

## It's Hydrological!

### Curriculum Objective

To teach students about hydroelectric power, the basics of how a hydroelectric dam operates. To teach students about the benefits of renewable energy and why it is important. To teach students, through the use of an interactive question and answer "race" game, about the water cycle, hydropower and renewable versus non-renewable energy sources.

### Washington State

### Essential Academic Learning Requirements (EALRs)

Science: 1.1 (nature and properties of earth materials BM 1,2&3)

Science: 1.2 (energy sources and kinds BM 1,2&3, energy transfer and transformation BM1,2&3)

Science: 1.3 (nature of forces BM 1,2&3, forces to explain motion BM 1,2&3, hydrosphere/atmosphere BM 1&2, environmental and resource issues BM 1,2&3)

Science: 2.1 (modeling BM 1&2, identifying problems BM 1&2, designing and testing solutions BM 1&2)

Science: 3.1 (limitations of science and technology BM 1&2)

Science: 3.2: (all peoples contribute to science and technology BM 1&2)

Mathematics: 3.1 (analyze information BM 1,2&3)

Mathematics: 5.2 (relate mathematical concepts and procedures to real-life situations BM 1,2)

Health & Fitness:1.2 (safely participates in a variety of developmentally appropriate physical activities BM 1&2)

Links: [hydroelectric power generation](#) | [hydrological cycle](#) | [positive & negative impacts of hydroelectric dams](#) | [renewable and non-renewable energy sources](#) | [Columbia River hydropower](#) | [turbines and generators](#)



## Course Description

### Part I (10-15 minutes)

This portion of the course illustrates how the hydrologic (water) cycle can provide renewable energy through a brief discussion of renewable versus non-renewable energy sources. Students receive handouts that describe how a hydroelectric dam operates. Students learn how a dam produces electricity by viewing a scale model of a complete hydroelectric system that includes a miniature hand-crank generator. The model shows how more energy must be produced when additional electrical appliances are being used (periods of peak power usage). Students learn that in order to meet this demand by society for more electricity they must turn the hand crank faster to produce a greater amount of electricity.

### Part II RACE (15 minutes)

Students form six teams and compete in a "race" along a concrete pathway. A representative from each group is placed at a starting block along the pathway. The members of each representative's team are asked questions about hydropower. Questions range from easy (one point) to difficult (three points) and advance the associated number of spaces for each correct answer. Prizes are awarded to the two winning teams.

## Prework

Students should have basic knowledge of the hydrologic or water cycle and understand the difference between renewable and non-renewable energy sources.

Students should list the positive and negative impacts of hydroelectric power generation, discuss them in class and brainstorm solutions to the problems. Students should write down some of the solutions and learn if some of their ideas are presently being implemented and the reasons why or why not.

## Classroom Activity

Present a [video about hydropower generation along the Columbia River](#) wherein the hydrologic cycle and renewable versus non-renewable sources of electrical generation are discussed.

Students may also visit an actual dam. Dam tours are available for dams at Post Falls, Upper Falls, Cabinet Gorge, Grand Coulee, Long Lake, Nine Mile, Noxon Rapids and Long Lake. The best time for tours of local dams is in the Spring (April or May) when spillgates are open and students can observe cascading water. To arrange for a tour, contact Washington Water Power at 1-800-727-9170 extension 8759.

## Background Information

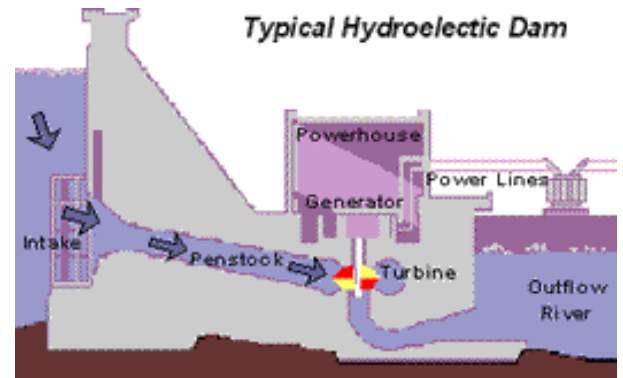
As a part of a continuous natural water cycle, the sun heats up water and draws (evaporates) water up from oceans, rivers, lakes and streams. The water, in the form of a gas, condenses into a liquid as it cools and rises, forming clouds. This water then returns to the earth in the form of precipitation (rain, snow, sleet, etc.). Rain and runoff from melting snow fills rivers and streams. Hydroelectric plants use the force of this flowing water to generate power. After this water passes through the plants' turbines, it is returned to the river.

Hydropower is a clean energy resource. It doesn't pollute the river, contribute to acid rain, deplete the ozone layer, or increase global warming. Of all the renewable electrical energy sources -- including geothermal, biomass, wind and solar -- hydropower currently costs the least and is the most reliable and efficient.

## Pictures



## Hydroelectric Power Generation



## Materials

- Three-dimensional scale model of a hydroelectric system
- Sidewalk "gameboard"
- Miniature, hand-crank generator
- Colored chalk
- Crepe-paper wristbands in six different colors for distinguishing teams
- Optional prizes for two winning teams