

## THE BENEFITS AND DRAWBACKS OF HYDROELECTRIC POWER PLANTS

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**Abstract:-** Through the application of gravity and the usage of water that is either flowing or falling, hydroelectric power is produced. The generation of electrical power using gravity force is known as hydropower. The most extensively utilised type of renewable energy produced 3,427 terawatt hours, or 16%, of the world's electricity in 2010. For the following 25 years, a growth of around 3.1% per year is anticipated. The Asia-Pacific area, which generates hydropower in 150 nations, accounts for about 32% of the global total. The greatest hydroelectric sector in the world is found in China, which in 2010 produced 721 terawatt-hours of energy, or 17% of the country's total energy consumption. There are now four hydroelectric power plants with a capacity more than 10 GW: the Guri Dam in Venezuela, the Itaipu Dam in Brazil, and the Three Gorges Dam in China. Due to its competitive price, hydroelectricity is a viable renewable energy source. Cost per kilowatt-hour for a typical hydroelectric plant with a capacity exceeding 10 megawatts ranges between 3 and 5 cents. Also, the station's output of electricity can be instantly increased or decreased to meet shifting energy demands. Damming Yet, when major dams and reservoirs are erected, river flows are disrupted, local ecosystems are harmed, and people and wildlife are frequently compelled to relocate. Hydroelectric projects release significantly less carbon dioxide (CO<sub>2</sub>) than fossil fuel-driven electricity facilities and produce no direct waste compared to those fueled by fossil fuels.

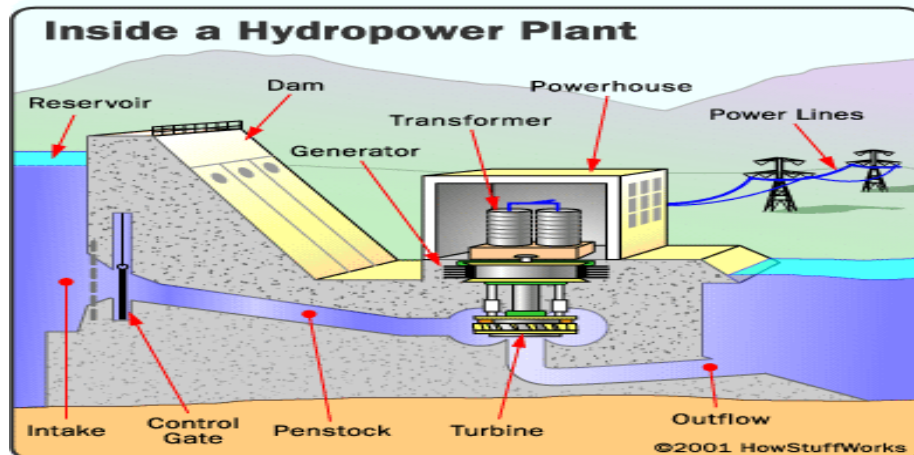
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### I. INTRODUCTION

A hydropower uses the energy of moving water to produce electricity. Rain and snow, which typically come from mountains or hills, form streams and rivers. This form of energy has been used for ages. Farmers have used water wheels to grind wheat into flour since the time of the ancient Greeks. Water flowing across a river is captured in buckets placed all around a water wheel. The mill's wheels are turned by the kinetic energy of the flowing water. In the late 19th century, electricity was first produced using hydropower. The first hydroelectric power plants were built near Niagara Falls in 1879.

In order to light its street lamps, the city of Niagara Falls started harnessing hydropower in 1881. In 1882, Appleton, Wisconsin, was chosen as the location for the nation's first hydroelectric power plant. In a reservoir that is controlled by a dam that is opened or closed to manage water flow, water can be stored. A hydroelectric plant normally consists of three components: a power plant that generates electricity, a dam that regulates water flow, and a reservoir. The turbine blades turn as a result of the water pressing against them when it enters the dam through an intake. Turbines turn generators to generate electricity. You can produce any amount of power you want depending on how much and how quickly the water drips. In addition to long-distance electric lines, electricity can also be transported over a telephone network. Nearly one-fifth of the world's electricity is generated by hydroelectric power. The five largest producers of hydropower in 2004 were China, Canada, Brazil, the United States, and Russia. Three Gorges on China's Yangtze River has one of the world's largest hydropower plants. In 2003, the reservoir for this plant began to fill, but it will not be ready for full operation until 2009. The dam is 607 feet (185 meters) high and 1.4 miles (2.3 kilometers) wide. Electricity is today generated cheapest by hydropower. Once the dam and equipment are built, the flowing water becomes the source of energy. Snow and rainfall are renewable

