

Hydroelectric Power

What is Hydroelectric Power (Hydropower)?

Hydroelectric power comes from the natural flow of water. The energy is produced by the fall of water turning the blades of a turbine. The turbine is connected to a generator that converts the energy into electricity. The amount of electricity a system can produce depends on the quantity of water passing through a turbine (the volume of water flow) and the height from which the water ‘falls’ (head). The greater the flow and the head, the more electricity produced.

Hydropower is a clean, domestic, and renewable source of energy. It provides inexpensive electricity and produces no pollution. Unlike fossil fuels, hydropower does not destroy water during the production of electricity. Hydropower is the only renewable source of energy that can replace fossil fuels’ electricity production while satisfying growing energy needs.

Hydroelectric systems vary in size and application. Micro-hydroelectric plants are the smallest types of hydroelectric systems. They can generate between 1 kW and 1 MW of power and are ideal for powering smaller services such as processing machines, small farms, and communities. Large hydroelectric systems can produce large amounts of electricity. These systems can be used to power large communities and cities.

Why Hydropower?

Technical Feasibility

Hydropower is the most energy efficient power generator. Currently, hydropower is capable of converting 90% of the available energy into electricity. This can be compared to the most efficient fossil fuel plants, which are only 60% efficient.

The principal advantages of using hydropower are its large renewable domestic resource base, the absence of polluting emissions during operation, its capability in some cases to respond quickly to utility load demands, and its very low operating costs. Hydroelectric projects also include beneficial effects such as recreation in reservoirs or in the water below dams.

Renewability

Hydropower is renewable because it draws its essential energy from the sun that drives the hydrological cycle, which in turn provides a continuous renewable supply of water. Since water is not altered as it goes through the turbines, it can be used to produce more electricity or be used in other sources.

Environmental Benefits

Considering the electric industry that exists today, hydropower has a distinct advantage over fossil fueled generator plants: it is clean, green and renewable. Hydropower does not contribute to local air pollution. Other energy generators are an important source of air, water, and soil pollution and greenhouse gases, and provide fewer opportunities for economic spin-offs.

Hydro developments are subject to extremely demanding environmental standards. Before a project can be developed, it must go through a rigorous process that examines the impact the project would have on the environment and on local communities. Water flow, water quality, water shed, management, fish passage, habitat protection, as well as the welfare and lifestyle of the local communities are taken into consideration.

Cost Effectiveness

In comparing hydropower to other energy generators, the other generators take less time to design, obtain approval, build and recover investment. However, they have higher operating costs and typically shorter operating lives (about 25 years).

A hydropower plant has a high capital cost but maintenance costs are only minimal when looking at some other sources of energy production. The plant life can be extended economically by relatively cheap maintenance and the periodic replacement of equipment (replacement of turbine runners, rewinding generators, etc). Typically a hydro plant in service for 40-50 years can have its operating life doubled.

Comparing the cost of electricity with the initial investment of a hydropower system, the pay back period is short. Theoretically, a hydro plant should be able to produce electricity for a fixed amount during the life span of the unit. The operating costs should not change because there is no associated price to the water. Unlike in fossil fuel plants, the price of natural gas, coal, etc. fluctuates depending on what the market is doing.

What are Some Problems with Hydropower?

There are few problems with hydropower. The first hydropower plants installed did not take into consideration environmental effects. Now, much effort is made to insure that there are minimal environmental and social affects on the surrounding areas. The biggest draw back to hydropower is the high initial cost but this cost can be recovered quickly due to low operating and maintenance costs.

In the past hydro sites were easier to develop because environmental requests were less stringent and there was less public opposition. New locations for hydro sites are more difficult to develop because of environmental concerns. Micro hydro is generally easier to develop because these can be implemented with minimal change to the water flow or surrounding areas.

For More Information

Katrina Sexton, P. Eng.
3000 College Drive South
Lethbridge, Alberta T1K 1L6

Phone (403) 329-1212
Fax (403) 328-5562
E-mail katrina.sexton@gov.ab.ca