Canada - 2025

PREAMBLE AND SUMMARY

This report provides information on the status and development of nuclear energy in Canada, including factors related to the effective planning, decision making and implementation of the nuclear power programme that together led to safe and economical operation of nuclear power plants.

The CNPP summarizes organizational and industrial aspects of nuclear power programmes and provides information about the relevant legislative, regulatory and international framework in Canada.

Canada has been a world leader in nuclear energy since the development of Canada's homegrown Canada deuterium–uranium (CANDU) reactor technology by Atomic Energy of Canada Limited (AECL), a Crown corporation founded in 1952. Rooted in this history, nuclear energy is an important part of Canada's current clean energy mix and will continue to play a key role in the transition to a low carbon future. This includes not only the contributions of nuclear energy to Canada's clean and secure energy mix and climate change targets, but continued investments in Canada's nuclear science and technology capabilities and exploration of the potential applications of innovative nuclear technologies, including both small- and large-scale nuclear reactors, as well as micro-modular reactors.

Nuclear energy is the second largest source of non-emitting electricity in Canada, with 17 commercial nuclear power reactors located in Ontario and New Brunswick, which produced approximately 13% of Canada's 2024 electricity supply. Canada is also the world's second largest uranium producer, with approximately 15% of the total world production in 2022 coming from mines in Saskatchewan. Most of Canada's uranium production is exported for use in nuclear power throughout the world.

1. COUNTRY ENERGY OVERVIEW

1.1. ENERGY SYSTEM

1.1.1. Energy Policy

Energy is an important contributor to Canada's economy, representing approximately CAD $279 billion in nominal GDP (10.3%), and 697,000 jobs (direct and indirect) in 2023. Regarding trade in 2024, Canada's total energy exports and imports were CAD $208.2 billion and CAD $56.1 billion, respectively. About 81% of Canada's greenhouse gas (GHG) emissions in 2023 were related to the use, production and consumption of energy; a trend which has remained roughly consistent over the past three decades.

The responsibilities of the federal and provincial levels of government with respect to energy are clearly delineated in the Canadian Constitution; in practice, many energy issues are a shared responsibility that require coordinated action. Provincial governments are the direct managers of most of the country's natural resources and have responsibility for energy management within their borders. The federal government is responsible for international and interprovincial trade and energy infrastructure, the management of energy resources on federal Crown land, offshore, and in northern territories, as well as the regulation of all nuclear materials and activities in Canada. Federal and provincial governments share responsibilities for environmental regulation of energy projects and non-nuclear scientific R&D. As such, the primary principles that guide Canadian energy policy are:

- **Respect for jurisdictional authority** and the role of the provinces and territories.
- **Market orientation:** Competitive markets are generally the most efficient means of determining supply, demand, prices and trade while ensuring an efficient, competitive and innovative energy system that is responsive to Canada's energy needs.

- **Targeted interventions:** When markets cannot achieve policy objectives, the government should intervene through regulation or other means. These policy objectives include issues of science and technology (e.g. R&D), health and safety (e.g. pipeline regulation), and environmental sustainability (e.g. impact assessments).

Canadian energy policies have evolved to reflect individual provincial, territorial or regional strengths. For example, Quebec and Manitoba, both rich in hydroelectricity resources, have almost entirely non-emitting power systems in place and are looking for opportunities to increase electrification, such as in transportation. Meanwhile, fossil-fuel-rich provinces such as Alberta and Saskatchewan have developed primarily hydrocarbon energy systems. Federal, provincial and territorial governments have a wide range of policies aimed at increasing the uptake of clean energy and decreasing reliance on high-emitting sources (e.g. coal and diesel).

These policies include federal initiatives to expand partnerships and support investments in interregional electricity transmission between jurisdictions to help lower system costs and improve system reliability as supply expands. They also include investments in developing non-emitting energy technologies to help de-risk and expand the portfolio of commercially viable clean technologies and smart grid systems to increase the reliability, resiliency, and penetration of non-emitting energy generation. As the pace of electrification accelerates across the Canadian economy, all evidence points to a need for significant investment in the electricity system over the next 25 years to meet a sharp expected increase in demand.

Canada’s Net-Zero Commitments

Though Canada remains an energy intensive country, the Government of Canada seeks to enable the environmentally responsible production and use of energy, while ensuring the growth and competitiveness of the Canadian economy, along with the availability of secure and competitively priced energy and the protection of energy infrastructure. In May 2015, Canada announced its commitment to reduce GHG emissions by 30% below 2005 levels by 2030. During December 2015, Canada joined the ranks of 177 countries that adopted the Paris Agreement at the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change. Together with international partners, Canada agreed to strengthen the global response to limit the average temperature rise to 1.5 degrees Celsius.

Only one year later, in December 2016, Canada’s federal, provincial, and territorial governments adopted the Pan-Canadian Framework on Clean Growth and Climate Change, going beyond the 30% emissions reduction target by 2030, to aim for a reduction of 80% below 2005 levels by 2050.

In 2019, the Government of Canada committed to the continued implementation of the Pan-Canadian Framework, while both strengthening existing and introducing new GHG emissions reduction measures. The federal government also committed to developing a plan to set Canada on a path to achieve net-zero emissions by 2050. Additional policy and programme measures to support Canada’s commitment to emissions reduction targets of 30% by 2030 and net-zero by 2050 were outlined in the subsequent strengthened climate action plan — A Healthy Environment and a Healthy Economy — released in December 2020.

The Government of Canada then committed to achieving an enhanced 2030 emissions reduction target of 40% to 45% below 2005 levels under the Paris Agreement, and adopted legislation to enshrine this nationally determined contribution, as well as the commitment to achieve net-zero emissions by 2050, in law. The Canadian Net-Zero Emissions Accountability Act, which came into force in June 2021, provides a framework of accountability and transparency to deliver on this commitment.

Under this Act, the Government of Canada is required to set national emissions reduction targets at five-year intervals for 2030, 2035, 2040, and 2045 to develop an Emissions Reduction Plan (ERP) for each target, as well as explain how each plan would contribute to reaching net-zero emissions in 2050. In March 2022, the Canadian federal government introduced Canada's 2030 ERP, which lays out the measures needed for Canada to meet the 40% reduction target by 2030 and lays the foundation for achieving net-zero emissions by 2050. The first Progress Report for this ERP was released in 2023, with subsequent progress reviews to be published in 2025 and 2027.

Furthermore, pursuant to the Act, the Net-Zero Advisory Body (NZAB) was established and mandated to provide independent advice on how Canada can achieve net-zero emissions by 2050.

1.1.2. Energy Statistics

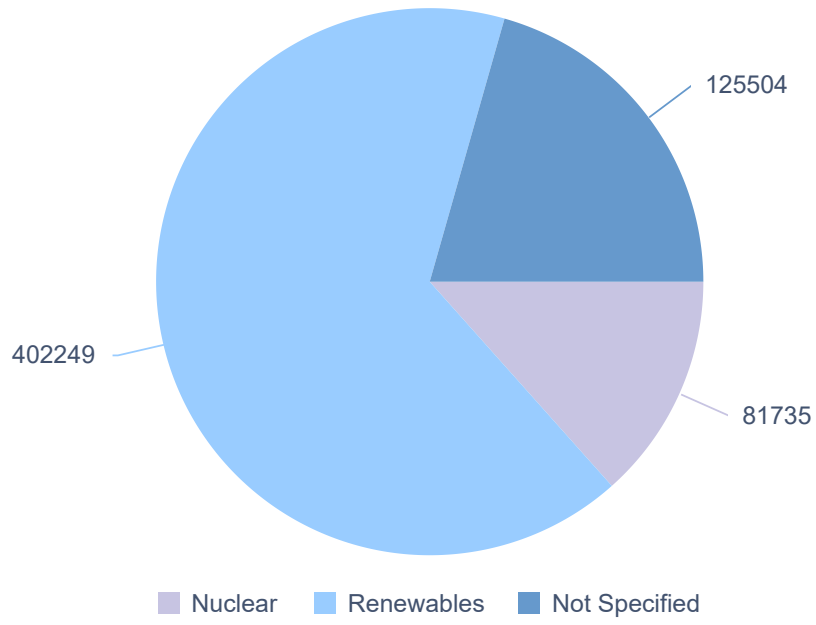
TABLE 1: INSTALLED CAPACITY AND ELECTRICITY PRODUCTION BY SOURCE

Energy Sources [Net]	Electricity Supplied		Installed Capacity	
	[GW(e)*h]	Share (%)	[GW(e)]	Share (%)
Total	609488			
Nuclear	81735	13.4		
Fossils				
---Coal (hard coal, lignite)				
---Gas				
---Oil				
Renewables	402249	66		
---Biomass	9348	1.5		
---Hydro (including tidal and wave)	341824	56.1		
---Solar(PV)	5234	0.9		
---Wind	45843	7.5		
Others	125221	20.5		
---Fossil (all)	125221	20.5		
Total				
Nuclear				
Fossils				
---Coal (hard coal, lignite)				

