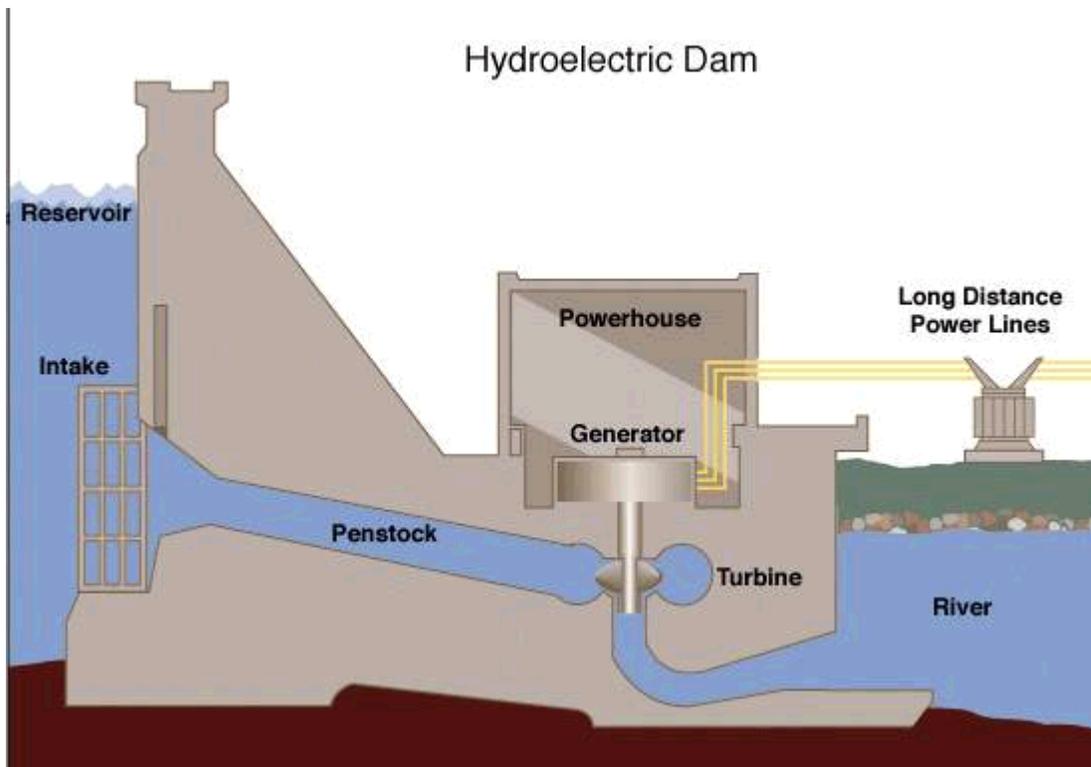


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Hydroelectricity What is hydroelectricity?

Hydroelectricity or hydroelectric power is the electricity obtained by harnessing the power of water flowing down from a high level. It is a timeless and renewable resource. Huge generators convert the potential energy of falling or fast moving water into electrical energy. The potential energy of the water is first converted into mechanical energy and then into electrical energy. Water, usually stored in dams, is led down through large pipes or tunnels to lower levels, and in the course of the fall, the water rotates turbines. The mechanical energy produced is converted to electricity by the generators connected to it. The structure that houses the turbines and generators is called the powerhouse. Transformers change the alternating current produced by the generators into current of very high voltage for easy transmission through long distances. In short, a typical hydropower plant includes a dam, reservoir, pipes, a powerhouse and an electrical power substation. The dam stores water, pipes carry it from the reservoir to turbines inside the powerhouse. The water rotates the turbines, which drive generators that produce electricity.



Picture from TVA website: [Http://tva.gov/power/hydroart.hmt](http://tva.gov/power/hydroart.hmt)

Hydroelectricity consumption in society today

“Hydroelectric power supplies 20% of the world’s electricity. Norway produces virtually all of its electricity from hydro, while Iceland produces 83% of its requirements, Austria produces 67 % of all electricity generated in the country from hydro (over 70 % of its requirements). Canada is the world's largest producer of hydro power and produces over 70% of its electricity from hydroelectric sources”(wikipedia.com) . Countries with the most hydro-electric capacity are as listed:

- Canada, 341,312 GWh (66,954 MW installed)
- USA, 319,484 GWh (79,511 MW installed)
- Brazil, 285,603 GWh (57,517 MW installed)
- China, 204,300 GWh (65,000 MW installed)

- Russia, 173,500 GWh (44,700 MW installed)
- Norway, 121,824 GWh (27,528 MW installed)
- Japan, 84,500 GWh (27,229 MW installed)
- India, 82,237 GWh (22,083 MW installed)
- France, 77,500 GWh (25,335 MW installed)

These are 1999 figures and include pumped-storage hydroelectricity schemes (wikipedia.com)

