Point Lepreau Generating Station

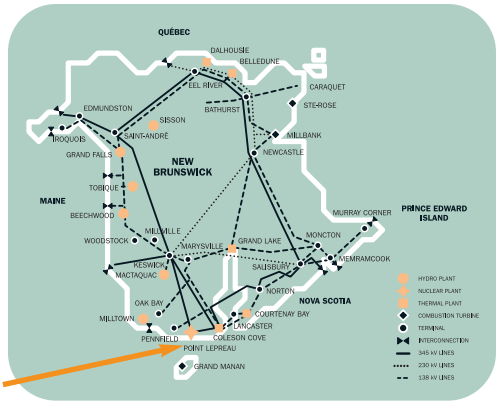
History

Point Lepreau Generating Station (PLGS) is a 680 MW CANDU pressurized heavy water reactor (PHWR), designed by Atomic Energy of Canada Limited (AECL). CANDU stands for **CAN**ada **D**euterium **U**ranium. The pressurized heavy water reactor uses natural uranium as its fuel source. PLGS was the first CANDU-6 in Canada and abroad to be licensed for operation (July 21, 1982), to achieve criticality – start-up (July 25, 1982) and begin commercial operation (February 1, 1983). NB Power was the first Canadian utility to sell electricity from a nuclear power plant to the US.

PLGS is the only nuclear facility in Atlantic Canada. Construction began in May 1975 and was completed in late 1981. From the planning stages right through completion of the project, significant employment opportunities were provided and millions of dollars were injected into the region. In 1979, during the peak of construction, approximately 3,500 people were employed on the project. Of the 139 individual contracts granted, 108 were given to local contractors. During its 23-year history, PLGS has been ranked 12 times as a world leader for its lifetime capacity factor.

Point Lepreau Generating Station is Atlantic Canada's only nuclear power plant.

Point Lepreau Generating Station produces 25-30% of New Brunswick's energy needs.



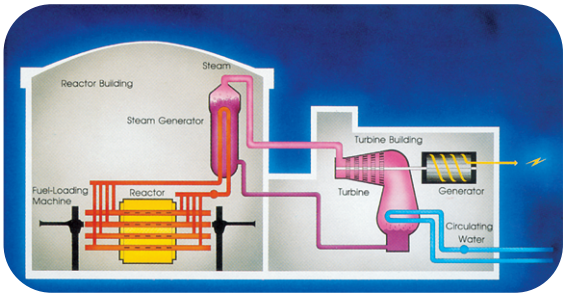
Point Lepreau Generating Station

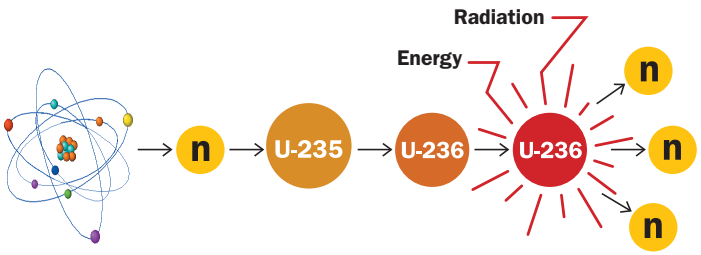
PLGS importance to NB Power

PLGS plays an integral role in helping NB Power achieve its mandate of providing electricity to the province of New Brunswick safely, reliably and at a reasonable cost. New Brunswick has a mix of generation to produce electricity including hydro, thermal (coal, oil and orimulsion) and a nuclear facility. NB Power has a total of 15 generating stations supplying electricity within the province, as well as exporting to Nova Scotia, Prince Edward Island, Quebec and to the New England States (US). PLGS contributes significantly to supplying electricity to NB Power's internal and external customers as it produces 25-30% of New Brunswick's energy needs.

How PLGS works

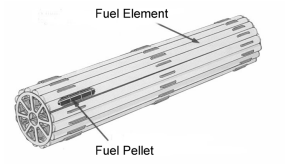
The uranium atoms undergo a fission process that releases thermal energy, creating a controlled chain reaction. The heat energy is picked up by a flow of heavy water (D_20) and transported to the steam generators. The flow of D_20 gives up its heat and turns light water (H_20) into steam. The steam is sent to the turbines via four main steam lines. The steam energy is converted to electricity via a generator.



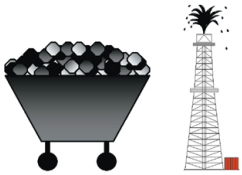


Fission

Fission occurs when a neutron strikes an isotope of uranium-235 (U-235) atom, creating the unstable element uranium-236 (U-236). The extra neutron results in the U-236 atom splitting and releasing other neutrons, energy and radiation. After moderation, the released neutrons go on to cause further fission and the cycle is repeated.



