

HYDROPOWER AT A GLANCE



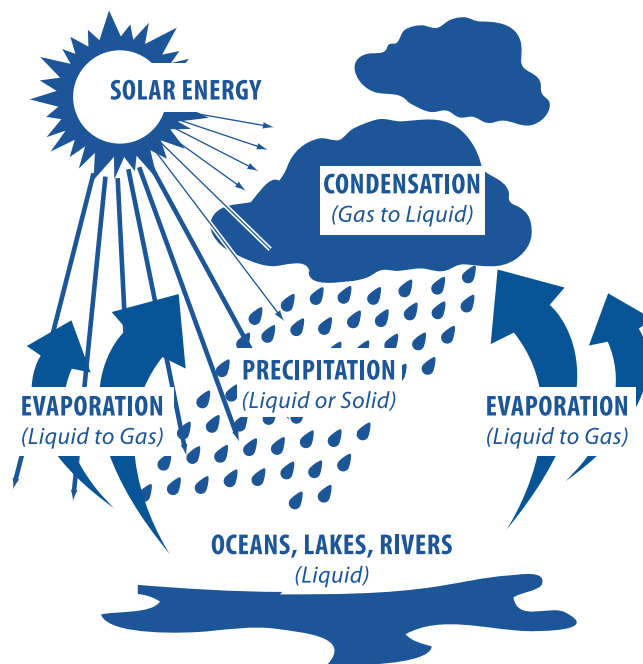
Hydropower provided about 1 percent of all energy consumed in the United States in 2022.

WHAT IS HYDROPOWER?

Hydropower (from the Greek word *hodor*, meaning water) is energy that comes from the force of moving water. The fall and movement of water is part of a continuous natural cycle called the water cycle.

Energy from the sun evaporates water in the Earth's oceans, lakes, and rivers and draws it upward as water vapor. When the water vapor reaches the cooler air in the atmosphere, it condenses and forms clouds. The moisture eventually falls to the Earth as rain or snow, replenishing the water in the oceans, lakes and rivers. Gravity drives the moving water, transporting it from high ground to low ground. Moving water can be extremely powerful.

THE WATER CYCLE



MARINE HYDROKINETICS

In the U.S., most hydropower is generated using conventional designs. Hydropower has the potential for growth by using marine energy or hydrokinetic technologies: energy from moving waves, tides, and currents.

HYDROPOWER PLANT

A conventional hydropower plant is a system with three parts: a power plant where the electricity is produced; a dam that can be opened or closed to control water flow; and a reservoir (artificial lake) where water can be stored.

HEAD AND FLOW

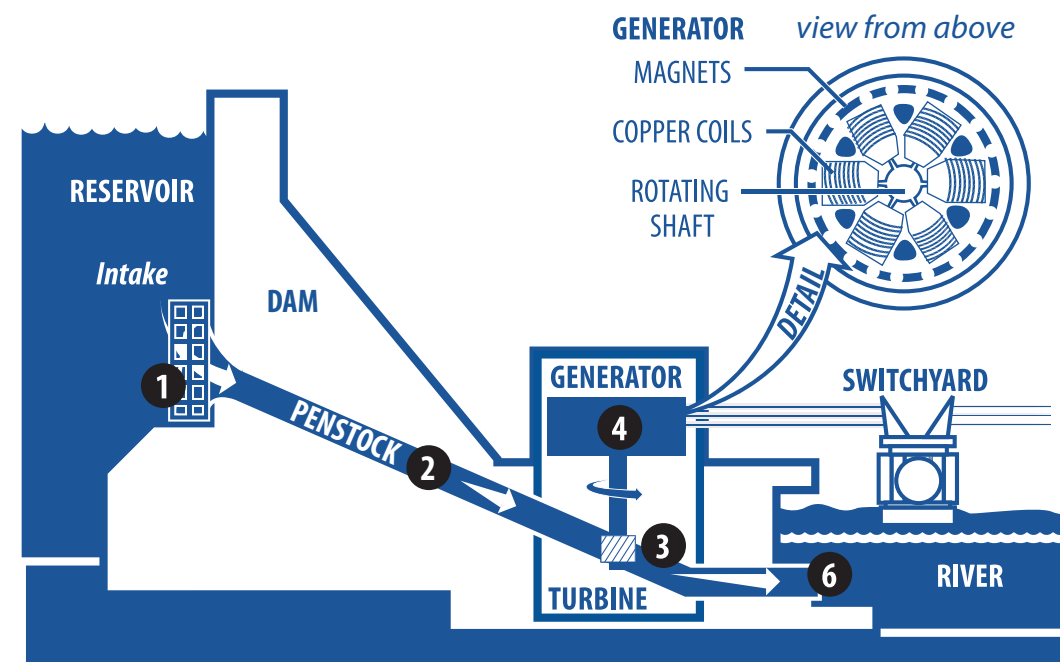
The amount of electricity that can be generated at a hydro plant is determined by two factors: head and flow. Head is how far the water drops. It is the distance from the highest level of the dammed water to the point where it goes through the power-producing turbine. Flow is how much water moves through the system—the more water that moves through a system, the higher the flow. Generally, a high-head plant needs less water flow than a low-head plant to produce the same amount of electricity. If a river has high flow rates, a reservoir may not be needed.

STORING ENERGY

One of the biggest advantages of a hydropower plant is its ability to store energy. The water in a reservoir is, after all, stored energy. Water can be stored in a reservoir and released when needed for electricity production. During the day when people use more electricity, water can flow through a plant to generate electricity. Then, during the night when people use less electricity, water can be held back in the reservoir. Storage also makes it possible to save water from winter rains for generating power during the summer, or to save water from wet years for generating electricity during dry years.

PUMPED STORAGE SYSTEMS

Some hydropower plants use pumped storage systems. A closed pumped storage system operates much like a public fountain does; the same water is used again and again. At a pumped storage hydropower plant, flowing water is used to make electricity and then stored in a lower pool. Depending on how much electricity is needed, the water may be pumped back to an upper pool. Pumping water to the upper pool requires electricity so hydro plants usually use pumped storage systems only when there is peak demand for electricity.



1. Water in a reservoir behind a hydropower dam flows through an intake screen, which filters out large debris, but allows fish to pass through.
2. The water travels through a large pipe, called a penstock.
3. The force of the water spins a turbine at a low speed, allowing fish to pass through unharmed.
4. Inside the generator, the shaft spins coils of copper wire inside a ring of magnets. This creates an electric field, producing electricity.
5. Electricity is sent to a switchyard, where a transformer increases the voltage, allowing it to travel through the electric grid.
6. Water flows out of the penstock into the downstream river.

TOP HYDRO STATES

