

Benefits and Drawbacks of Hydroelectricity

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ABSTRACT: *Hydroelectricity is the word used to describe to hydropower produced electricity; the generation of electricity by the use of dropping or moving water's gravitational influence. This is the most commonly utilized source of solar energy, accounting for 15 % of global electricity generation, generating 3,427 terawatt-hours of electricity in 2010, and for the next 25 years it is projected to rise by around 3.1 percent per year. Hydropower is generated in 130 countries worldwide, with 32 percent of global hydropower being generated by the Asia-Pacific region in 2010. With 721 terawatt-hours of output in 2010, World's largest producer of hydroelectricity, accounting for about 17 percent of domestic electricity consumption. The Three Gorges Dam and Xiluodu Dam in China, Itaipu Dam across the Brazil/Paraguay border, and Guri Dam in Venezuela are now 4 hydroelectric power stations greater than 10 GW. The value of hydroelectricity is considerably lower, making renewable energy a profitable resource. The overall price per kilowatt-hour of electricity from a hydro station greater than 10 megawatts is 3 to 5 U.S. cents. It is also a versatile source of electricity because, in order to adjust to increasing energy requirements, the quantity generated by the station can be adjusted high or low quite rapidly. Damming, nevertheless, prevents the flow of the river and therefore can affect local habitats, and it also includes the relocation of people and animals to create large dams and reservoirs. The project generates no direct waste and has a substantially lower production level of greenhouse gases (CO₂) than fossil fuel based power stations once a hydroelectric plant is built.*

Keywords: *Advantages, Dams, Disadvantages, Hydropower, Reservoir, Turbine system, Renewable energy.*

INTRODUCTION

Hydropower is generated electricity by the use of moving water energy. Typically originating in mountains and hills, rainfall or melting snow produces rivers and streams which ultimately flow to the ocean. For decades, this energy has been abused. Farm workers have been using water wheels to process wheat into flour since before the ancient Greeks. Installed in a river, a water wheel with baskets positioned from around wheel collects flowing water. The flowing river's kinetic energy spins the wheel and is transformed to the mechanical energy that runs the mill [1]. Hydropower had become a source for electricity production in the late nineteenth century. In 1879, the first hydroelectric power plant was constructed at Niagara Falls. Street lamps were powered by hydroelectric power in 1881 in the city of Niagara Falls. In Appleton, Wisconsin, in 1882, the world's first hydropower plant began operating in the USA.

A traditional hydroelectric generators is a three-part system: an electrical plant whereby electricity is generated; a dam which can be raised or lowered to regulate the flow of water; and a reservoir where it would be able to keep water. The water passes into an intake behind the dam and moves through a rotor against the wings, allowing them to spin. To generate energy, the motor rotates a generator. The quantity of power which can be produced depends on how much the water falls as well as how much water passes thru the network. The power can be delivered to households, factories, and companies over long-distance powerlines [2]. Nearly one fifth of the world's electricity is generated by hydroelectricity. The 5 biggest hydropower manufacturers in 2004 were China, Canada, Brazil, the United States, and

Russia. The 3 Gorges on China's Yangtze River is among the world's largest hydroelectric dams. The building of the reservoirs for this project began in 2003, but the plant also isn't projected to be operationally feasible until 2009. The reservoir is 1.4 miles (2.3 kilometres) long and 185 metres (607 feet) deep. The easiest way of producing power nowadays is hydroelectric power. It's because the energy supply, water currents, is unlimited after a reservoir has been created and the machinery installed. It is a renewable source of fuel which, through snow and rainfall, is sustainable annually. Hydroelectricity is also easily accessible; the water flow thru the generators can be regulated by engineering to generate electricity on demand. Furthermore, reservoirs, such as swimming and boating, can offer outdoor spaces. But damming rivers can destroy wildlife and other natural resources or damage them. Some fish may be prohibited from swimming up to breed, such as salmon. Techniques such as fish ladders allow salmon reach upstream breeding regions by dams, however the existence of hydro plants affects their patterns of movement and harms fish stocks. In the water, hydropower plants may also lead to low concentration of dissolved oxygen, which would be detrimental to river ecosystems[1].

