# Cost Effective Hydro Power Plant

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## ABSTRACT

Our project basically deals with the generation of continuous and renewed source of electricity which we can consume t throughout the calendar year. It basically revolves around the idea of generating a pollution free source of electricity via utilising the abundant source of water resource that India has been gifted with. It will throw light on that section of country where almost availability of electricity for 24 hours is still a rising issue of various conflicts. It will eventually allow the rural residents to have an easy access to a very cheap and an affordable set of hydro plant with very less maintenance and negligible labour cost.

It has some main parts. The first one is the **RESERVOIR** which will be used for storing water at an high altitude to ensure water availability in all seasons and it will indirectly support up for the electric power generation.

The second component is that of **ALTERNATOR** 20Kw followed up with a small power station and a turbine house.

The idea behind this project comes out after visiting the rural areas by hearing there day to day problems of Electricity.

***Keywords: Reservoir,Alternator,Power staion.***

History of Hydroelectric Plants and its Problems

The History of Hydroelectric Power. The technology to take advantage of falling water and get useful mechanic energy is old. The history of hydropower started over 2000 years ago, when water wheels were being used by the ancient Greeks to grind grain.

Hydroelectric power was also important during the industrial revolution at the beginning of the 1800's and provided mechanical power for textile and machine industries.

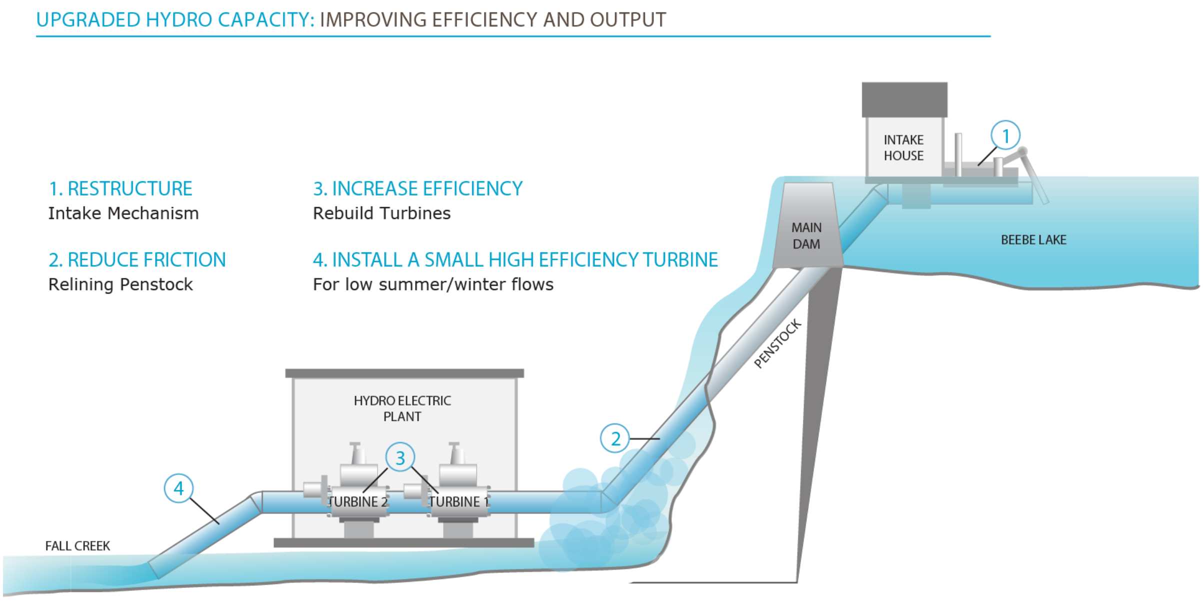
Probably the most important year in hydropower history was in 1831 when the first electric generator was invented by Michael Faraday. This layers the foundation for us to learn how to generate electricity with hydropower almost half a century later, in 1878.

The first hydroelectric power plant, located in Appleton, Wisconsin, began to generate electricity already in 1882. The power output was at about 12.5 kW. 7 years later, in 1889, the total number of hydroelectric power plant solely in the US had reached 200.

In the 19th century these power plants got an increased amount of commercial attention and were built rapidly in suitable areas all over the world. 1936 marks an important year – the largest hydroelectric power plant, the Hoover Dam, was opened and generated 1345 MW (installed capacity later increased 2080MW) from the flowing water in the Colorado River.

