

# Nuclear in Canada

## NUCLEAR ENERGY A KEY PART OF CANADA'S CLIMATE STRATEGY AND A DRIVER FOR CLEAN GROWTH

- Nuclear electricity in Canada displaces about **50 million tonnes of GHG emissions** annually.
- Electricity from Canadian uranium offsets more than **300 million tonnes of GHG emissions** worldwide.

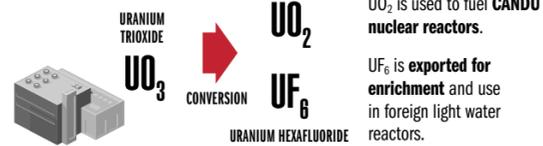
**Legend:**

- Uranium Mining & Milling
- Uranium Processing - Refining, Conversion, and Fuel Fabrication
- Nuclear Power Generation and Nuclear Science & Technology
- Waste Management & Long-term Management
- Shutdown or Decommissioned Sites
- ▲ Inactive or Decommissioned Uranium Mines and Tailings Sites

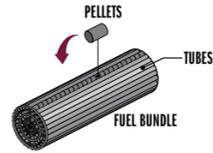
Yellowcake is refined at Blind River, Ontario, to produce uranium trioxide.



At Port Hope, Ontario, uranium trioxide is converted.



At plants in southern Ontario, fuel pellets are loaded into tubes and assembled into fuel bundles for CANDU reactors.



**FUEL PELLET** = 400 kg of COAL or 413 litres of OIL or 350 m³ of GAS

Equivalent electricity generated

19 CANDU reactors at 4 nuclear power generating stations 6<sup>th</sup> globally in nuclear power capacity



Supported by a robust supply chain of over 200 companies.

There are 10 large-scale CANDU reactors undergoing life extension programs that will keep the fleet operating past 2060. The \$26B CAD investment is funded by the province of Ontario, executed by the utilities, and is currently on-budget and on-schedule.

### New Nuclear in Canada

New nuclear energy projects will be an important part of Canada's future clean energy mix. Projects are being considered in Ontario, New Brunswick, Saskatchewan, and Alberta.

- Large-scale nuclear power is required to increase baseload power capacity as electrification intensifies.
- SMRs offer more flexible applications in remote industrial operations (e.g., mining), smaller grids, and heavy industry.

### Large-Scale Nuclear Reactors

- Canada has a history of deploying large-scale nuclear power and continues to lead in innovation and development.
- Bruce Power expansion project to add up to 4800 MWe of nuclear power in Ontario
- CANDU MONARK in development could provide up to 1 GW of power per reactor
- There are 27 CANDU reactors operating around the world, representing a 6.5% market share
- Canada is a leading producer of isotopes for medical and industrial applications and is home to 4 research reactors for nuclear R&D

### Small Modular Reactors (SMRs)

Different SMR designs support various electrification needs. Canada has been charting a path forward through Canada's SMR Roadmap (2018) and Action Plan (2020), and the Enabling SMRs Program (2023). Current commercial SMR activities in Canada include:

- 3 vendors currently participating in CNSC's Vendor Design Review
- License to Construct application submitted for SMRs at Darlington
- License to Prepare Site submitted for SMRs at Point Lepreau, and MMR at CNL Chalk River

15% of the world's uranium is mined and milled in northern Saskatchewan (2022)

The uranium mining industry is the largest private employer of Indigenous people in Saskatchewan.

