

Hydroelectricity

Last Updated: August 18, 2013

Background (directly from EIA and DOE)

Hydropower is one of the oldest sources of energy (DOE). It was used thousands of years ago to turn a paddle wheel for purposes such as grinding grain. Yet because the source of hydroelectric power is water, hydroelectric power plants must be located on a water source. Therefore, it wasn't until the technology to transmit electricity over long distances was developed that hydropower became widely used. The USA's first industrial use of hydropower to generate electricity occurred in 1880, when 16 brush-arc lamps were powered using a water turbine at the Wolverine Chair Factory in Grand Rapids, Michigan (Energy Information Administration).

Hydropower technologies use flowing water to create energy that can be captured and turned into electricity. The amount of available energy in moving water is determined by its flow or fall. Swiftly flowing water in a big river, like the Mississippi, carries a great deal of energy in its flow. Water descending rapidly from a very high point, like Niagara Falls in New York, also has lots of energy in its flow (EIA).

Hydropower is the most common and least expensive source of renewable electricity in the United States today. More than 6% of the country's electricity was produced from hydropower resources in 2008, and about 70% of all renewable electricity generated in the United States came from hydropower resources (EIA). Over half of U.S. hydroelectric capacity for electricity generation is concentrated in three states: Washington, Oregon, and California.

Hydropower technologies have a long history of use because of their many benefits, including high availability, low cost, and lack of pollution.

Objectives

Students will be able to:

- Describe where hydropower plants are supplying power globally.
- Describe how hydropower plants get their energy.

Materials Needed

- "Hydropower.pptx"

Safety Concerns

None.

Vocabulary

- Hydroelectricity: energy generated by forcing water through a turbine connected to a generator

Procedure

Time	Activity	Description	Supplies
20 minutes	Introductory Debate	What is hydropower? Engage the class in an informal debate; what might be the pros and cons of hydropower development?	
15 minutes	Lecture	<ol style="list-style-type: none"> 1. Where is hydropower used? 2. Where does the energy come from? Concept of energy conversions - Kinetic energy, hydrological cycle , etc <ol style="list-style-type: none"> a. What are the important variables to calculate the electricity output of hydro power plants 3. Environmental and social impacts 4. Hydropower pros and cons 	“Hydropower.pptx”

Additional Resources

Reputable

Energy Basics | Department of Energy.

http://www.eere.energy.gov/basics/renewable_energy/hydropower.html

Energy Kids: Hydropower | Energy Information Administration.

http://www.eia.gov/kids/energy.cfm?page=hydropower_home-basics

Hydroelectricity | US Environmental Protection Agency.

<http://www.epa.gov/cleanenergy/energy-and-you/affect/hydro.html>

Opinion / Newspaper

Youtube | How a power plant works <http://www.youtube.com/watch?v=cEL7yc8R42k>

Author(s)

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Funding Sources

Portions of this work were supported by a) the Leonard Gelfand Center for Service Learning and Outreach, and b) the Center for Climate and Energy Decision Making (SES-0949710) through a

cooperative agreement between the National Science Foundation and Carnegie Mellon University.

Next Generation Science Standards Alignment

HS-LS2-7: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

Crosscutting Concept: Stability and Change

HS-ESS3-1: Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

Crosscutting Concept: Systems and System Models

HS-ESS3-4: Evaluate or refine a technological solution that reduces impacts of human activities.

Crosscutting Concept: Systems and System Models