---Gas
---Oil
Renewables
---Biomass
---Hydro (including tidal and wave)
---Solar(PV)
---Wind
Others
---Fossil (all)

Data as of 2024-12-31 from IAEA Power Reactor Information System

CHART 1: ELECTRICITY PRODUCTION BY SOURCE



Electricity Supplied [GW(e)*h]

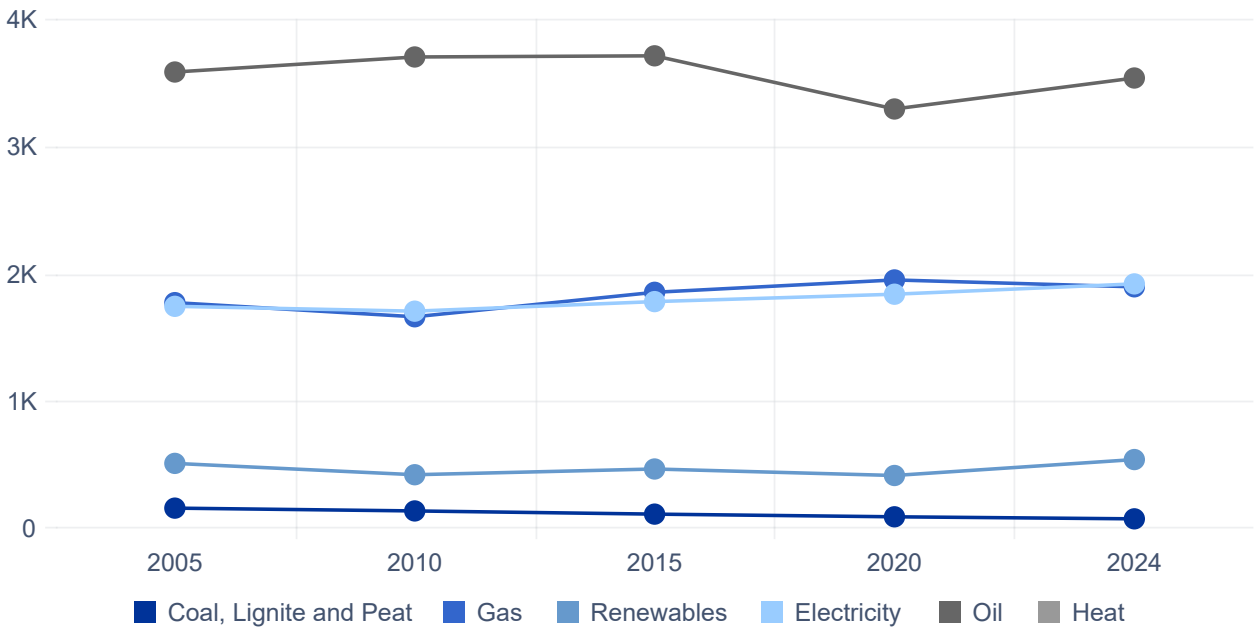
TABLE 2: ENERGY CONSUMPTION

Final Energy consumption [PJ]					
Final Energy consumption [PJ]	2005	2010	2015	2020	2024
Coal, Lignate and Peat	162	140	115	94	78
Petroleum products	3583	3701	3710	3293	3536
Natural gas	1774	1663	1855	1952	1898
Biomass and wastes	475	404	439	394	516

Electricity	1745	1707	1782	1840	1921
Heat	38	20	30	24	27
Total	7777	7635	7931	7597	7976
Coal, Lignate and Peat					
Petroleum products					
Natural gas					
Biomass and wastes					
Electricity					
Heat					
Total					

Data as of 2024-12-31 from IAEA Referential Data Series 1

CHART 2: ENERGY CONSUMPTION



Final Energy consumption [PJ]

1.2. ELECTRICITY SYSTEM

1.2.1. Electricity System and Decision-Making Process

Under the Constitution, electricity generation, transmission, and distribution fall primarily under provincial jurisdiction. Provincial governments are responsible for most aspects of regulation and energy sector development within their geographical boundaries, including electricity policy and power generation. While the three Canadian territories of the Yukon, Northwest Territories, and Nunavut do not share these constitutional authorities, jurisdiction over electrical energy has been devolved under the Yukon Act, the Northwest Territories Act, and the Nunavut Act, respectively. The provinces and territories therefore have the authority to

govern their electricity systems. A province or territory is free to decide the sources of its electricity supply and the design of its electricity markets. The federal government's role is restricted to nuclear energy policy and regulation, the regulation of emissions from the sector, the regulation of international transmission lines and electricity exports, and the regulation of interprovincial transmission lines that are designated by the Governor in Council.

1.2.2. Structure of the Electric Power Sector

Canada has an exceptionally clean electricity generation system; in 2024, approximately 79% of the electricity supply was drawn from non-emitting sources (about 56% hydroelectric, 15% nuclear and 10% other renewable resources). That said, provincial and territorial electricity supply portfolios vary greatly.

Hydropower is the predominant source of electricity generation in British Columbia, Manitoba, Quebec, and Newfoundland and Labrador, exceeding 80% of the total provincial supply in these jurisdictions. In Ontario and New Brunswick, hydropower and nuclear energy together represent major sources of electricity. Natural gas dominates Alberta and Saskatchewan generation, while coal and coke account for the largest source of electricity generation in Nova Scotia. Northern territories have a mix of generating sources, with the Yukon's predominant electricity generation derived from hydroelectricity (78%). The Northwest Territories have a predominant mix of petroleum generation and hydroelectricity, and Nunavut primarily relies on diesel. In Prince Edward Island, wind energy (93%) accounts for most of the electricity generated along with solar energy (6%), though the province imports most of its electricity from New Brunswick.

Canada's electricity industry is largely characterized by public (i.e., provincial, territorial or municipal governments) ownership in six of the ten provinces and its three territories. Four provinces (Alberta, Ontario, Nova Scotia and Prince Edward Island) feature varying degrees of private ownership in their utility sectors, although all nuclear assets are publicly owned. Eight of the ten provinces maintain a single company with vertically integrated structures. Alberta and Ontario have opted for unbundling of generation and transmission/distribution since deregulation in the 1990s, including the creation of a competitive retail market for all final electricity consumers. Both provinces feature private ownership of competitive resellers of electricity to end users.

At the distribution/supply level, large cities in Alberta and Ontario have municipally owned utilities, such as Toronto Hydro, Hydro Ottawa and Alectra, in Ontario, as well as EPCOR and ENMAX in Alberta, which are owned respectively by the City of Edmonton and the City of Calgary.

There are a few private industry players, such as Nova Scotia Power, Fortis BC, Newfoundland Power, and Maritime Electric in Prince Edward Island, with an increasing number of independent (renewable) power producers emerging in most provinces.

The following table indicates the entities involved in providing electricity generation, transmission, and distribution services in each province and territory.