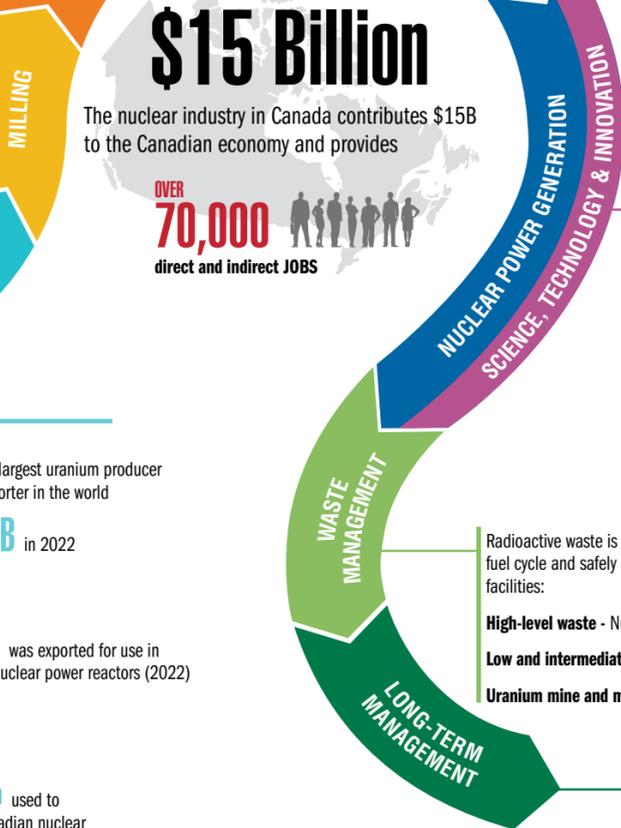


At uranium mills, ore is processed into concentrate: "Yellowcake".



Start

URANIUM MINING



Uranium fuels the world's nuclear power plants.

2<sup>nd</sup> largest uranium producer and exporter in the world  
**\$1.1B** in 2022

80% was exported for use in foreign nuclear power reactors (2022)

20% used to fuel Canadian nuclear power reactors (2022)

Radioactive waste is produced throughout the nuclear fuel cycle and safely managed in licensed storage facilities:

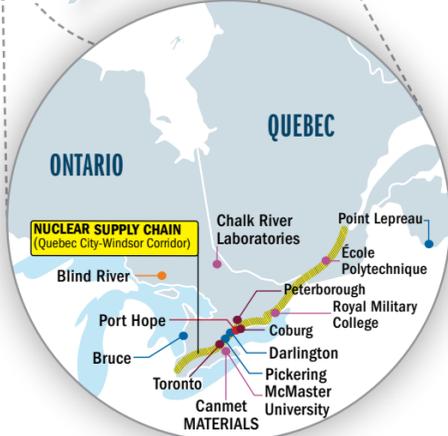
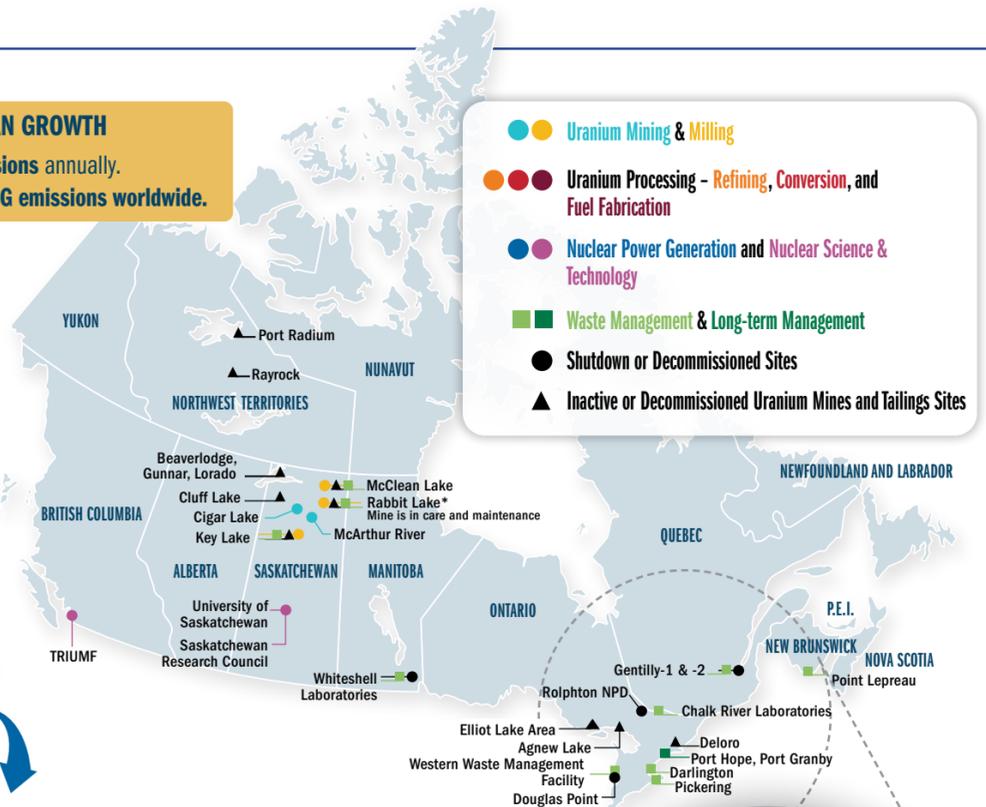
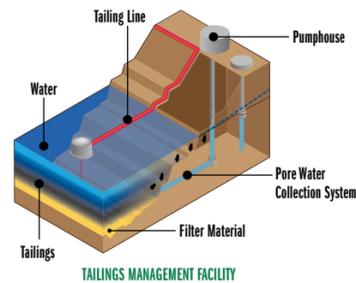
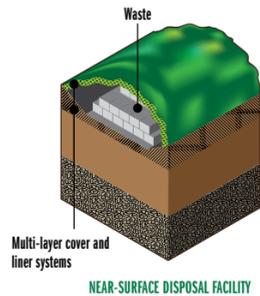
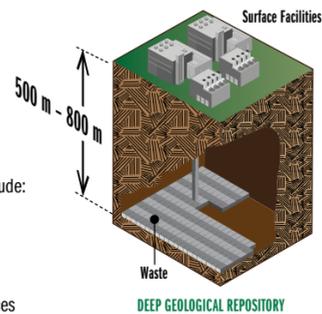
- High-level waste - Nuclear fuel waste **HLW**
- Low and intermediate-level waste **L&ILW**
- Uranium mine and mill tailings waste **UMMT**



