

Nuclear energy – An introduction

Alberta, like many jurisdictions in Canada and around the world, is exploring the potential of nuclear energy development. Able to provide abundant, emissions-free energy 24 hours a day, nuclear power could help meet Alberta's future energy needs as our population grows and the demand for electricity rises.

Below is information on how nuclear energy is generated, the types of nuclear reactors and the benefits of nuclear energy.

What is nuclear energy?

Nuclear energy is energy released from the nucleus of an atom, usually uranium. Most nuclear energy is produced through a process called fission, where atoms are split to release energy.

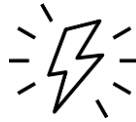
How a nuclear power plant works



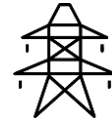
1. Fission generates heat, turning water into steam



2. Steam turns a turbine



3. The turbine turns a generator, creating electricity



4. Electricity is exported to the grid

A single nuclear reactor can produce a large amount of electricity. Most nuclear power plants have more than one reactor, making it possible for one facility to supply power to millions of people.

What is a Small Modular Reactor?

Smaller and more compact than traditional power plants, SMRs are a new type of nuclear technology. Here are some of the differences between SMRs and traditional reactors like the Canada Deuterium Uranium (CANDU) reactor.

Traditional reactor

- Produces about 1,000 megawatts (MW) of electricity
- Takes 10-15 years to plan and build
- Costs up to \$15 billion
- Requires about 3 kilometres of land
- Ideal for powering large cities

SMR

- Produces up to 300 MW of electricity
- Expected to take 7-10 years to plan and build
- Estimated cost is about \$6 billion
- Size varies from a 3-storey building to a city block
- Ideal for industry, small grids and remote communities

What are the benefits of nuclear energy?



Reliable

- Nuclear power facilities can provide abundant, reliable electricity, 24 hours a day, no matter the weather for decades.
- CANDU reactors can produce power without interruption even during refueling.
- Canada's abundant uranium reserves provide a unique opportunity to domestically produce nuclear power.



Sustainable

- Nuclear power does not produce any direct greenhouse gases, making it a carbon-free source of electricity.
- Nuclear power has a small land footprint compared to other energy sources.
- Because of the density of nuclear fuel, a small amount can produce a lot of energy.

Where is nuclear energy used?

Many countries use nuclear power to produce electricity, including the US, Canada, France, South Korea and Japan. Nuclear power has been safely used in Canada for more than 60 years. Canada pioneered the CANDU technology and is globally recognized for leadership in safety and public health.



- Supplies about 15 per cent of Canada's electricity
- 19 reactors at 4 facilities in Ontario and New Brunswick
- Contributes more than \$22 billion each year



- Provides 9 per cent of the world's electricity
- About 440 nuclear reactors in more than 30 countries
- Second largest source of low-carbon power

Learn more

Canadian Nuclear Safety Commission

cnsccsn.gc.ca

- Regulates the use of nuclear energy and materials in Canada to protect health, safety, security and the environment.

International Atomic Energy Agency

iaea.org

- United Nations agency for cooperation in the nuclear field. Works with member states and worldwide partners to promote the safe, secure and peaceful use of nuclear technologies.

Atomic Energy of Canada Ltd.

aecl.ca

- Federal Crown corporation that advances nuclear science and technology and helped pioneer the CANDU reactor. Oversees waste management.

