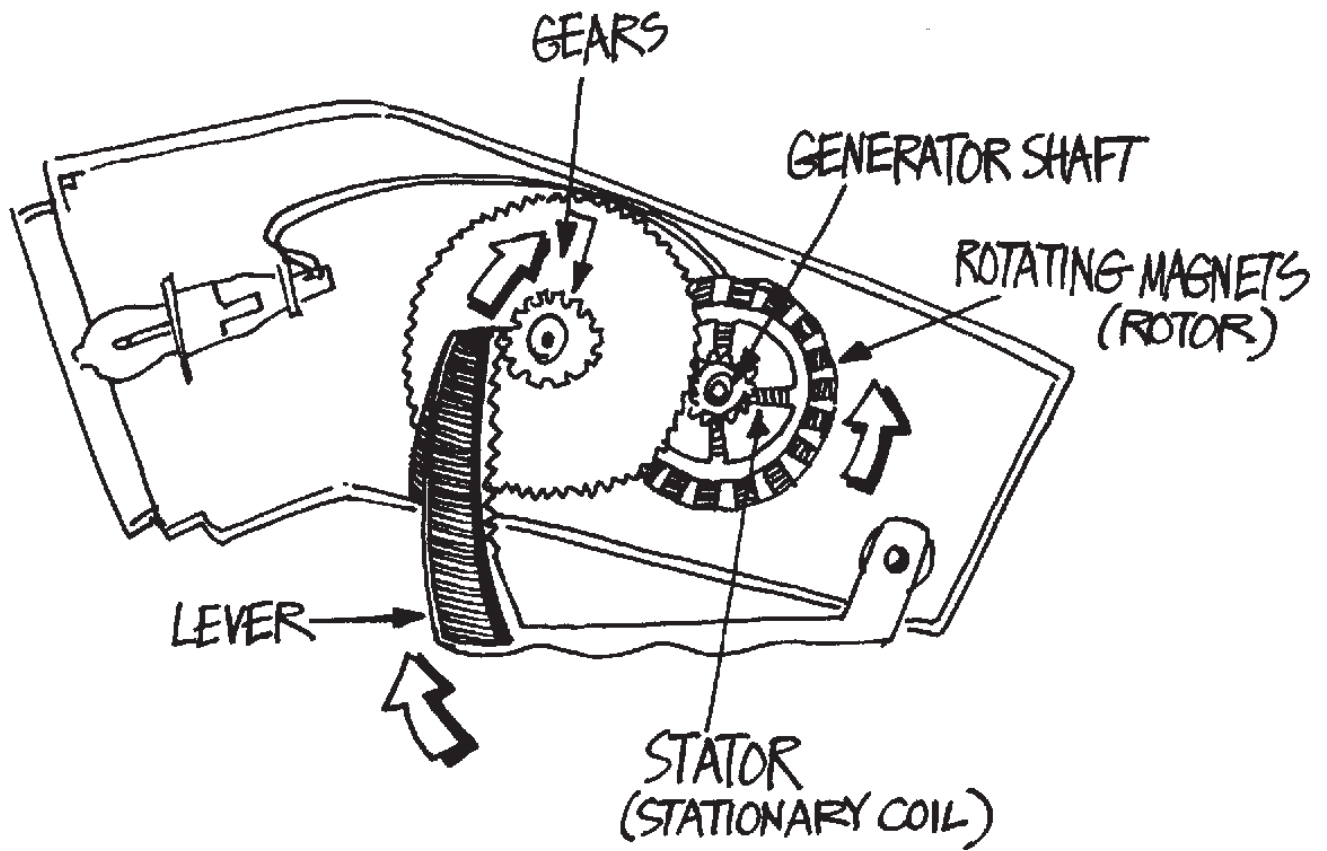
1. **Dam:**
A dam allows the flow of water to be managed and directed in a river.
2. **Penstock:**
A penstock is used to deliver water from the river or reservoir to the turbine.
3. **Turbine:**
A turbine acts like a water wheel. Some modern turbines are shaped like propeller blades.
4. **Wicket Gates:**
Wicket gates are a series of adjustable vanes or shutters that direct the water flow to the turbines. By controlling their position, the volume and angle of water pushing against the turbine wheel blades can be controlled.
5. **Shaft:**
The shaft connects the turbine to the generator.
6. **Generator:**
The two most important parts of the generator are the rotor and stator. The shaft is connected to the rotor, which is a series of magnets that rotate. The rotor, shaft and turbine all turn at the same speed. The stator is the stationary part of the generator and consists of coils of copper wire. Electricity is produced as the rotor spins past the stator's coil.
7. **Tail Race:**
The tail race is where the water exits the dam and returns to the river. The same amount of water that entered the penstock returns to the river.
8. **Spillway:**
Water not used for energy production or other purposes is released through (or over) the spillway.
9. **Fish Screens:**
Devices installed to assist migrating fish downriver.

HYDROPOWER PROJECT



Hydropower Puzzle

USING A GENERATOR TO LIGHT A FLASHLIGHT



Hydropower Puzzle