Initiatives underway for long-term management of radioactive waste include:

- Deep geological repository for nuclear fuel waste
- Near-surface disposal facility for LLW
- Tailings management facilities

All in keeping with internationally accepted approaches and best practices



# Governance Framework

## Policy Makers



**FEDERAL**  
Nuclear energy is under federal jurisdiction.

### Key Federal Legislation



- Nuclear Safety and Control Act
- Nuclear Fuel Waste Act
- Nuclear Liability and Compensation Act
- Nuclear Energy Act
- Export and Import Permits Act

### Federal Nuclear Policy

- Natural Resources Canada is the lead department on behalf of the Minister of Energy and Natural Resources.
- Other federal departments: ECCC, GAC, HC, TC



- Uranium
- Nuclear Energy
- Nuclear Research and Development and Science and Technology
- Civil Nuclear Liability
- Radioactive Waste Management

### Key Policies



- Canada's Policy for Radioactive Waste Management and Decommissioning
- Nuclear Non-Proliferation Policy
- Non-Resident Ownership Policy in the uranium mining sector



**PROVINCIAL & TERRITORIAL**  
Provinces and territories have ownership over the natural resources and provincial grids that lie within their boundaries.

### Electricity Supply

Provinces choose approaches and technologies for electricity generation based on their natural endowments and regional requirements.



### Management of Natural Resources

#### JURISDICTION



\* Also regulated by the CNSC

## National Regulator



**Canadian Nuclear Safety Commission**



Regulates



Nuclear Energy



Protect

The **Canadian Nuclear Safety Commission (CNSC)** regulates the use of nuclear energy and materials to protect health, safety, security and the environment; to implement Canada's international commitments on the peaceful use of nuclear energy; and to disseminate objective scientific, technical and regulatory information to the public.

The CNSC is an independent administrative tribunal set up at arm's length from government.

## Nuclear Sector

**URANIUM COMPANIES**

- Cameco
- Orano

**NUCLEAR ENERGY PRODUCERS**

- Bruce Power
- Ontario Power Generation
- New Brunswick Power

**NUCLEAR SCIENCE & TECHNOLOGY**

- Atomic Energy of Canada Limited
- Canadian Nuclear Laboratories
- Universities
- Federal & Provincial Laboratories
- SMR innovators
- Hospitals
- Nuclear Applications
- Industry

**NUCLEAR SUPPLY CHAIN**

- Industry
- Engineering, Procurement, and Construction Firms
- Manufacturing
- Construction
- Services
- Original Equipment Manufacturer

A number of companies stretching along the Quebec City-Windsor Corridor and in others locations across Canada

**MAJOR RADIOACTIVE WASTE OWNERS**

- Atomic Energy of Canada Limited
- Ontario Power Generation
- Hydro-Québec
- New Brunswick Power
- Uranium mining, milling and processing industry

### Nuclear Waste Management Organization

As per the *Nuclear Fuel Waste Act*, the Nuclear Waste Management Organization is responsible for implementing Canada's plan for the safe long-term management of used nuclear fuel, with funding from waste owners.