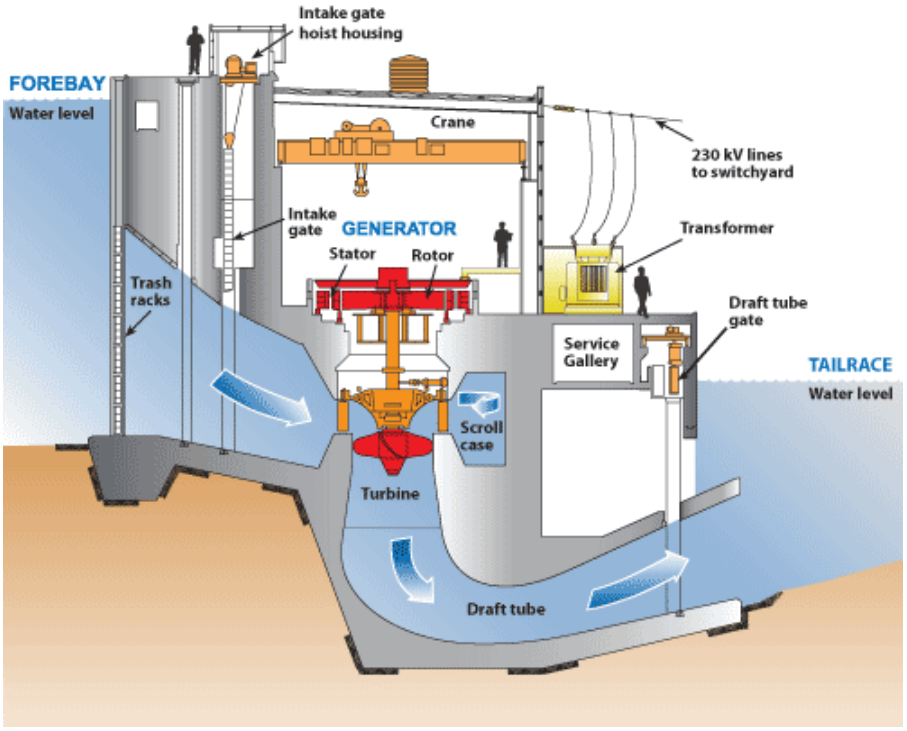
Electricity in Manitoba

Production

Manitoba Hydro uses generators to produce electricity inside of hydroelectric generating stations. A cross section of a typical generating station is shown below.



Water enters the station through the intake and enters into the scroll case. The **scroll case** is a spiral area surrounding the turbine. The movement of the water causes the turbine to spin.

As the turbine spins, the attached rotor also spins. The **rotor** is a huge electromagnet inside a cylinder. This cylinder, called a **stator**, contains many coils of wire. As the magnets of the rotor move past the coils of the stator, an AC current is induced in the coils.

As you can see from the diagram, the water flows downhill, losing potential energy as it does. This potential energy is converted into the mechanical energy of a generator, which produces electrical energy.

Just one of the ten generators at the Limestone Generating Station can produce 133 million watts, or 133 megawatts, of electricity. That's enough electricity to power over 12 000 homes.

Transmission

In Manitoba, nearly 80% of our electricity is produced by hydroelectric generating stations on the Nelson River in northern Manitoba. So, Manitoba Hydro must transmit the electricity about 900 km to southern Manitoba where most people live and work.

The electricity produced by hydroelectric generators is alternating current (AC). Unfortunately, AC electricity does not travel long distances easily.

To overcome this problem, Manitoba Hydro turned to high voltage direct current (HVDC) technology. Direct current (DC) is electric current that flows in one direction only. It is the type of electricity produced by batteries and used in cameras, flashlights, and cars.

Direct current has an advantage over alternating current because it loses less power over long distances. Also, construction of a DC transmission line costs about 33% less than an AC transmission line.

A higher voltage is used with DC transmission to increase energy transmission and reduce losses. This is analogous to moving water through a pipe. Just as large amounts of water can be moved through a large pipe, large amounts of electricity can be moved through a large wire. You can also move large amounts of water through a small pipe by increasing the pressure. Similarly, large amounts of electricity can be moved through a small wire by increasing the voltage.

In your home, the electricity you use is 120 V AC. The electricity travelling from the north on the HVDC lines is 500 000 V DC.

Since generators produce AC electricity with about 25 000 V, that electricity must be converted to DC and raised to a higher voltage (using transformers) before it can be transmitted to the south. This conversion is accomplished at the converter stations located near Gillam, Manitoba.

Once the electricity has been converted, it travels south to the Dorsey Converter Station. At Dorsey, the electricity is converted back to AC because that is what is used in our homes. From Dorsey, eleven 230 000 V AC lines supply southern Manitoba.

The high voltage lines transport electricity to substations located throughout the province. These substations contain transformers that reduce the voltage to lower levels.

From the substations, the electricity runs through overhead lines, or underground cables, to transformers near a customer's home or business. These transformers step the voltage down to 120 V AC for use in our homes.