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**Energy from Water**

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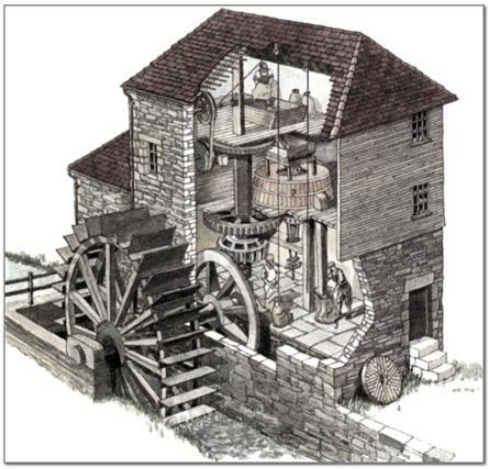
Rivers often start as small trickles of rain water or melting snow high in the mountains. Responding to the pull of gravity, the trickles flow downhill. They merge into larger and larger channels. High in the mountains, a river has a great store of potential energy. As it flows downhill, this potential energy changes into kinetic one. A bladed wheel mounted over a river or stream can be used to harness the water's energy. During the 1800s such water wheels were employed to run machines. Today water turns the turbines of electric generators that produce electricity. Electricity produced by flowing water is called hydroelectricity.



Water Wheel

Hydroelectricity has two main advantages. It produces very little pollution. And water in nature is never really used up. Liquid water does evaporate. But water vapor rises into the air, condenses into clouds, and returns to the earth as rain or snow. However, hydroelectricity can sometimes cause a problem. In certain areas, dams have killed species of water animals and plants by interrupting the natural flow of water. This interruption can sometimes interfere with the reproductive cycles of these living organisms (for example, salmon). The problem can be prevented by careful study of river life before a dam is constructed. For instance, a lot of dams are now being built with the help of fish ladders. These structures provide a way for fish to swim around a dam. Thus, the dam does not interfere with the activities of the fish.

Another way that can be used to produce electricity is a geyser. The latter shoots out jets of steam from water that boils naturally underground. Underground water in a geyser is boiled by geothermal energy. Geothermal energy is heat inside the earth. Heat is energy transferred between materials that have different temperatures. Energy is transferred from rocks to water trapped below the surface. The water heats up and can change into steam. When steam forms, pressure builds up until it is released as a geyser. Geothermal energy can be tapped by locating underground areas where steam or very hot water is trapped. The steam or hot water, once located, can be pumped out and used to turn turbines.

The ocean becomes another important source of electricity. Sea water can provide vast amounts of a fuel, such as hydrogen. Water is made of hydrogen and oxygen. The process by which hydrogen is separated from the oxygen in water is electrolysis.

Hydrogen can be used in place of fossil fuels to heat water and produce the steam for turning turbines. Unlike fossil fuels, hydrogen produces no pollution when it burns. Burning

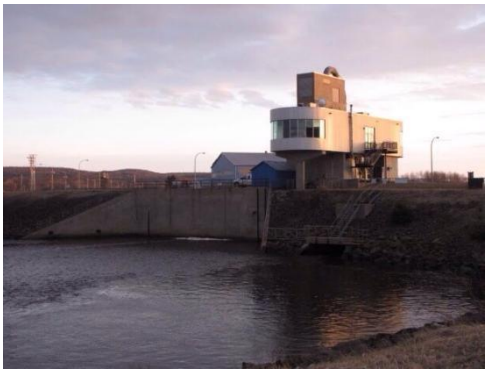
hydrogen produces ordinary water. However, hydrogen can burn explosively unless it is carefully controlled. A problem with using hydrogen from the ocean as a fuel is that electrolysis requires energy. It takes electricity to separate hydrogen from water. If applied to a large amount of ocean water, electrolysis would require a great deal of electricity. As yet, no effective means of providing electricity for this process has been perfected. In many cases, it would take more electricity to get the hydrogen than the hydrogen could provide when it is burned. However, research is continuing.

The tides are still another source of electricity. The incoming and outgoing flow of water can be used to spin the blades of turbines. The spinning turbines and alternators then generate electricity.

The tidal power plant built across the estuary of the La Rance River in Brittany, France has an installed capacity of 240 MW distributed between 24 bulb-type turbine generators, each with the capacity of 10 MW. In a world first for this resource of renewable energy, it produces around 500 GWh/year [1].

La Rance Power Plant, France

Another such hydroelectric power plant is located on the Annapolis River in Nova Scotia, Canada. North America's only salt water generating station can make as much as 20 MW of electricity and has a daily output of roughly 80-100 MWh, depending on the tides. It is also a tourist center that lets you witness the incredible power of the Bay of Fundy's world-renowned tides [2].



Annapolis Tidal Power Plant, Canada

There are a lot of advantages of using tides to generate electricity: tides are a perfectly predicable phenomenon, they are inexhaustible and carbon-free, and they have low environmental impact.

References:

1. La Rance Power Plant [Electronic resource]. – Mode of access: http://www.edf.fr. – Date of access: 13.03.2019.
2. Annapolis Tidal Station [Electronic resource]. – Mode of access: http://www.nspower.ca. – Date of access: 01.04.2019.