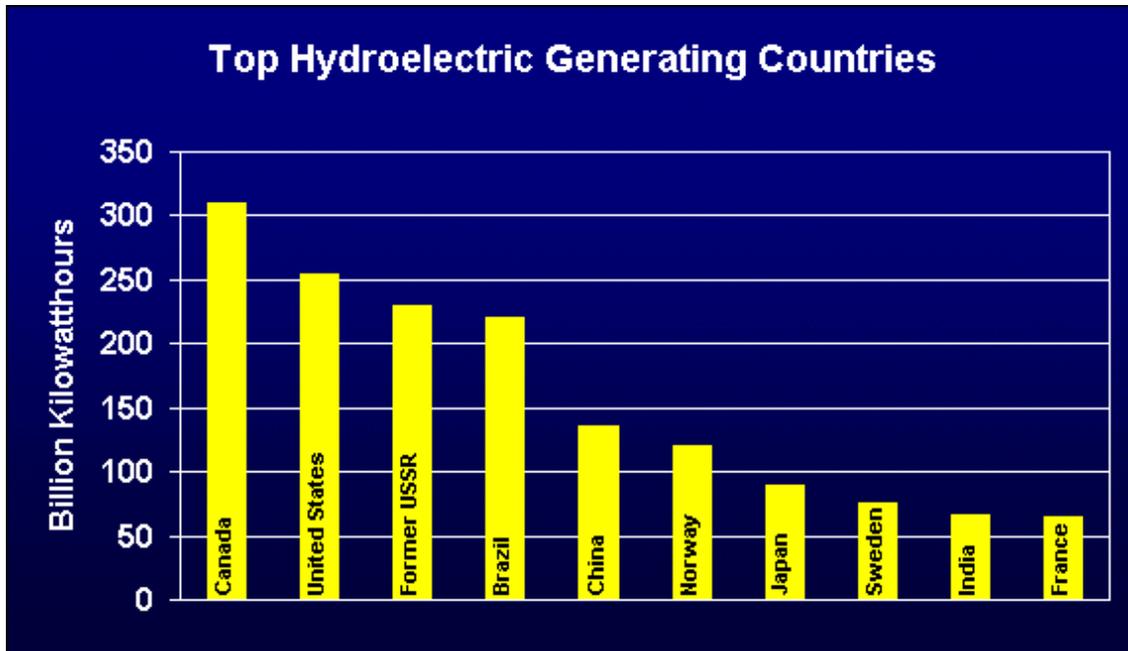


Chart from www.wvic.com/hydro-facts.htm

Hydroelectricity in the United States

Although most energy in the United States is produced by fossil-fuel and nuclear power plants, hydroelectricity is still important to the Nation, as about 10 percent of total power is produced by hydroelectric plants. According to Foundation of Water and Energy Education this 10% can be thought of in the following ways:

- Hydropower produces more than 90,000 megawatts of electricity annually, which is enough to meet the needs of 28.3 million consumers.
- Hydropower accounts for over 90% of all electricity that comes from renewable resources (e.g., solar, geothermal, wind, biomass).
- Hydropower is generated at only 3% of the nation's 80,000 dams.

Hydropower is currently the largest and least expensive source of renewable electricity produced in the United States according to the U.S. Department of Energy. In the Northwest, hydropower is an even larger part of each person's daily life. Up to 80% of the electricity in the Northwest is produced by hydropower each year. That's enough electricity to meet the needs of 13.6 million homes. And because hydropower is one of the lowest cost forms of energy, most Northwest residents have a significantly lower electric bill than residents in other parts of the country.

The largest dam in the United States is The Grand Coulee Dam which produces 7,600 megawatts located in the state of Washington. The United States most famous dam is the Hoover Dam built in 1935 on the Colorado river situated in the Black Canyon. The Hoover Dam has 17 turbines that produce 4 billion kilowatts per hour. The Glen Canyon Dam, also a large dam, was also built on the Colorado river situated in the entrance to the Grand Canyon. The Colorado river is in fact the most dammed river in all the United States. The best known hydroelectric projects are associated with the large dams that have large reservoirs which generate thousands of megawatts of electricity on demand. In fact, the six largest dams in Oregon, Washington and Idaho account for 50% of available hydroelectric power in these states. (www.eia)

U.S. Electric Utility Net Generation of Electricity

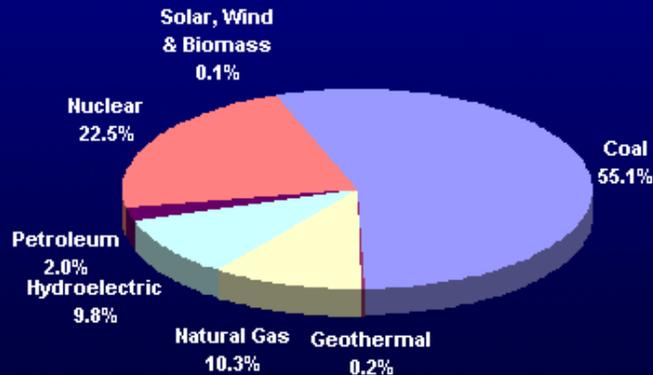


Chart from www.wvic.com/hydro-facts.htm

It is worth noting, that hydroelectric power does not have to be produced on a large scale. Some developing nations, such as China and parts of Africa, are making small dams, which can produce between 1 kilowatt and 1 megawatt of electricity. Small dams have several advantages, for example they can be built in one or two years, have a long life and don't need much maintenance. They can be operated by remote control, so they don't need so much man-power. Small dams are reliable and flexible, as they can react quickly to changes in energy demand because of their fast start-up and shut-down response.

