Hydroelectric Energy

Background

Hydroelectric power is the most widely-used renewable source of energy. People have used moving water to help them in their work throughout history. Flowing water creates energy that can be captured and turned into electricity. Hydroelectricity accounts for about 7% of total energy production in the US.

The most common type of hydroelectric power plant uses a dam on a river to store water in a reservoir. Water released from the reservoir flows through a turbine, spinning it, which in turn activates a generator to produce electricity. But hydroelectric power doesn't necessarily require a large dam. Some hydroelectric power plants just use a small canal to channel the river water through a turbine.

Another type of hydroelectric power plant—called a pumped storage plant—can even store power. The power is sent from a power grid into the electric generators. The generators then spin the turbines backward, which causes the turbines to pump water from a river or lower reservoir to an upper reservoir, where the power is stored. To use the power, the water is released from the upper reservoir back down into the river or lower reservoir. This spins the turbines forward, activating the generators to produce electricity.

Oklahoma has four hydroelectric power dams—Denison Dam, Eufaula Dam, Fort Gibson Dam, and Pensacola Dam—and one pumped storage plant—the Salina Pumped Storage Project.

Denison Dam, also known as Lake Texoma Dam, is located on the Red River between Texas and Oklahoma. The dam impounds Lake Texoma. The purpose of the dam is flood control, water supply, hydroelectric power production, river regulation, navigation and recreation. It produces roughly 25,000 megawatt hours of electricity per year. The dam was completed in 1943.

Eufaula Dam is a dam across the Canadian River in southeastern Oklahoma. Completed in 1964, it impounds Eufaula Lake, one of the world's largest man-made lakes, covering 102,500 acres. The dam provides flood control, water supply, navigation and hydroelectric power generation. It supports a 90 MW power station. Three generators produce 30 MW each.

The Fort Gibson Dam is a gravity dam on the Grand (Neosho) River in northeastern Oklahoma. The purpose of the dam is flood control and hydroelectric power production. It was authorized by the Flood Control Act of 1941 and construction began the next year. During World War II construction was suspended and it continued in May 1946. In June 1949, the river was closed and the entire project was complete in September 1953. Four generators produce 208,482 Megawatts of electricity each year.

The Pensacola Dam, also known as the Grand River Dam, is located on the Grand River between Disney and Langley. The dam is operated by the Grand River Dam Authority and creates Grand Lake o' the Cherokees. It was constructed between 1938 and 1940 for the purposes of hydroelectric power generation, flood control and recreation. It is Oklahoma's first hydroelectric power plant and is the longest multiple-arch dam in the world. The idea to construct a dam on the Grand River originated in the late 1800s with Henry C. Holderman, a Cherokee Nation citizen, who wanted to provide electric power to the Cherokee Nation. Holderman and a few colleagues conducted the first survey of the river in 1895 on their own handmade houseboat.

The Salina Pumped Storage Project is a 260-megawatt pumped-storage power station near Salina. Its construction was in response to growing power demands and a lack of dam sites on the Grand River. The first phase was completed in 1968 and the second in 1971. The upper reservoir for the power station is Lake W. R. Holway which was built on Saline Creek, and the lower reservoir is Lake Hudson on the Grand River. During periods of lower power demand, water is pumped from Lake Hudson to Lake Holway and released back down through the pump-generators during periods of high energy demand.

Vocabulary

dam—a barrier constructed across a waterway to control the flow or raise the level of water
design—to plan out in systematic, often graphic form.
energy—the ability to do work
engineering design—the process of devising a system, component or process to meet desired needs
hydroelectric power plant—a power plant that uses water turbines to generate electricity
hydroelectricity—electricity produced by the energy of moving water
hydropower—generating power from the movement of water. Also called hydroelectric power.
kinetic energy—the energy of motion. For example, a spinning top, a falling object and a rolling ball all have kinetic energy.
mechanical energy—energy used to create motion. It is the sum of an object's kinetic and potential energy.
model—a small object, usually built to scale, that represents another, often larger object.
potential energy—the energy stored by an object as a result of its position. For example, a roller coaster at the top of a hill, or water being held behind a dam.
power plant—a complex of structures, machinery, and associated equipment for generating electric energy.
reservoir— natural or artificial pond or lake used for the storage and regulation of water.
rotational rate—how fast something turns. A measure of speed indicated by the number of turns that take place during a period of time. For example, 100 revolutions per minute.
turbine—a machine in which the kinetic energy of a moving fluid is converted into mechanical energy by causing a series of buckets, paddles or blades on a rotor to rotate.
waterwheel—a wheel that rotates by direct action of water; used to generate power or do work