Advantages of Hydroelectricity

1. Electricity can be generated at a steady rate once a dam is built.
2. The sluice gates can be shut if electricity is not required, stopping the generation of electricity. When energy supply increases, the water could be stored to be used at another moment.
3. Dams are built to last for several years, and therefore can add for several years / centuries to the production of electricity.
4. For water sports and leisure / pleasure activities, the lake that forms behind the dam could be used. With their own right, hydroelectric plants are becoming tourist destinations.
5. For agricultural irrigation, the lake's water may be used.
6. The accumulation of lake water ensures that whenever the water is discharged to generate electricity, energy is absorbed unless required.
7. Electricity generated by reservoir structures does not produce greenhouse gas emissions while in operation. The environment is not tainted by them.
8. Renewable: Renewable are hydroelectric resources. This means we can't make use of it. There are, nevertheless, only a small number of suitable dams where it is possible to create hydropower, and far fewer spots where these projects are viable.
9. Green: The production of electricity from hydropower is not self-polluting. Mostly during building of these generating stations, the only emissions happens.
10. Reliable: Hydroelectricity is energy which is very accurate. In terms of the electric energy that the plant provide, there's very few variations, until a different output is needed. Hydroelectric generators is used as a base load source of energy by nations which have significant hydropower assets. As long as the magazine contain water, power can be produced.

11. Flexible: Modifying water flow and electricity output is simple, as described earlier. Water flow is decreased at times when energy consumption is minimal, and the magazines amounts are maintained for times when energy consumption is elevated.
12. Safe: Hydroelectricity is much safer compared to, among other things, fossil fuels and nuclear energy. No fuel is involved (other than water that is).
 - Hydroelectric power is clean. It protects 22 billion barrels of gas or 120 million tonnes of coal from being burnt every year.
 - Greenhouse gases and other environmental damage are not generated by hydroelectric power.
 - Hydroelectricity leaves no wastages behind.
 - Reservoirs constructed by Wisconsin hydropower plants have broadened recreational resources based on water and support diverse, healthy and productive fishing industry. In reality, hydroelectric dams have significantly higher catch rates for game fish such as walleye and smallmouth bass than natural lakes[2].

The main form of renewable energy is hydropower. It supplies more than 97 percent of all electricity provided by renewable energy sources. Less than 3% of renewable electricity output comes from other means, like solar, geothermal, wind and biomass.

- Hydropower dam projects offer a range of water-based recreation areas, including fishing, water activities, canoeing, and hunting for water fowl.
- Hydro operators own a vast amount of land around several reservoirs open to the public for applications such as hiking, hunting, snowmobiling, and skiing.
- In their hydropower ventures, hydro operators have many recreational amenities, like ship landings, bathing areas, toilets, camp sites, fishing piers, walking and walking trails, canoe ports, and car parking.
- To regional industries, hydroelectric dams lead. A analysis of one Wisconsin medium-sized hydropower project found that the recreational benefit surpassed \$6.5 million annually for locals and tourists[2][3].

Hydroelectricity doesn't really "use" water, it returns all water to its source of origin. Hydroelectric power can be produced 24/7 on an infinite basis, assuming that the body of water it uses rarely runs dry. That is another entirely sustainable form of energy as well. Once in operation, the power plants do not produce any waste by-products in their conversion process. When power is in higher demand, dams installed can also close the doors and store the water to be used[4].

Disadvantages of Hydroelectricity

1. Dams are very costly to build and have to be designed to a really excellent quality.
2. The large value of the building of dams ensures that they should run to be sustainable for several years.
3. The flooding of vast stretches of land implies that it threatens the natural ecosystem.