sources of yearly energy. A hydropower can also be easily found. Its flow can be controlled by the engineers to generate electricity on demand. Recreational opportunities are also available at reservoirs, including swimming and boating. Damming rivers can destroy or compromise natural resources such as wildlife. In some cases, such as salmon, some fish cannot swim upstream to spawn. Although salmon can cross dams and reach upstream spawning grounds using fish ladders, the presence of hydroelectric dams disrupts their migration patterns and harms their populations. Low dissolved oxygen levels in the water can also be caused by hydroponically grown plants, harming river habitats.



### Advantages of Hydroelectricity :-

1. Water flow and electricity output are easily adjustable. When the power consumption is low, the water flow is reduced and the magazine levels are conserved so that when the power consumption is high, the levels are raised.
  2. Generating electricity with hydro energy does not pollute the environment. Construction of these massive power plants is the only source of pollution.
  3. When dam systems are in use, electricity produced doesn't emit green house gases. The atmosphere is not polluted by them.
  4. Water can be used from the lake for irrigation.
  5. In addition to generating electricity for many years or decades, dams are designed to last for many decades.
  6. A dam can produce electricity at a constant rate once it is constructed.
  7. By closing the sluice gate, electricity cannot be generated if the station is not in need of it. In times of high electricity demand, water can be saved and used later.
  8. Water sports and leisure activities can be performed in the lake behind the dam. A large dam often becomes a tourist attraction in its own right.
  9. When water builds up in the lake, it can store energy until it is needed, when it can be released to create electricity.
  10. A renewable energy source is hydroelectric power. There is no limit to what we can accomplish. However, hydroelectric power plants can only be built in a limited number of reservoirs. They can also only be built in a few places where they are profitable.
  11. Hydraulic power is extremely reliable. It is not common for the electric power produced by the plants to fluctuate unless it is needed to do so. Hydroelectricity is used as a base load energy source in countries with large hydropower resources. The magazine can generate electricity as long as water is present.
  12. Hydroelectricity is much safer than fossil fuels and nuclear energy. The only fuel (aside from water) involved is electricity.
- Hydropower is environmentally friendly. A 22 billion- gallon oil tanker or 120 million-ton coal furnace is not needed as it prevents the burning of both.
  - There is no air pollution or greenhouse gas release with a hydropower.
  - Hydropower don't leave any waste behind.

- Water resources in Wisconsin have expanded due to hydropower projects, and they support a diverse, healthy, and productive fishery. Hydropower reservoirs catch substantially more game fish than natural lakes. In terms of renewable energy, hydropower leads the way. Renewable energy generates over 97% of all electricity in the country. There are fewer than 3% other renewable energy sources including solar, geothermal, wind, and biomass.
- Several water-based recreational activities can be enjoyed in reservoirs formed by hydroelectric dams, such as fishing, water sports, boating, and hunting water fowl.
- The operators of hydropower projects often provide recreation facilities to their customers, such as boat landings, swimming beaches, restrooms, picnic areas, fishing piers, nature trails, and canoe portages.
- Local economies benefit from hydropower reservoirs. The recreational value of one large hydropower project in Wisconsin totaled more than \$6.5 million annually. Water is not 'used' in hydroelectricity, as it is entirely returned to its point of origin after use. As long as a body of water is not depleted, hydroelectric power can be generated 24/7 indefinitely. Moreover, it is another source of energy that is completely clean. In the process of converting fuels into electricity, the plants do not produce any waste byproducts. During times of high demand for power, dams can also close their gates and conserve water.