British Columbia	Nearly all generation, transmission and distribution services are provided by BC Hydro, a provincial Crown corporation. Fortis BC, a private utility, also generates, transmits and distributes electricity to customers in the southern part of the province. BC Hydro has signed long-term power purchase agreements with some independent power producers

	developing renewable energy projects smaller than 200 MW(e).
Alberta	A number of companies generate electricity in the province, making it a competitive market, whereas transmission and distribution services operate within a regulated monopoly model. AltaLink and ATCO Electric are responsible for transmission within their own distinct service areas. Distribution is handled by various companies, including ATCO Electric, Energy Alberta, FortisAlberta, and some Rural Electrification Associations (REAs), depending on the specific service area.
Saskatchewan	Nearly all generation, transmission and distribution services are provided by SaskPower, a provincial Crown corporation. Additionally, a select number of private companies (e.g. Algonquin Energy, Northland Power, TransAlta, Capital Power, and Boralex) and smaller municipalities (e.g. City of Swift Current and Estevan) also participate in the electricity market, providing supplementary services.
Manitoba	Nearly all generation, transmission and distribution services are provided by Manitoba Hydro, a provincial Crown corporation. Additionally, a select number of private companies (e.g. Pattern Energy, Algonquin Power and Utilities Corp) provide supplementary capacity.
Ontario	Electricity generation in Ontario is characterized by a mix of regulated and unregulated entities. Ontario Power Generation (OPG) and Bruce Power are pivotal entities in the province's energy generation, while Hydro One is the primary transmission provider. Hydro One operates under a regulated framework and is partly publicly owned. Distribution services are managed through local utilities (e.g. Ottawa Hydro and Toronto Hydro) which serve distinct geographic areas and ensure reliable electricity delivery to homes and businesses across Ontario.
Quebec	Nearly all generation, transmission and distribution services are provided by Hydro-Québec, a provincial Crown corporation. Hydro-Québec has signed long-term power purchase agreements with some independent power producers.
New Brunswick	Nearly all generation, transmission and distribution services are provided by New Brunswick Power Corporation (NB Power), a provincial Crown corporation. Additionally, a few smaller municipalities (e.g. the City of Edmundston) and private companies (e.g. Acciona Energy) provide supplementary capacity.
Nova Scotia	Nearly all generation, transmission and distribution services are provided by Nova Scotia Power, which is privately held by Emera Inc., a publicly traded company, and operates in a regulated

	monopoly environment. Additionally, a number of private companies (e.g. SkyPower Corp. and Scotian WindFields Inc.) provide supplementary capacity.
Prince Edward Island (PEI)	Nearly all generation, transmission and distribution services are provided by Maritime Electric, which is privately held by Fortis Inc., a publicly traded company, and operates in a regulated monopoly environment. Most of PEI's power is imported from New Brunswick. Maritime Electric has signed long-term power purchase agreements with some independent power producers.
Newfoundland and Labrador	Newfoundland and Labrador Hydro generates most of the electricity in the province, and provides transmission and distribution services in Labrador, the Great Northern Peninsula of Newfoundland and the smaller communities along the southern coast of Newfoundland. Newfoundland Power, which is a private company held by Fortis Inc., a publicly traded company, provides most transmission and distribution services in the more populated areas of Newfoundland.
Yukon	All generation, transmission and distribution services are provided by a combination of Yukon Energy Corporation, a territorially owned Crown corporation, and Yukon Electrical, a private company owned by ATCO Inc., a publicly traded company.
Northwest Territories	All generation, transmission and distribution services in the Northwest Territories are provided by a combination of Northwest Territories Power Corporation, a territorially owned Crown corporation, and Naka Power, a private company owned by ATCO Inc., a publicly traded company.
Nunavut	All generation, transmission and distribution services in Nunavut are provided by Qulliq Energy Corporation, a territorially owned Crown corporation.

1.2.3. Electricity Statistics

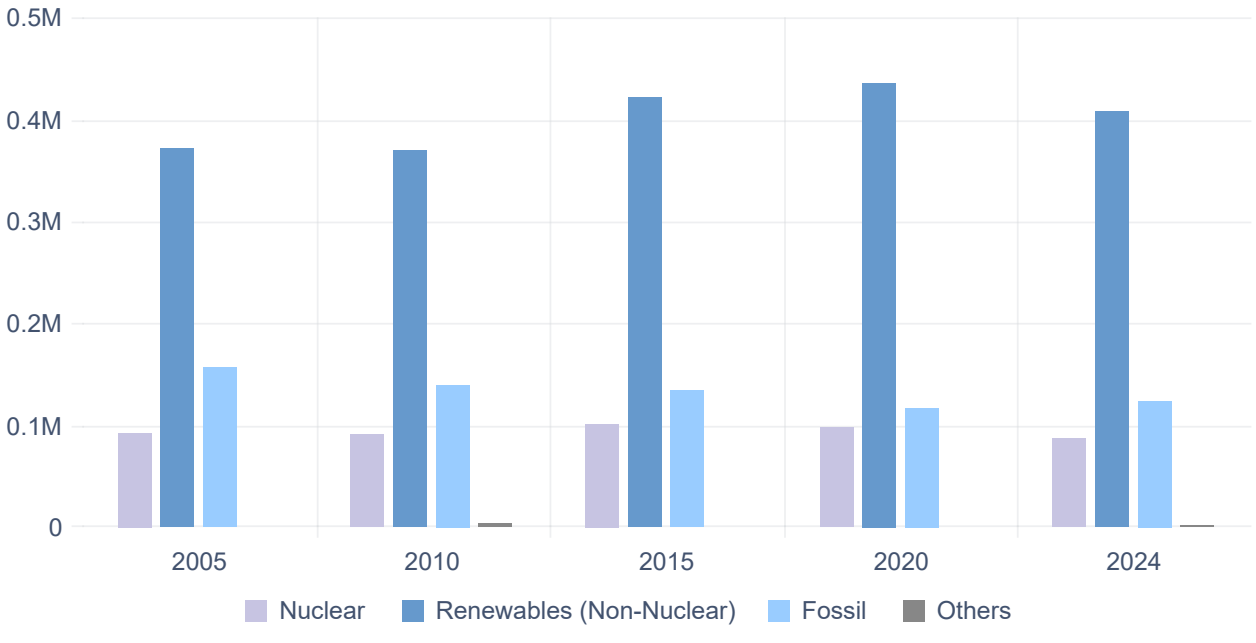
TABLE 3: ELECTRICITY PRODUCTION

Electricity production (GWh)					
Electricity production (GWh)	2005	2010	2015	2020	2024
Biomass and waste	8294	9148	9257	10156	9533
Coal, lignite and peat	100586	79541	62055	38665	16562
Natural gas	40945	51883	64639	72972	102114
Oil	15649	8338	7910	4713	5193
Geothermal	0	0	0	0	0
Hydro	362031	351461	382266	386617	346506
Nuclear	92040	90658	101809	98195	86639

Solar	18	249	2841	4072	9418
Tidal	28	28	13	0	0
Wind	1567	8724	26964	35761	43223
Others	0	3006	141	312	984
Total	621158	603036	657895	651463	620172
Biomass and waste					
Coal, lignite and peat					
Natural gas					
Oil					
Geothermal					
Hydro					
Nuclear					
Solar					
Tidal					
Wind					
Others					
Total					

Data as of 2024-12-31 from IAEA Referential Data Series 1

CHART 3: ELECTRICITY PRODUCTION



Electricity production (GWh)

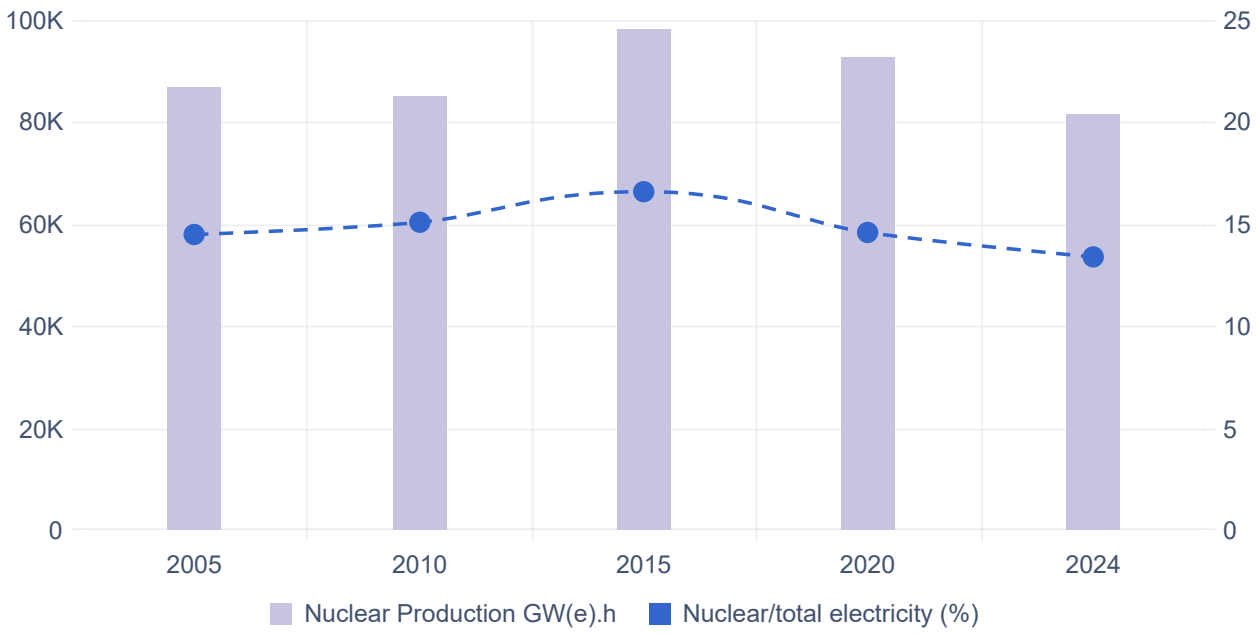
TABLE 4: NUCLEAR SHARE OF TOTAL ELECTRICITY PRODUCTION

	2005	2010	2015	2020	2024
Nuclear/total electricity (%)	14.5	15.1	16.6	14.6	13.4

Nuclear/total electricity (%)

