

HYDRO POWER ENERGY.

→ INTRODUCTION.

India is blessed with immense amount of hydro-electric potential and ranks 5th in terms of exploitable hydro-potential on global scenario. As per assessment made by CEA (Central Electricity Authority), India is endowed with economically exploitable hydro-power potential to the tune of 1,48,700 MW of installed capacity.

In 1998, Govt. of India announced "Policy on Hydro Power Development" under which impetus is given to development of hydropower in the country.

→ DEFINITION.

Hydro is a greek word, which means water. Hydroelectricity is the conversion of the mechanical energy in flowing H_2O into electricity. Hydro electricity is generated when the force of falling H_2O from dams, rivers or waterfalls is used to turn turbines, which then drives generators that produce electricity. The energy produced is directed to substations where transformers "step up" the voltage before its transmission to the ~~set~~ electricity grid.

→ PROCESS OF ENERGY GENERATION IN HYDROELECTRIC POWER PLANT.

- The first step in the generation of energy in a hydropower plant is the collection of run-off flows to dams downstream. The water falls through a dam downstream. The water falls through a dam, into the hydropower plant and turns a large wheel called turbine. The turbine converts the energy of falling H₂O into mechanical energy to drive the generator after this process has taken place electricity is transferred to the communities through transmission lines & the H₂O is released back into the lakes, streams & rivers.

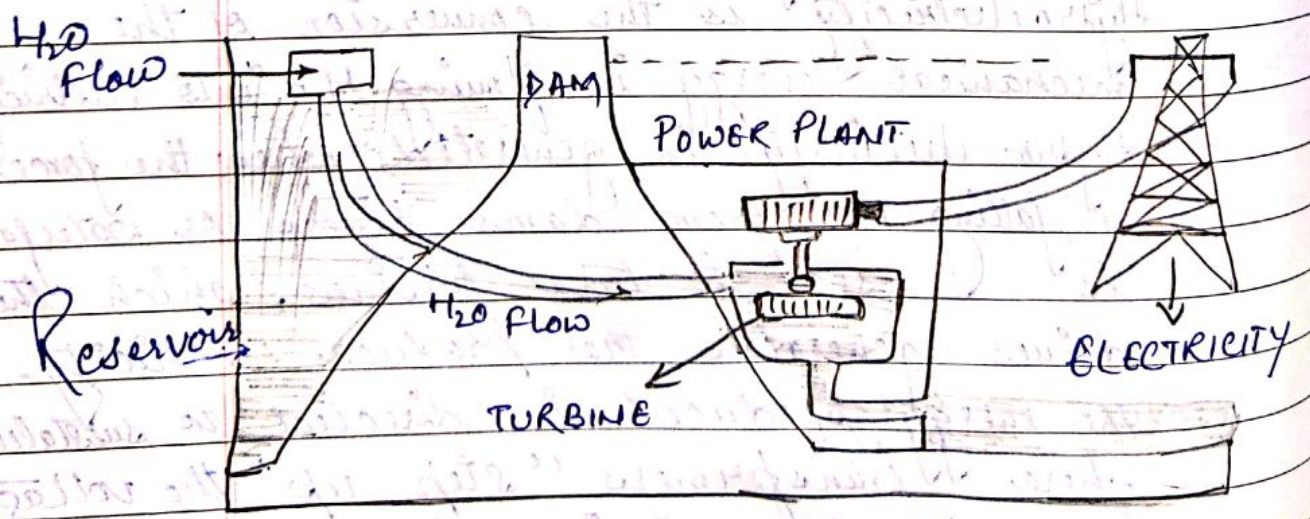


Diagram for energy generation in Hydroelectric Power plant.

→ THE PRINCIPLE OF HYDROPOWER.

- The principle behind the production of hydropower is simple; it uses the energy of flowing H_2O . Many hydropower plants benefit from several storage schemes, & in some river systems a number of power stations are positioned in cascade one after the other, so that the water's energy can be exploited several times before it finally flows out into the sea. Inside the power station, the H_2O drives a turbine, whose mechanical energy is turned into electrical energy in the generator. Hydropower is a highly flexible energy source, since the H_2O can be stored in the reservoirs until needed. Hydropower schemes without reservoirs are often called run-of-rivers.

→ Environmental aspects

- Hydropower is an environment-friendly & renewable source of energy.
- It produces no air pollutants & shows the best Green House Gases (GHG) emission performances of all power generation technologies.
- While river regulation helps to protect people and the environment from droughts & floods, the modification of a river's flow pattern also affects fish & biodiversity.

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→ CLASSIFICATION OF HYDRO PROJECTS BASED ON INSTALLED CAPACITY.

- Hydropower projects are generally categorized in two segments i.e. small and large hydro. In India, hydro projects up to 25 MW station capacities have been categorized as small Hydro Power (SHP) Projects.

- Micro : upto 100 kW

- Mini : 101 kW to 2 MW

- Small : 2 MW to 25 MW

- Mega : hydro projects with installed capacity ≥ 500 MW

Thermal Projects with installed capacity ≥ 1000 MW while Ministry of power Govt. of India is responsible for large hydro projects, the mandate for the subject small hydro power (upto 25 MW) is given to Ministry of New & Renewable.

→ ADVANTAGES OF HYDROPOWER.

- Hydropower is a renewable source of energy because it uses and not consumes the H₂O for generations of electricity, & the hydropower leaves this vital resource available for other uses.

- It is a renewable source of energy with no consumables involved; there is very little recurring cost & hence no high long term expenditure.
- It is cheaper as compared to electricity generated from coal & gas fired plants.
- It also reduces the financial losses due to frequency fluctuations and it is more reliable as it is inflation free due to not usage of fossil fuel.
- Hydropower stations are preferred solution for meeting peak loads in grids due to its unique capabilities of quick starting & closing.
- Dams are also used for irrigation.

→ CHALLENGES RELATED TO HYDROPOWER.

- The hydropower generation is highly capital intensive mode of electricity generation.
- Due to the fact that hydropower projects are primarily located in hilly areas, where forest cover is comparatively better than plain areas, diversion of forest land is sometimes unavoidable.

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- Submergence of land, thereby loss of flora & fauna & large scale displacement due to the hydropower projects.

- Potential for droughts.

- Loss of biodiversity & unbalance of ecosystem.

→ CONCLUSION.

- Hydropower plants are a vital energy source to the world.

- Water is an efficient & reliable fuel.

- Both wind & hydroelectric power are good alternatives for fossil fuels & nuclear power plants.

- These are not 100% clean & do have an environmental impact.

- They do not give off CO_2 which means they don't contribute to GHG.