Advantages and disadvantages of hydroelectricity

There are many advantages and disadvantages concerning hydroelectricity. Hydroelectricity are good in some ways, but like anything they

have some flaws. It is possible that the alternatives to hydroelectric projects might be better. It is also possible that alternatives to hydroelectric projects would be worse. The following will list some advantages and disadvantages.

Some advantages to hydroelectric power are:

- Fuel is not burned so there is minimal pollution
- Water to run the power plant is provided free by nature
- It's renewable - rainfall renews the water in the reservoir, so the fuel is almost always there.
- Capable of generating large amounts of power (large plant's typical capacity = 300-400 megawatts).
- Currently inexpensive.
- Can provide a place for people to enjoy recreational activities such as boating or swimming and become a popular tourist attraction.
- Very few breakdowns.
- If needed, dams can be shut down instantly, whereas nuclear plants can take days.

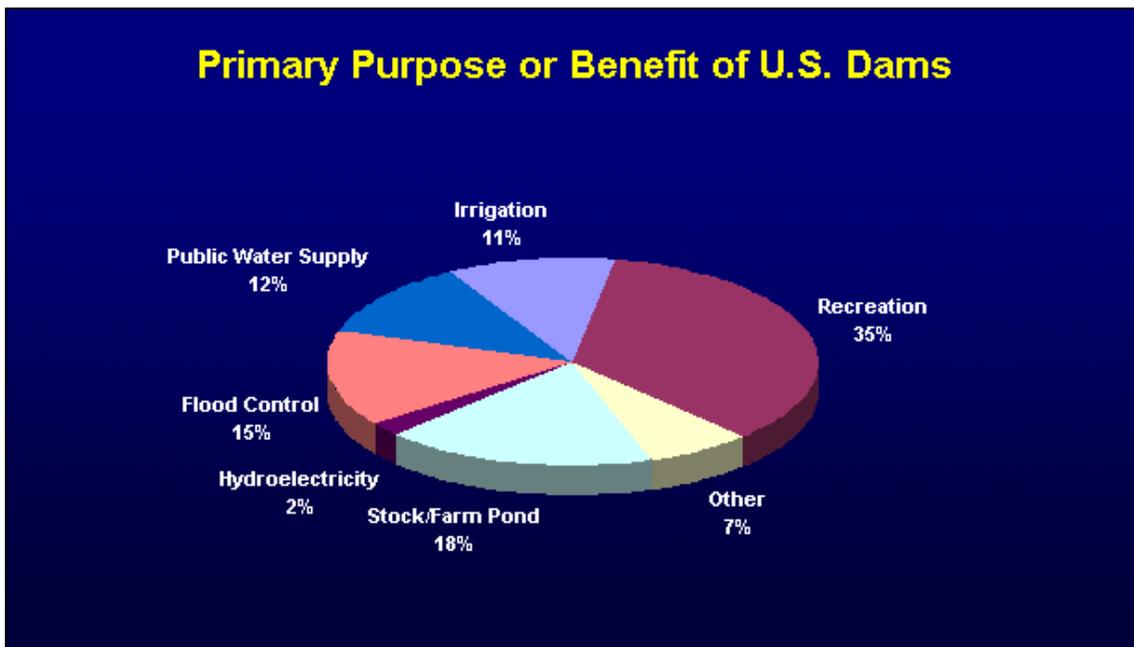


Chart from www.wvic.com/hydro-facts.htm

Some disadvantages of hydroelectricity are:

- Dams cause disruption in aquatic and terrestrial ecosystems.
- Locations aren't always reliable (drought) or easy to come by.
- More expensive than fossil fuels.

- Inefficient energy source
- Impact on the human population- when a dam is built thousands of people may have to be displaced because the land is needed for the dam.
- Dams can break in a massive flash flood.
- Dams are expensive to build and due to drought may become useless, or produce much less power than originally planned.
- Hydroelectric power production requires flooding of entire valleys and scenic areas.
- Studies show that the plant decay caused downstream of major dams may produce as many greenhouse gases as more conventional methods of producing electricity.

Conclusion

Hydroelectric power has always been an important part of the world's electrical supply, providing reliable, cost effective electricity, and will do so in the future. Hydropower has environmental impacts different from those of fossil fuel power plants. The actual effects of dams and reservoirs on various ecosystems are just now becoming understood. The future of hydroelectric power will depend upon future demand for electricity, as well how societies value the environmental impacts of hydroelectric power compared to the impacts of other sources of electricity.

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