A single fuel bundle can produce enough electricity for the average home for 100 years.



You would need 400 tonnes of coal or 1,500 barrels of oil to produce the same amount of electricity.

Fuel

Natural uranium ore is mined in Canada. The uranium ore is converted to a yellow cake (U_3O_8) at the mine. It is then taken to the uranium refinery in Port Hope, Ontario where it is refined to uranium oxide (UO_2), a black powder. At the fuel fabrication plant, the powder is compressed into fuel pellets, which are then baked in an oven to harden and give them properties of ceramic material. The fuel pellets are placed into 37 fuel elements that are assembled to create a fuel bundle.

One fuel bundle costs between $2,000-$3,000. This cost is fixed year-round and has been consistent since this type of fuel bundle was developed.

Irradiated (spent) fuel

A fuel bundle typically stays in the reactor between six months to 18 months. This irradiated fuel (or spent fuel) is removed from the reactor via automated fueling machines and stored underwater in a spent fuel bay. The fuel is stored in water for two reasons: the water is a good shield from radiation, and the water carries the heat away from the irradiated fuel bundle. After seven years, the radioactivity and heat have decreased enough to allow the irradiated fuel to be transferred to dry storage in concrete canisters above ground. The canisters are on the property of PLGS and are constantly monitored.

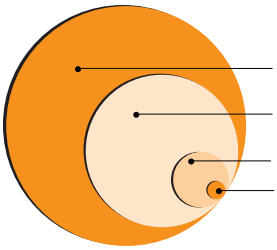
Environment

Generating electricity using hydro, thermal or nuclear methods all have an impact on the environment. Flooding can sometimes occur in areas above a hydro dam, emissions from thermal (coal and oil) plants such as sulphur dioxide (SO_2) and carbon dioxide (CO_2) contribute to acid rain and greenhouse gas effect and nuclear stations generate radioactive waste that must be carefully monitored and controlled. Although nuclear power plants do emit very small amounts of radiation into the environment, these releases are no greater than the radioactivity released from burning coal to produce the same amount of energy.

Radiation is all around us and cannot be avoided. Most of the radiation that people are exposed to comes from natural sources such as the sun and elements in the ground. Radiation is measured in sieverts (Sv). When dealing with radiation exposure to people, doses are often so low that millisieverts (mSv) or microsieverts (µSv) are used. One thousand microsieverts is equal to one millisievert and one thousand millisieverts is equal to one sievert. The average person receives between 2,000-5,000 µSv (2-5 mSv) per year. People who live in areas like Denver, Colorado (where the altitude is higher), will receive slightly more exposure.

Throughout its 23-year history, PLGS's radiological emissions have always been well below the legal limit of 1,000 µSv per year. The following chart provides a record of the total radiation dose due to emissions.

* Please note all doses are in microsieverts (µSv).



Comparison

Natural background radiation: 2,000-5,000 µSv per year

Legal limit for dose from emissions: 1,000 µSv per year (CNSC)

Single chest X-ray: approximately 70 µSv

Total radiation dose due to emissions from Point Lepreau Generating Station since 1983: 20.08 µSv

In 2001, Point Lepreau Generating Station achieved the ISO-14001 designation for environmental management. The station has always maintained a strong environmental program for all aspects of its operation. The ISO designation confirms that our program meets international standards.

Information

For more information on NB Power and Point Lepreau Generating Station, please call (506) 659-6433. You may also visit our Web site at www.nbpower.com.

PLGS technical information

Reactor Type	*CANDU-6 PHW (pressurized heavy water)*
Gross Station Output	*680,000 kW*
Reactor Building Containment	*Low-pressure containment, pre-stressed concrete vessel*
Number of Fuel Channels	*380*
Fuel Type	*Natural uranium (UO_2)*
Fuel Capacity of the 380 Fuel Channels	*4,560 bundles, each with 37 elements*
Refuelling Method	*On-power*
Primary Coolant Pumps	*4*
Boilers (Steam Generators)	*4*
Generator Voltage Output	*26,000 Volts*
Turbine Type	*1 double-flow high-pressure turbine and 3 double-flow low-pressure turbines, all arranged on the same shaft*
Turbine Speed	*1,800 RPM*
Steam Temperature	*260°C (500°F)*
Cooling Water Flow (Condenser)	*Seawater 25.8 m^3/s (341,000 lgpm)*
Reactor Regulating System	*Direct digital control dual computer*