Data as of 2024-12-31 from IAEA Power Reactor Information System

CHART 4: NUCLEAR SHARE TREND



1.3. NUCLEAR ENERGY SUPPORTING SDGs

UN Sustainable Development Goals	***How Nuclear Power Programme Supports Goals***
SDG 5 – Gender Equality	Canada has committed to Equal by 30, an initiative that supports the advancement of women in the energy sector, including nuclear, targeting 50% representation by 2030 (from 22% in 2021). As part of this initiative, Natural Resources Canada (NRCan), Women in Nuclear Canada, and Canadian Equality Consulting collaborated on the Gender Balance Roadmap for the nuclear energy sector in 2023 to track the rate of participation by women and assist nuclear organizations in achieving gender balance. Building on the success of the Gender Balance Roadmap, Women in Nuclear Canada and Canadian Equality Consulting also

	launched the Gender Equity Badge Accreditation programme – an initiative designed to support members in advancing equity, diversity, and inclusion in their workplaces. Many organizations and firms within the Canadian nuclear sector have also made their own commitments to increase gender diversity (for example, the Organization of Canadian Nuclear Industries (OCNI), Canadian Nuclear Association, and Women in Nuclear Canada).
SDG 7 – Ensure access to affordable, reliable, sustainable and modern energy for all	Nuclear energy is a reliable, clean source of baseload power, responsible for approximately 51% of the electricity produced in Ontario (2024) and around 30% in New Brunswick (2023). Other jurisdictions in Canada are also considering nuclear energy to meet their rising energy needs. To meet the increasing demand for clean electricity in Canada, the Canada Infrastructure Bank (CIB) is investing in infrastructure projects that will enhance energy systems' availability and reliability, helping to ensure access to affordable, reliable, sustainable, and modern energy for Canadians. Over CAD $200 million in equity financing has been provided for new transmission lines linking Nova Scotia and New Brunswick, which will improve the reliability of interprovincial power grids and support the expansion of renewable energy generation. The CIB is providing a CAD $970 million loan for the Darlington New Nuclear Project (DNNP). Additionally, funding of CAD $55 million from the Environment and Climate Change Canada's (ECCC) Future Electricity Fund has also been provided to support the DNNP endeavour. When completed, the project will be the first commercial small modular reactor (SMR) built in a G7 country. This first unit, along with a subsequent fleet of an additional three units, will support Ontario and Canada in meeting growing electricity demands and achieving climate objectives. To support nuclear interested jurisdictions in evaluating energy technologies to provide safe, reliable generation for current and future generations, the Government of Canada, through the Electricity Pre-development Program, has provided approximately CAD $153 million to advance pre-development work on nuclear projects across the country, including: • CAD $50 million to Bruce Power, Ontario; • CAD $25 million to NB Power, New Brunswick; • CAD $7 million to ARC Clean Technology, New Brunswick; • CAD $50 million to SaskPower, Saskatchewan, in addition to CAD $24 million from ECCC's Future Electricity Fund; • CAD $13 million to Capital Power Limited Partnership, Alberta; • CAD $8.3 million to Energy Alberta Capital Limited Partnership, Alberta. Canada is also providing up to CAD $304 million to Atkins Realis (the exclusive

	licensee of CANDU technology) through a preliminary commercial agreement to invest in financing for the development and modernization of a new, large-scale, natural uranium–fueled CANDU nuclear reactor. Modernization of Canadian-owned CANDU technology will provide a viable, cost-effective design in support of the expansion of nuclear energy capacity in Canada and internationally. Continued investment in nuclear energy and supporting energy sectors will help advance carbon-free power generation and help build clean, affordable, and reliable electricity for Canadians now and into the future.
SDG 8 – Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	Canada's nuclear energy industry provides high quality jobs and economic opportunities for Canadians, contributing approximately 89 000 direct, indirect, and induced jobs across the sector in 2024 (according to estimates from the Canadian Nuclear Association). The industry is dedicated to creating a diverse and inclusive workforce and is committed to employing individuals from various age groups and genders. Canada's four operating nuclear plants in Ontario and New Brunswick employ a diverse set of people, including control-room operators, engineers, and technicians. The commitments of industry have also positively influenced gender representation, with women making up 21% of the nuclear workforce in 2024, a 5% increase from 2019. Indigenous Peoples currently represent approximately 4% of the nuclear workforce, which represents a 1% increase from 2019. Canada remains committed to creating an enabling environment for all to meaningfully participate in the nuclear sector and is open to working with industry, non-governmental/non-profit organizations, and other partners in advancing inclusivity and productive employment.
SDG – 9 Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	The Federal Government retains ownership of Canada's main nuclear R&D laboratory, Chalk River Laboratories. The Crown corporation, AECL, oversees the administration of the lab by a private contractor called Canadian Nuclear Laboratories (CNL), through a government-owned, contractor-operated model. The Government of Canada has funded nuclear research for many decades and today provides approximately CAD $76 million in yearly government appropriations for nuclear-related research and deveopment (R&D) activities through the Federal Nuclear Science and Technology Work Plan. To ensure that CNL has the facilities and infrastructure needed to continue to be a hub for nuclear innovation, in Budget 2024, the Government of Canada provided CAD $3.1 billion over 11 years to AECL to support CNL's ongoing work. Several other programmes contribute to Canada's vibrant nuclear R&D ecosystem, including: • CNL's Canadian Nuclear Research Initiative (CNRI) to support collaborative

	advanced reactor research projects with third-party proponents in Canada. The goal of the programmes is to accelerate the deployment of safe, secure, clean, and cost-effective advanced reactors in Canada. • The Government of Canada's Enabling Small Modular Reactors Program works to bring clean power to more Canadians through R&D to enable SMR deployment. The programme seeks to support efforts that address waste generated from SMRs and develop supply chains for SMR manufacturing and fuel supply. The programme is funding 15 projects to support the conditions and enabling frameworks necessary for SMRs to displace fossil fuels and contribute to climate change mitigation. • Canada is participating in the Nuclear Innovation: Clean Energy Future (NICE Future) initiative to promote dialogue among clean energy stakeholders and partners at all levels, ensuring informed decision making by key actors to highlight the opportunities and challenges of clean energy commitments, and how nuclear energy can fit in a diversified energy mix.
SDG 12 – Ensure sustainable consumption and production patterns	Under *Canada's Policy for Radioactive Waste Management and Decommissioning*, the Government of Canada provides oversight to nuclear waste generators and owners to ensure they collaborate, develop, implement and maintain an Integrated Strategy for Canada's radioactive waste management. The Strategy addresses long term plans for waste management, including waste minimization and optimization, in a timely manner to reduce the burden of waste management on future generations. In August 2023, OPG and its partners opened the Western Clean-Energy Sorting and Recycling (WCSR) facility in Ontario. This purpose-built facility has the capacity to reduce volumes of waste through processing and maximizing the recycling and free-release of clean materials. OPG is using the facility to sort low-level radioactive materials such as used worker garments, small tools, mops, and rags to reduce volumes of materials currently stored at the Nuclear Sustainability Services - Western Waste Management Facility.
SDG 13 – Take urgent action to combat climate change and its impacts	In June 2021, Canada passed the *Canadian Net-Zero Emissions Accountability Act* to enshrine the Crown's commitment to achieve net-zero emissions by 2050. To achieve this key milestone, Canada continues to take bold and immediate action to reduce GHG emissions, while strengthening its domestic economy with sustainable jobs and clean industrial growth. The 2030 ERP provides an ambitious and achievable roadmap that outlines a sector-by-sector path for Canada to reach its emissions reduction target of 40% below 2005 levels by 2030 and net-zero emissions by 2050. Nuclear energy constitutes a key part of Canada's approximate 79% clean

	electricity grid and helps offset emissions from fossil fuel power sources. Several new nuclear builds, both small- and large-scale, are being considered in Canada, namely in the provinces of Ontario, New Brunswick, Saskatchewan, and Alberta, which could enhance Canada's clean electricity grid.

