HYDROELECTRICITY

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Pros and Cons

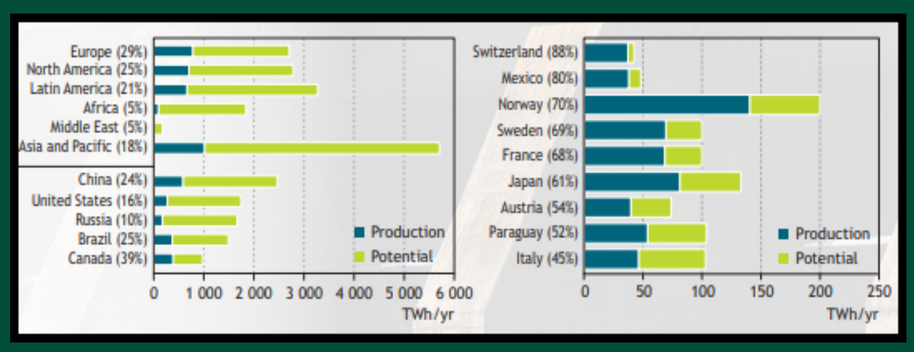
Like any other form of energy, hydroelectricity has its pros and cons. The clearest disadvantage it has is the disruption of an ecosystem. The river turns into a reservoir upstream. This reservoir spills out and floods the surrounding environment. This flooding can kill or force a relocation of organisms. Plants, wildlife, and even humans can be affected by this. Take for instance The Three Gorges dam built in China. This is the largest dam currently constructed and was highly controversial. It forced the relocation of 1.3 million people. Additionally, many dams do not allow fish to pass through, disrupting reproductive cycles of some species. They also result in a large amount of sediment build up behind the dam. That being said, hydroelectricity is a clean power source. It won't produce greenhouse gasses compared to the likes of burning fossil fuels. It requires no imports, once it is built it is there and produces electricity from virtually nothing.

Efficiency

A modern dam has an efficiency of about 90% which is extremely efficient compared to other electricity generating methods. For instance, compare this to generating energy from coal. With coal you first have to light the coal on fire, then the first makes the water boil, then the steam from the water turns the turbine. Each one of those steps is a loss of energy. But in a dam water directly turns the turbine, no extra steps required. This of course makes it efficient when compared to others. This saves a tremendous amount of energy that can just be used to power a home, rather than help generate power.

History

The use of flowing water to create power, or rather work is nothing new. The first water wheels have been dated back to the third century BC. It was cleverly used in different ways to produce material goods such as lumbar, paper, grain, metal goods, and more. It wasn't until 1878, that water was used to directly be turned into electricity. For reference, a hydroelectric power plant created in Appleton, Wisconsin in 1882, had an output of 12.5 kilowatts. From here the amount of dams quickly began rising. In 1889 there were 200 dams in the United States, and by 1920, 40% of all of the power produced in the US was from hydroelectricity. The Hoover Dam finished construction in 1936, and produced 1,345 MW, today it is up to 2,000 MW. This would develop further throughout the century, but ultimately, as more and more dam locations are taken up, be outpaced by fossil fuels. Today, through more than 2,000 sites, it generates 6.6% of all power for the US, making it a decent portion of all renewable energy produced.



Expandability

Hydroelectricity does however have a limit. There are only so many spots that can be dammed, there is only so much energy that can be taken from the water. Switzerland for example, a country where 60% of their energy is produced by hydroelectricity has been estimated at having reached 88% of their total potential energy through hydroelectricity. That is not to say that every country has used the majority of their real estate. For example, Africa has only used 5% of its total potential for building dams, while Europe, the most developed hydroelectricity wise, is about 29% potential. There is plenty of room left to expand and more major dams (capacity of 1 MW or greater) are already planned, roughly 3,700.

How it works

The first step in generating electricity from water is getting the water to flow down the penstock. This is done well in advance of the dam being made, when engineers are picking a spot for the dam. They have to find a large river that has a large drop in elevation, so gravity can just force the water down the penstock. Then when the water gets near the end of the penstock it will then transfer its kinetic energy to the blades of the hydraulic turbine causing it to spin. As this hydraulic turbine spins it will start to generate mechanical energy. Then this mechanical energy is sent to a hydroelectric generator, which converts it to electricity. But when there is not a lot of electricity needed, such as during the night, water will actually move up the dam in a process called pumped storage. All that happens during this time is the water is pumped back up into the reservoir, to be used at a later time when there is a large need for electricity. But if there ever is so much water stored in the dam, there are emergency doors to let the water out to prevent the dam from collapsing.