Besides his there are so many problems with Hydro projects such as **Ecosystem damage and loss of land, Water loss by evaporation, Siltation and flow shortage, Methane emissions (from reservoirs) etc......**

## Model of Cost Effective Hydro Plant




**Detailed Information of Model**

1) Reservoir

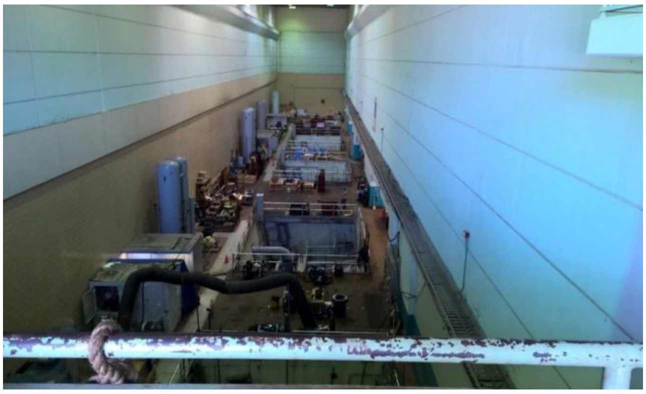
**Reservoir**, an open-air storage area (usually formed by masonry or earthwork) where water is collected and kept in quantity so that it may be drawn off for use. Reservoirs ordinarily are formed by the construction of dams across rivers, but off-channel reservoirs may be provided by diversion structures and canals or pipelines that convey water from a river to natural or artificial depressions. The water is used for emergencies such as power blackouts, pump station failures, and fire control. In addition, these tanks serve to satisfy the peak hourly water demands in the community. When water demand exceeds the average daily demand, water flows out of the tanks into the distribution network. When water demand is very low (i.e., late at night), high-lift pumps refill the tank.

2) Water Turbine

Water flowing from the penstock is allowed to enter the power generation unit, which houses the turbine and the generator. When water falls on the blades of the turbine the kinetic and potential energy of water is converted into the rotational motion of the blades of the turbine. The rotating blades cause the shaft of the turbine to also rotate. The turbine shaft is enclosed inside the generator. In most hydroelectric power plants there is more than one power generation unit. There is large difference in height between the level of turbine and level of water in the reservoir. This difference in height, also known as the head of water, decides the total amount of power that can be generated in the hydroelectric power plant. There are various types of water turbines such as Kaplan turbine, Francis turbine, Pelton wheels etc. The type of turbine used in the hydroelectric power plant depends on the height of the reservoir, quantity of water and the total power generation capacity.

3) POWER HOUSE

A power house consists of two main parts, a sub-structure to support the hydraulic and electrical equipment and a superstructure to house and protect this equipment. The superstructure of most power plants is the buildings that house all the operating equipment. The generating unit and the exciter is located in the ground floor. The turbines which rotate on vertical axis are placed below the floor level while those rotating on a horizontal axis are placed on the ground floor alongside the generator.



WORKING PRINCIPLE OF HYDRO- ELECTRIC POWER PLANT

In hydroelectric power plants the potential energy of water due to its high location is converted into electrical energy. The total power generation capacity of the hydroelectric power plants depends on the head of water and volume of water flowing towards the water turbine.

The water flowing in the river possesses two type of energy:

• The kinetic energy due to flow of water and

• Potential energy due to the height of water.

In hydroelectric power and potential energy of water is utilized to generate electricity.

The formula for total power that can be generated from water in hydroelectric power plant due to its height is given

$P= q*h*g$

Where "p" is the power produced in "watt"

"Q" is the rate of flow of water which in cubic meter/second

"h"= height of water which is measured in "meter"

It's also head of water.

The difference between source of water (from where water is taken) and the water's outflow (where the water is used to generate electricity, it is the place near the turbines). "g" is the gravity constant 9.81 m/second square

The formula clearly shows that the total power that can be generated from the hydroelectric power plants depends on two major factors

a. The flow rate of water or volume of flow of water and

b. Height or head of water.

c. More the volume of water and

d. More the head of water more is the power produced in the hydroelectric power plant.

To obtain the high head of water the reservoir of water should as high as possible and power generation unit should be as low as possible. The maximum height of reservoir of water is fixed by natural factors like the height of river bed, the amount of water and other environmental factors. The location of the power generation unit can be adjusted as per the total amount of power that is to be generated. Usually the power generation unit is constructed at levels lower than ground level so as to get the maximum head of water.

The total flow rate of water can be adjusted through the pen stock as per the requirements. If more power is to be generated more water can be allowed to flow through it.

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