### **Disadvantages of Hydroelectricity :-**

1. Power plants are generally expensive to build. This applies to hydroelectric power plants as well. The plant, however, requires fewer workers and maintenance costs are normally low.
2. The construction of dams blocking a river in one country usually leaves the following country with no control over the flow of the same river. Disputes between nearby countries can result from this.
3. Dams built at a large scale can damage the Earth's geology. During the construction of the Hoover Dam in the USA, a number of earth quakes occurred and the earth's surface was depressed.
4. Flooding destroys the natural environment by flooding large areas of land.
5. Dams are extremely expensive to build and must be built to a very high standard.
6. In order to become profitable, dams must be operated for decades given their high construction cost.
7. There must be an evacuation of residents living in the valley to be flooded. The loss of farmland and businesses is severe. People in some countries are forced to leave to make way for hydro-power schemes.
8. Dams today can be designed and planned as well as they can be built; however an older dam has been known to breach (give in under the weight of the water). Flooding and deaths have resulted from this.
9. The natural level of the water table is altered by building large dams. Aswan Dam construction in Egypt, for instance, caused significant changes in the water table. In turn, this is gradually causing damage to many of its ancient monuments, as salts and damaging minerals are deposited in the stone work by the 'rising damp' caused by the changing water table levels. Hydropower has environmental consequences as a result of the damming of rivers, the alteration of water flow, and the construction of roads and power lines. A complex interaction of physical and biological factors may cause hydroelectric power plants to affect fish. There are more users interested in exploitation of fish species, which indicates that this is a field about which many people have strong opinions. Water levels, water velocity, shelter opportunities, and food access all play a role in shaping the habitat of fish. Fish would suffer irreversible damage if they were drained. Further, depending on the type and stage of the fish's lifecycle, the amount of water in a river may have different effects on them. The large fluctuations in flow in unregulated river systems may not be ideal for fish production.
10. Water availability is directly related to how much electricity and energy is produced during droughts. This could be affected by a drought.
11. Limited reservoirs: Hydroelectric power plants have already been built in areas that had suitable reservoirs available. More than 20 major power plants are currently under construction which will produce more than 2000 MW. There have been only two such projects in the past two years. The construction of hydroelectric plants is costly, and they must meet very high standards. Plants must operate for a very long time before they become profitable because of the high cost. As a result of dam construction, land can flood, destroying the natural environment, the habitat of animals, and even people. It is also possible for the

construction of hydroelectric dams to cause problems with water access. Those downriver may no longer have control of water flow if a dam is constructed in one location. As the water flows out of the reservoir, it spins a turbine, which in turn activates a generator to produce electricity. A huge dam isn't necessary to produce hydroelectricity. Some hydropower plants only channel the river water through a turbine using a small canal. Power can also be stored in another type of hydroelectric power plant. Powered by a power grid, the generators generate electricity. The generators then reverse the rotation of the turbines, which causes the turbines to pump water from a river or upper reservoir to a lower reservoir, where it is stored. It is necessary to release water from the upper reservoir into the lower reservoir or the river to generate power. Activating the generators with this force spins the turbines forward, generating electricity.

## **II. RESULT AND DISCUSSION**

Supplying power to the expanding population poses challenges in many nations. The framework for decision-making is shifting as a result of climate change imperatives and a move away from energy sources that release greenhouse gases. A well-developed technology that employs energy flowing from higher to lower elevations is hydropower. The scale of the projects ranges from substantial reservoirs to modest run-of-river projects. Low greenhouse gas emissions and renewable energy characterise hydropower. This premium energy source offers a variety of services. Other forms of power generation, such as those utilising renewable energy sources, are supported in addition to base load and peak load generation. Despite the clear benefits of hydropower, its development has frequently been marred by intense controversy due to social and environmental issues. For hydropower developers and operators, it has been difficult to create technologies that support sustainable hydropower projects and good practises in hydropower development. Moreover, financiers and development partners have created their own strategies. Some convergence has aided in the assessment and direction of hydroelectric sustainability. The hydropower industry is currently aware of the challenges with sustainability that need to be handled and how to keep up excellent practises in doing so. It provides power to a home, office, factory, hospital, and school. Every day, billions rely on hydroelectricity. Hydroelectricity is typically the first choice for developing nations when it comes to delivering accessible electricity in rural areas. With hydroelectricity, community members may enhance sanitation and education. As China and India's development has grown rapidly, they have built dozens of dams over the past decade. Hydroelectricity, however, is often associated with human suffering. Large hydroelectric dams flood entire valleys because of the massive reservoirs they create. Dam construction could cause many homes, towns, and communities to move.

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