2. NUCLEAR POWER SITUATION

2.1. OVERVIEW

Canada is a Tier 1 nuclear nation, with nearly 70 years of experience in nuclear energy and a well-developed supply chain. Canada's successful nuclear programme is based on its unique CANDU reactor technology, which uses pressurized fuel channels, natural uranium fuel, and heavy water as both a coolant and moderator. Canada's nuclear expertise spans across the entire fuel cycle, from uranium mining and milling to R&D, deployment and operations, and decommissioning and waste management.

2.1.1. Historical Developments

There are currently 17 CANDU reactors in full commercial operation in Canada, which provide approximately 15% of the supply to meet Canada's current electricity needs. The many milestones of the Canadian nuclear programme include the following (individual reactor capacity figures are approximate; refer to Table 5 for more detailed information):

Power Plant Development

Canada's early years of nuclear development began with small research and demonstration reactors. Chalk River Laboratories (CRL) pioneered nuclear physics, nuclear chemistry, and radiation biology research. Key to these efforts were the National Research Experimental (NRX) and National Research Universal (NRU) reactors, pivotal in advancing basic science, health research, and the development of CANDU reactor technology. Expansion in nuclear science and technology continued at Whiteshell Laboratories from 1963, focusing on innovations like the WR-1, the world's largest organically cooled, heavy water moderated nuclear reactor. Additional facilities included a SLOWPOKE reactor, shielded hot cell facilities, and various nuclear research laboratories, supported by an underground research facility and fuel storage research for storage and disposal programmes.

- In 1955, AECL, Ontario Hydro, and Canadian General Electric made a commitment to build the first small scale prototype 22 MW(e) CANDU reactor, the Nuclear Power Demonstration (NPD) reactor in Rolphton, Ontario, which began supplying the Ontario power grid in 1962. The NPD reactor was permanently shut down in 1987, after having also served as a training facility for reactor engineers and operators.
- The Douglas Point Nuclear Generating Station was constructed in Kincardine, Bruce County, Ontario. The 200 MW(e) reactor connected to the grid in 1967, went into full service in 1968, and operated until 1984. NPD and Douglas Point established the technological base for the larger commercial units to follow and launched Canada's nuclear power programme.
- In 1971, Ontario Hydro began operating the first unit of the Pickering Nuclear Generating Station. Over the next two years, three additional units came online, completing the first phase of the plant (A). An expansion followed with Units 5-8 (B), beginning operation between 1983 and 1986. In 2005, Units 1 and 4 underwent refurbishment to extend their operational life.

However, Units 2 and 3 were shut down due to economic and operational challenges in 2008. OPG announced plans in 2022 to extend the operation of Pickering's remaining units until 2026, with further assessments being conducted to evaluate potential extensions beyond that date.

- In 1972, Hydro-Québec began operating the Gentilly-1 prototype reactor, which was in service until 1979. Subsequently, Gentilly-2 started operations in 1983. However, due to economic and technical considerations, Gentilly-2 was permanently shut down in 2012.
- In 1977, the Bruce Nuclear Generating Station saw the first of its eight units come online. Starting with Bruce A, Units 1–4 were online by 1979. The expansion continued with Bruce B, Units 5–8 beginning operation between 1984 and 1987. To extend the plant's operational life, Bruce A, Units 3 and 4 were refurbished and restarted in 2003, followed by Units 1 and 2 in 2012. An extensive refurbishment programme is ongoing for Bruce B units, which is expected to ensure their operation until 2064.
- In 1983, NB Power started operations at the Point Lepreau Nuclear Generating Station. To extend its operational life, the plant underwent refurbishment and was restarted in 2012, with an expected life extension until 2040.
- In 1990, the first unit of the Darlington Nuclear Generating Station commenced operation, with all four units operational by 1993.
- A major refurbishment project began in 2016 to extend the life of Units 1 through 4 at the Pickering Nuclear Generating Station, scheduled for completion by 2026. In January 2025, Ontario approved OPG’s plan to proceed with the Project Definition Phase for refurbishment on Units 5 to 8 (also known as “B” units).
    - In February 2024, Ontario expressed final support for the refurbishment of these units, enabling OPG to advance the initiation phase, with engineering, design, and procurement activities, incorporating lessons learned from the Darlington refurbishment.
- OPG submitted an application to renew its licence to prepare a site for the DNNP in June 2020. In December 2021, OPG announced its selection of the General Electric Hitachi (GEH) BWRX-300 reactor for deployment at the DNNP site. The BWRX-300 is a 300 MW(e) water-cooled, natural circulation SMR.
- In April 2025, the CNSC issued a construction licence for OPG’s chosen technology at DNNP, valid until March 2035. Shortly thereafter, the Government of Ontario provided final approval for OPG to begin construction in May 2025.

Waste Management

In accordance with the Nuclear Fuel Waste Act, the Nuclear Waste Management Organization (NWMO) was established in 2002 by the nuclear energy corporations OPG, Hydro-Québec and New Brunswick Power, as a not-for-profit entity responsible for implementing Canada’s plan for the long-term management of all Canada’s spent nuclear fuel. This plan, called Adaptive Phased Management (APM), was selected by the Governor in Council in 2007 and involves centralized containment and isolation of used nuclear fuel in a deep geological repository (DGR), in an area with suitable geology and a willing and informed host community. A siting process, led by the NWMO, to identify an informed and willing community with a safe and suitable site to host a DGR was launched in May 2010. On 28 November 2024, the NWMO announced Wabigoon Lake Ojibway Nation and the Township of Ignace as the host communities for the future site for Canada’s DGR for used nuclear fuel. With site selection completed, the DGR will undergo a comprehensive regulatory review process.

In addition to advancing Canada’s plan for used nuclear fuel under the Nuclear Fuel Waste Act, the NWMO is leading the development of a second DGR to safely manage intermediate-level and non-fuel high-level radioactive waste under the Integrated Strategy for Radioactive Waste (the Strategy). The NWMO took on this additional mandate, which is separate from its responsibilities under the Nuclear Fuel Waste Act, following endorsement of the Strategy by the Minister of Energy and Natural

Resources in 2023. The NWMO has committed to implementing a consent-based process for the DGR for intermediate and non-fuel high-level waste and plans to begin engaging with Canadians and Indigenous Peoples in 2025 to receive input on their proposed site selection process.

CANDU Technology Ownership and Nuclear Laboratories

In October 2011, as part of the restructuring of AECL, the Government of Canada completed the sale of AECL's CANDU Reactor Division to Candu Energy Inc., a wholly owned subsidiary of AtkinsRéalis, then known as SNC-Lavalin. However, AECL has retained the intellectual property for CANDU reactor technology, with AtkinsRéalis having an exclusive licence. Canada's homegrown CANDU technology serves as the backbone of its nuclear fleet and has been exported globally to support Canada's allies to achieve energy security.

In September 2015, a government-owned, contractor-operated model (Go-Co) was implemented at AECL's sites (including sites being decommissioned as well as the national nuclear laboratories). Under this model, AECL continues to own the sites, facilities, assets and liabilities, and CNL, a private sector contractor, manages and operates AECL's sites on their behalf. In support of these efforts, Budget 2015 announced an investment of CAD $1.2 billion to revitalize AECL's Chalk River Laboratories, Canada's largest nuclear science and technology complex. As the 2015 contract is set to expire in 2025, AECL has launched a competitive procurement process to continue the management and operation of CNL beyond the contract expiry period, with announcements anticipated in summer 2025.

Canada's Budget 2024 also announced several additional financial commitments and policies to support the expansion of nuclear energy, such as R&D efforts, including CAD $3.1 billion over 10 years for AECL to support CNL's ongoing nuclear science research, environmental protection, and site remediation work.

Nuclear Policy Development and Federal Investments

Nuclear energy plays a significant role in Canada by supporting domestic energy security, climate commitments, and fostering positive economic growth through non-emitting energy generation. Ensuring that a strong and robust enabling environment is in place for supporting clean growth objectives is crucial for fostering opportunities during the transition to a cleaner economy. The Government of Canada continues to work in collaboration with provinces and territories, Indigenous partners, industry, and others to promote nuclear policy alignment and provide strategic investments for the benefit of all Canadians.