4. People who live in towns and villages which are submerged in the valleys should move away. This implies they're losing their fields and companies. Citizens are forcefully displaced in some nations so that hydro-power projects could go forward.
5. Significant geological damage can be caused by the construction of massive dams. The construction of the Hoover Dam in the USA, for instance, caused a series of earthquakes and distressed the surface of the earth at its site.
6. While modern dam planning and construction is fine, old dams have been known to be breached in the past (the dam gives under the weight of water in the lake). This contributed to casualties and floods.
7. Dams designed to obstruct a river's progress in one country typically mean that the supply of water from the same river in the next country is out of their reach. This can result in severe difficulties among neighbouring nations.
8. Constructing a major dam changes the level of the existing groundwater. The Aswan Dam construction in Egypt, for instance, has changed the effect on the water level. As salts and toxic minerals are accumulated in the stone work from the 'growing damp' induced by the changing ground water levels, this gradually contributes to destruction to many of its historical buildings.
9. Environmental effects: Environmental consequences of hydroelectric power are linked to natural intervention due to water damage, altered flow of water and road and power line building. A exchange relationship among multiple biological and physical variables is that hydroelectric plants can impact fishes. More consumer interests are connected to fish species management, which helps make this an area in which many have strong views. Physical factors like water level, water velocity and shelter opportunities and access to food are influenced by aquatic ecosystems. Draining would also be utterly disastrous for the fish. In addition, depending on the form and stage of the lifecycle, the amount of water can have diverse impacts on the fish in a river. Not that all uncontrolled lakes and rivers, cos of significant variations in flow, are ideal in terms of capture fisheries.
10. Costly: In particular, it is costly to create power stations. No exception to this are hydro electric stations. Such projects, on the other hand, wouldn't need a lot of employees and maintenance expenses are generally low.
11. Droughts: The generation of electricity and the price of energy are directly linked to how much water is available. Potentially, a drought may impact this.
12. Small reservoirs: We already have begun to use appropriate hydroelectric power plant storage tanks. There are presently about 30 large power plants under construction that are projected to produce over 2,000 MW. In the last two years, just a few of these initiatives has been launched[2][5].

Hydropower generators are very costly to create, like all power plants, and must be constructed to a very high quality. The high cost implies that to become profitable, plants should run for a long time. The construction of dams can also lead to soil floods, which can

lead to the degradation of the natural ecosystem and the native environments of animals or even humans. The construction of hydroelectric power projects also can create a lot of issues with water access. The establishment of a dam in one location can mean that water flow is no longer regulated by those down river. In areas that adjacent nations share a source of water, this may create conflict[6].

A dam on a river is used by the most popular variety of hydroelectric plant to prevent flooding. A turbine flows via runoff water from the dam, spinning it, which in turn stimulates a process to produce energy. But a large dam is not necessarily necessary for hydroelectricity. To funnel the river water via a turbine, some hydroelectric plants only use a tiny canal. A further kind of hydroelectric plant can also hold power - named as pumped storage plant. The energy is sent into the electricity generation from the power grid. Then the turbines turn the generators backwards, allowing the generators to pump the water to an upper reservoir from a lake or lower reservoir, where the electricity is collected. The water is released from the upper reservoir back down into the river or lower reservoir in order to use the electricity. This spins forward the turbines, triggering the turbines to generate electricity[7].

CONCLUSION

For several nations, fulfilling the emerging needs for energy produces challenging judgments. The background for judgement is also shifting, especially in view of the imperatives of climate change that promote a shift away towards sources of energy that contribute to global warming. Hydroelectricity is a proven technology that harnesses energy from higher altitudes to lower altitudes. It comes in different shapes from massive dam programs to small run-of-river facilities. Hydropower is clean and has low emissions of greenhouse gases. It is a luxury source of power, offering a variety of services. These include the production of base load and peak load, and encouragement for many other types of production of electricity, especially renewable. Given such advantages, resulting in severe society and the environment, hydroelectric technologies have been particularly contentious throughout recent years. The development of platform to improve great training and sustainable hydropower projects has been a problem for hydropower developers and operators, as well as government planners and regulators. Investors and growth partners have built their own methods in a similar way. Importantly, in these attempts to analyse and direct hydroelectric conservation, there's been some collaboration. There is a huge international awareness of the main sustainability concerns which need to be tackled by the hydropower sector at this moment in time, as well as of the paths to consistent good practise for those numerous topics.

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