Through extensive collaboration with partners and stakeholders, the Government of Canada released the SMR Roadmap in 2018 and subsequent SMR Action Plan in 2020 as key frameworks to help foster innovation and attract investments in the development and deployment of SMR technologies. Since the release of these guiding documents, considerations on potential nuclear technology deployment have broadened to include both small- and large-scale nuclear reactors, as well as micro-modular reactors. To support a growing nuclear sector, Canada has made significant investments to help advance the development and deployment of nuclear technologies, in addition to recent policy announcements.

Targeted Programme Funding

Strategic Innovation Fund – Innovation, Science and Economic Development Canada

- In October 2020, Canada committed CAD $20 million to Terrestrial Energy to support the development of Integral Molten Salt Reactor (IMSR) technology.
- In March 2021, Canada committed CAD $50.5 million from the Strategic Innovation Fund and Regional Economic Growth Innovation programme to support the development of Moltex Energy Canada Inc. Stable Salt Reactor – Wasteburner (SSR-W).
- In March 2022, Canada committed CAD $27 million of funding for Westinghouse Electric Canada's eVinci micro reactor project.

Future Electricity Fund – Environment and Climate Change Canada

- In August 2023, Canada committed CAD $24 million to the Government of Saskatchewan to support the potential deployment of a 300MW(e) GE-Hitachi BWRX-300 SMR.
- In March 2025, Canada committed CAD $80 million, from an initial contribution of CAD $24 million, to Saskatchewan Government's Crown Investments Corporation to support SMR predevelopment work, including environmental assessments, regulatory studies, and Indigenous engagement.
- In March 2025, Canada committed CAD $55 million to support the advancement of three new 300 MW(e) GE Hitachi BWRX-300 SMRs for the DNNP.

Electricity Predevelopment Program – Natural Resources Canada

- In October 2023, Canada committed CAD $7 million to ARC Clean Technology for development of their 100 MW(e) ARC-100 SMR.
- In August 2023, Canada committed up to CAD $50 million to SaskPower on pre-development activities for the potential deployment of a 300 MW(e) GE-Hitachi BWRX-300 SMR.
- In February 2024, Canada committed CAD $50 million to Bruce Power's assessment of new generation opportunities at Bruce Nuclear Generating Station, which could add 4,800 MW(e) of nuclear capacity.
- In December 2024, Canada committed CAD $25 million to NB Power for predevelopment work for 600 MW(e) of new SMR capacity at Point Lepreau Nuclear Generating Station.
- In March 2025, Canada committed CAD $13 million to Capital Power Limited Partnership to support the development of an assessment of the potential suitability of three locations in Alberta as potential host locations for SMR deployment and to increase public knowledge on nuclear technologies.
- In March 2025, Canada committed CAD $8.3 million to Energy Alberta Capital Limited Partnership to advance predevelopment for a proposed new nuclear plant in the Peace Region, with a potential capacity of up to 4,800 MW(e).

Project Financing

- In October 2022, CIB committed a loan investment of CAD $970 million to OPG's DNNP in support of the pre-development phase for the GE-Hitachi BWRX-300 SMR.
  - This amount represents CIB's largest investment in clean power to date and could be the first in a series of measures to ensure the success of one of the first commercial SMRs in the world.
- In September 2023, Canada announced up to CAD $3 billion in export financing to support the construction of two new CANDU reactors in Romania.

- In March 2025, Canada announced it had entered into a preliminary commercial agreement to loan up to CAD $304 million to AtkinsRéalis, the exclusive licensee of CANDU reactor intellectual property, to support the development and modernization of the next generation CANDU reactor (i.e. MONARK).

Policy Announcements

- Canada's Budget 2024 announced several financial commitments and policies to support the expansion of nuclear energy, including providing CAD $3.1 billion over 10 years to AECL to support continued nuclear science research, environmental protection, and site remediation work. In addition, the budget announced measures to help clarify and reduce timelines for major projects, including setting a three-year target for nuclear project reviews by working with the Canadian Nuclear Safety Commission (CNSC) and the Impact Assessment Agency of Canada (IAAC) to consider how the process can be better streamlined and duplications reduced between the two agencies.
- The 2024 Fall Economic Statement reiterated the Government of Canada's commitment to further support nuclear energy, including:
    - Implementing Investment Tax Credits to incentivize the development and deployment of nuclear and uranium projects.
        - Scientific Research and Experimental Development tax incentive increase from CAD $3 million to CAD $4.5 million at 35% of expenditures.
        - Clean Electricity investment tax credit at 15% for eligible expenditures.
        - Clean Technology investment tax credit at 30% for eligible expenditures.
        - Clean Technology Manufacturing investment tax credit at 30% for eligible expenditures.
    - Solely having the CNSC process apply to certain brownfield nuclear projects, as opposed to also requiring a federal impact assessment.
    - The intent to create a fuel backstop programme to support up to CAD $500 million in enriched nuclear fuel purchase contracts from allied countries.

Following November 2023 updates, Canada's Green Bond Framework successfully re-opened its second green bond to raise an additional CAD $2 billion (October 2024) from the initial CAD $4 billion issuance in February 2024. The second and third issuances include certain nuclear energy expenditures as eligible expenditures.

2.1.2. Current Organizational structure

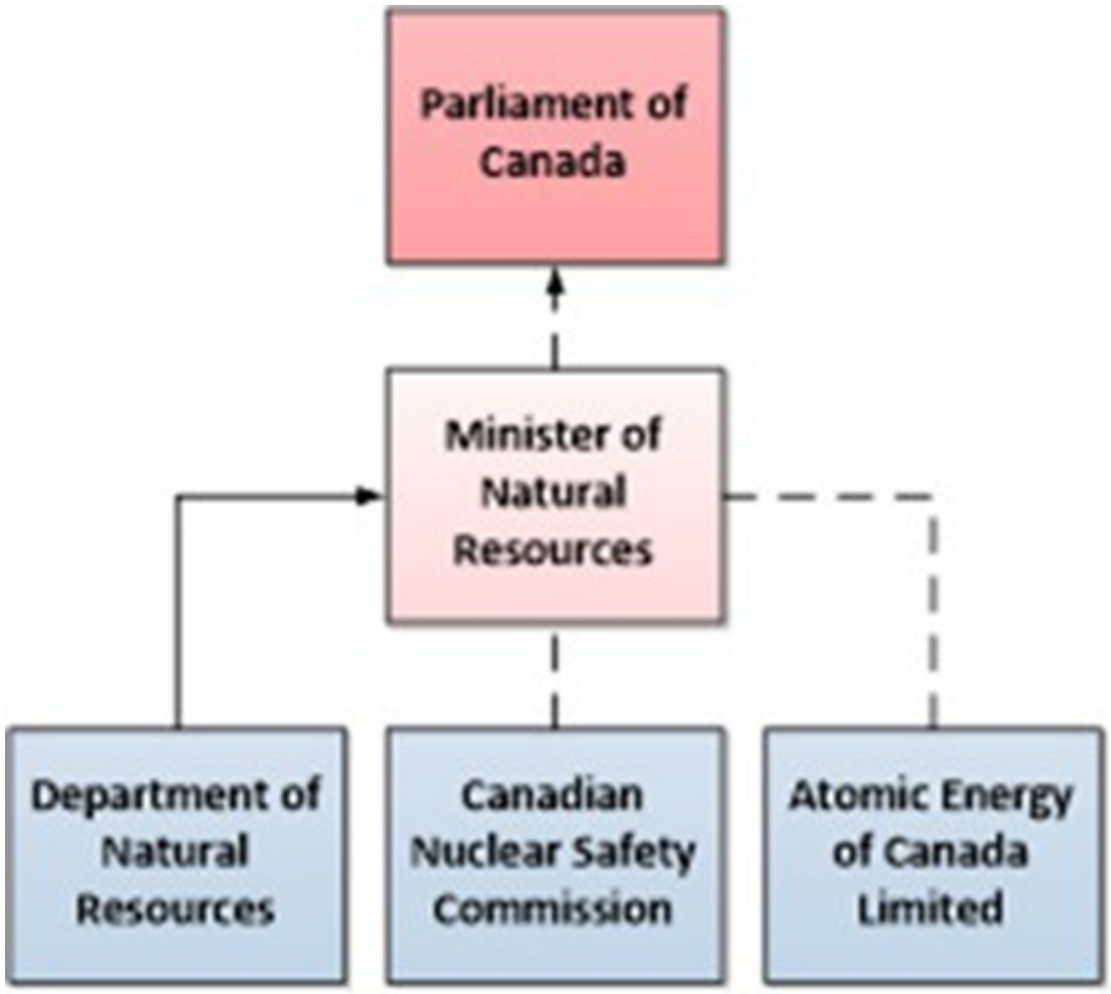


FIG. 1. Federal reporting structure

The Department of Natural Resources (NRCan) reports directly to the Minister of Energy and Natural Resources, while the CNSC and AECL report to Parliament through the Minister.

2.1.3. Development Strategy

Canada’s ambitious climate, energy security, and economic growth objectives are foundational to the Government of Canada’s clean growth approach. Nuclear energy, including both small- and large-scale technologies, can play a leading role in helping meet these objectives. While it is ultimately up to provinces and their utilities to deploy nuclear technologies, the Government of Canada has invested in nuclear technology development and deployment and is working with partners and stakeholders to set the broader enabling conditions to foster success in the sector.

Canada also continues to work with partners and stakeholders as it looks to develop a comprehensive approach to nuclear energy policy for the country.

2.2. CONSTRUCTION

2.2.1. Project Management

Nuclear energy projects are mainly funded by provinces and utilities, with the federal government taking an enabling role through strategic investments, regulatory regimes, and environmental considerations. Provinces retain jurisdiction over the composition of their electricity grids and ultimately have the final decision on which energy technologies best suit their needs.

2.2.2. Project Funding

Funding for New Reactor Builds

Canada has not constructed a new nuclear power reactor since Darlington 4 was completed in 1993. However, with the recent global resurgence of nuclear energy, the Government of Canada recognizes nuclear energy as an important part of its clean energy mix now and into the future. The Government of Canada is investing in nuclear energy development and deployment and is working with provinces and territories, Indigenous partners, industry, and others to foster alignment and cohesion on sector priorities. Traditionally, Canada's reactors have been supported financially through a combination of provincial and federal government funding, and private capital, with federal government funding delivered mostly via AECL, the Crown corporation responsible for nuclear deployments and innovation. Historically, funding was delivered through low-interest loans, contributions (for plant construction itself as well as for accompanying infrastructure, such as heavy water plants), and in some cases, debt and/or interest forgiveness. Funding in recent years has included targeted programme funding to support pre-development work and R&D for new nuclear reactors as well as larger project financing.

2.2.3. Sites

On 4 April 2025, the CNSC announced its decision to authorize OPG to construct a BWRX-300 SMR at the Darlington New Nuclear Site, which would add up to 300 MW(e) of new nuclear capacity. Subsequently, on 8 May 2025, the Ontario government provided final project approval, enabling OPG to begin construction of the first unit. In addition, the Government of Ontario has asked OPG to explore opportunities for new nuclear energy generation at their Wesleyville site, following expressions of interest from the Municipality of Port Hope and the Williams Treaties First Nations. Based on OPG's early assessments, the site could potentially provide up to 10 000 MW(e) of new nuclear generation. Bruce Power is also proposing the Bruce C project within the existing Bruce Power Nuclear Generating Station, which could house up to 4800 MW(e) of new nuclear capacity.

NB Power continues to work with ARC Clean Technology Canada and Moltex Energy Canada to advance their projects at the Point Lepreau site on the northern shore of the Bay of Fundy in New Brunswick.

- On 22 December 2022, Canada's Minister of Environment and Climate Change responded to a designation request that the project to deploy the first ARC-100 unit at the Point Lepreau Nuclear Generating Station site does not warrant designation pursuant to subsection 9(1) of the Impact Assessment Act (IAA). The Environmental Impact Assessment (EIA) will be conducted under the Province of New Brunswick's comprehensive process, with support from the CNSC.

SaskPower is planning to submit a Licence to Prepare a Site application and complete the required impact assessment submission under the IAA (Canada) as early as 2027 to support the construction of up to 650 MW(e) of new nuclear generation capacity. The commercial operating date for 325 MW(e) is expected to be 2034, followed by a decision to construct up to another 325 MW(e) at the same site, with a commercial operation date in 2037.

In April 2025, Energy Alberta submitted an Initial Project Description (IPD) to the IAA (Canada) for the proposed Peace River Nuclear Power Project. This IPD is for a new nuclear power station in Northern Alberta, potentially including up to four 1000 MW(e) CANDU MONARK reactors.

TABLE 5A: STATUS OF REACTORS UNDER CONSTRUCTION

Reactor Unit	Type	Net Capacity [MW(e)]	Status	Date	Operator	Supplier

Not Applicable
Data as of 2024-12-31 from IAEA Power Reactor Information System

2.2.4. Organizations and Institutions

Canada has a well-developed supply chain that covers the entire domestic energy generation, nuclear power plant (NPP) building and operation, and waste management and decommissioning cycle, while also providing servicing of CANDU reactors in Canada and abroad. Supply chain and industry segments include manufacturing, engineering, construction, operations, and maintenance of nuclear facilities.

There are over 250 member companies participating in the OCNI, which represents the Canadian nuclear supply chain. Their business lines range from specialized technical services through small instrument suppliers to engineering, procurement and construction (EPC) companies.

Along with the extensive network of companies that make up OCNI, there are a number of industry leaders which together form the robust infrastructure that supports the construction, operation, and maintenance of NPPs in Canada, and support the country’s continued leadership in the global nuclear energy sector.

Notably, OPG, Bruce Power, and NB Power remain key Canadian leaders in NPP construction and operation. Other significant contributors include, but are not limited to, AECL (federal Crown corporation); AtkinsRéalis (formerly SNC-Lavalin); BWXT Canada; AECON; and CNL.

Nuclear Safety and Regulatory Authority: The CNSC is the federal regulator for nuclear safety in Canada. It oversees the use of nuclear energy and materials to protect health, safety, security, and the environment, and to implement Canada’s international commitments on the peaceful use of nuclear energy.

2.3. OPERATION

2.3.1. Status and Performance of Nuclear Power Plants

The CNSC releases an annual report on regulatory oversight for Canadian Nuclear Power Generating Stations. This report is based on detailed CNSC staff assessments of findings from compliance verification activities for each facility in the context of fourteen CNSC safety and control areas.

Highlights from recent reports include:

- The NPP licensees followed approved procedures and took appropriate corrective action for all events reported to the CNSC.
- NPPs operated within the bounds of their operating policies and principles.
- There were no serious process failures at the NPPs. The number of unplanned transients and trips in the reactors was low and acceptable to CNSC staff. All unplanned transients in the reactors were properly controlled and adequately managed.
- Radiation doses to the public were below the regulatory limits.
- Radiation doses to workers at the NPPs were below the regulatory limits.
- The frequency and severity of non-radiological injuries to workers was low.
- Radiological releases to the environment from the NPPs were below regulatory limits.
- Licensees met the applicable requirements related to Canada’s international obligations; safeguards inspection results were acceptable to the IAEA.

TABLE 5B: STATUS OF REACTORS IN OPERATION

Reactor Unit	Type	Net Capacity [MW(e)]	Status	Operator	Supplier	First Grid Date	Commercial Date	Suspension Date
BRUCE-1	PHWR	816	Operational	BRUCEPOW	OH/AECL	1977-01-14	1977-09-01	1997-10-16
BRUCE-2	PHWR	817	Operational	BRUCEPOW	OH/AECL	1976-09-04	1977-09-01	1995-10-08
BRUCE-3	PHWR	770	Operational	BRUCEPOW	OH/AECL	1977-12-12	1978-02-01	1998-04-01
BRUCE-4	PHWR	807	Operational	BRUCEPOW	OH/AECL	1978-12-21	1979-01-18	1998-03-16
BRUCE-5	PHWR	817	Operational	BRUCEPOW	OH/AECL	1984-12-01	1985-02-28	
BRUCE-6	PHWR	817	Operational	BRUCEPOW	OH/AECL	1984-06-26	1984-09-14	
BRUCE-7	PHWR	817	Operational	BRUCEPOW	OH/AECL	1986-02-22	1986-04-10	
BRUCE-8	PHWR	817	Operational	BRUCEPOW	OH/AECL	1987-03-07	1987-05-20	
DARLINGTON-1	PHWR	878	Operational	OPG	OH/AECL	1990-12-19	1992-11-14	
DARLINGTON-2	PHWR	878	Operational	OPG	OH/AECL	1990-01-15	1990-10-09	
DARLINGTON-3	PHWR	878	Operational	OPG	OH/AECL	1992-12-07	1993-02-14	
DARLINGTON-4	PHWR	878	Operational	OPG	OH/AECL	1993-04-17	1993-06-14	
PICKERING-5	PHWR	516	Operational	OPG	OH/AECL	1982-12-19	1983-05-10	
PICKERING-6	PHWR	516	Operational	OPG	OH/AECL	1983-11-08	1984-02-01	
PICKERING-7	PHWR	516	Operational	OPG	OH/AECL	1984-11-17	1985-01-01	
PICKERING-8	PHWR	516	Operational	OPG	OH/AECL	1986-01-21	1986-02-28	

POINT LEPREAU	PHWR		660	Operational	NBEPC	AECL	1982-09-11	1983-02-01	
Number of reactors: 17									

Data as of 2024-12-31 from IAEA Power Reactor Information System

2.3.2. Plant Life Management, Plant Upgrades and License Renewals

Licence renewals

In Canada, licences to operate NPPs are typically renewed every 10 years, offering a regular and predictable opportunity for CNSC to ensure licensees are qualified to carry on the activities authorized by the licence and will continue to make adequate provision for the protection of the environment, the health and safety of persons, and the maintenance of national security and measures required to implement international obligations to which Canada has agreed. As part of the renewal process, licensees typically conduct Periodic Safety Reviews (PSRs) to assess the facility's compliance with modern standards, the validity of its licensing basis, the effectiveness of safety programmes and components, and the necessary improvements with their implementation timelines. The PSR also entails identifying any factors that would limit safe long-term operation. Findings from the PSR are used to inform a more comprehensive global assessment and to develop an integrated implementation plan that describes any safety improvements to be carried out during the next licence period.

Refurbishments and Life Extensions

NPPs have comprehensive programmes in place for plant life management, including specific life cycle management programmes for critical components.

In contrast to incremental life extension operations in light water reactors, refurbishments of CANDU heavy water reactors are more comprehensive projects that often involve a complete replacement of major components. They include disassembling the reactor core, including the removal of pressure tubes, calandria tubes, and end fittings, before new components are installed. Through refurbishment, CANDU reactors can extend their original design life of 30 years to approximately 30 additional years.

The province of Ontario (owner of 16 of the 17 commercial power reactors in Canada) is investing CAD $26 billion over 2016–2033 to extend the life of nuclear reactors in the province by approximately 30 years, to maintain total nuclear power capacity at 9.9 gigawatts electric (GW(e)) in the province.

The overall refurbishment plan for the Ontario nuclear generating stations entails the sequential refurbishment of units at the Darlington, Bruce, and Pickering sites.

- **Darlington (four units):** The first refurbishments at Darlington began with Unit 2 in 2016 (returned to service in 2020), followed by Unit 3 in 2020 (returned to service in 2023), Unit 1 in 2022 (returned to service in 2024), and Unit 4 in 2023 (expected to be returned to service in 2026). OPG estimates that the refurbishment of all four units will be complete in 2026, and that the station should remain operational until approximately 2055.
- **Bruce (eight units):** Refurbishments of Bruce A Units 1 and 2 have already been completed, with the units returning to service in fall 2012. In 2017, Bruce Power reached an agreement with the Province of Ontario to complete the refurbishment of the remaining units at the Bruce site, Units 3 and 4 (Bruce A station) and Units 5-8 (Bruce B station). The refurbishment

project began in 2020 with Unit 6, which was completed in 2023, and continued with Unit 3 in 2023 and Unit 4 in 2025. The remaining units will follow. Upon completion, the plant is expected to remain operational until approximately 2064.
- **Pickering (four units):** OPG is planning the refurbishment of Pickering B (four units), with the Government of Ontario having approved the Project Definition Phase in early 2025. The remaining two units at Pickering A (Units 1 and 4) were shut down in 2024 and are transitioning to safe storage in 2024.

Canada's last nuclear power reactor is situated in New Brunswick at the Point Lepreau Nuclear Generating Station, which was refurbished and returned to service in 2012. The Generating Station currently holds a 10-year operating licence, which expires on 30 June 2032.

2.3.3. Organizations and Institutions

Canada's four nuclear generating stations are owned by provincial Crown corporations, with OPG owning the Darlington, Bruce, and Pickering Nuclear Generating Stations in Ontario. OPG leases the Bruce Nuclear Generating Station to Bruce Power, who manages the operations. In New Brunswick, NB Power owns Point Lepreau Nuclear Generating Station, home to the only nuclear reactor in the province. These three licensees require CNSC licences for each of the five types of activities in the life cycle of a Class 1A nuclear facility, including the operational phase.

The CNSC's licensing system is administered in cooperation with federal and provincial/territorial government departments and agencies that work in areas such as health, environment, Indigenous consultation, transportation, and labour. Before a licence is issued, the concerns and responsibilities of these departments and agencies are taken into account to ensure that no conflicts exist with the provisions of the (NSCA) and its regulations. The CNSC is obligated to comply with any federal legislation and therefore may make its licensing decisions in consultation with any department or agency government bodies at the federal level having independent but related responsibilities with the CNSC.

The safe operation of NPP in Canada is the sole responsibility of the licensee. Through the implementation of a nuclear management system, regulatory requirements established in NSCA *and* its Regulations, licences issued by the Commission, and regulatory documents must be complied with. CNSC staff, some of which are stationed at the NPPs, conduct various compliance verification activities and monitor operations to ensure they are conducted safely and in accordance with regulatory requirements

2.4. DECOMMISSIONING

2.4.1. Permanent Shutdown

Pickering Units 1–4

Pickering Units 1 and 4 joined transitions into safe storage (as planned) in 2024, joining Units 2 and 3 which were placed in storage with surveillance, a safe state, in 1997. OPG's current deferred decommissioning strategy is a careful, multi-decade process with distinct phases, beginning with the removal of the fuel and water to place the station in a safe storage state, followed by moving the used fuel into dry storage and eventual removal from the site.

After a period of long-term monitoring and surveillance, the facilities will be dismantled, and the site will be restored approximately 40 years after the end of commercial operation. OPG has a process in place to review the decommissioning strategy assumption,

considering such factors as industry trends, technological advances, as well as public, community and stakeholder expectations. A detailed decommissioning plan for Units 1–4 was submitted to the CNSC in December 2024.

Gentilly-2

The Gentilly-2 facility, operated by Hydro-Québec, is located on the south shore of the Saint Lawrence River in Bécancour, Québec, about 15 km east of Trois-Rivières.

The CANDU reactor has a nominal capacity of 675 MW(e) and went into commercial operation in 1983. Based on a recommendation from Hydro-Québec, the Government of Québec decided in 2012 to close Gentilly-2. The reactor was shut down on 28 December 2012 and completely defueled by 3 September 2013.

The CNSC issued a 10-year decommissioning licence to Hydro-Québec for the Gentilly-2 Nuclear Generating Station in June 2016. Activities are currently underway at the facility to transition it into a dry, safe storage state. All used fuel was transferred from wet to dry storage at the end of 2020, permitting the drainage of the storage pool. Hydro-Québec has adopted a deferred decommissioning strategy, with final decommissioning expected to take place in the 2050s. The radioactive waste is safely stored on site in a radioactive waste management facility. Programmes are in place to confirm that the installation remains in a safe state until the final dismantlement and permanent waste disposition.

TABLE 5C: STATUS OF REACTORS IN PERMANENT SHUTDOWN

Reactor Unit	Type	Net Capacity [MW(e)]	Status	Operator	Supplier	First Grid Date	Commercial Date	Shutdown Date
DOUGLAS POINT	PHWR	206	Permanent Shutdown	OH	AECL	1967-01-07	1968-09-26	1984-05-04
GENTILLY-1	HWLWR	250	Permanent Shutdown	HQ	AECL	1971-04-05	1972-05-01	1977-06-01
GENTILLY-2	PHWR	635	Permanent Shutdown	HQ	AECL	1982-12-04	1983-10-01	2012-12-28
PICKERING-1	PHWR	515	Permanent Shutdown	OPG	OH/AECL	1971-04-04	1971-07-29	2024-10-01
PICKERING-2	PHWR	515	Permanent Shutdown	OPG	OH/AECL	1971-10-06	1971-12-30	2007-05-28
PICKERING-3	PHWR	515	Permanent Shutdown	OPG	OH/AECL	1972-05-03	1972-06-01	2008-10-31
PICKERING-4	PHWR	515	Permanent Shutdown	OPG	OH/AECL	1973-05-21	1973-06-17	2024-12-31
ROLPHTON NPD	PHWR	22	Permanent Shutdown	OH	CGE	1962-06-04	1962-10-01	1987-08-01
Number of reactors: 8								

Data as of 2024-12-31 from IAEA Power Reactor Information System

2.4.2. Decommissioning Plan and Process

The Government of Canada has responsibilities for waste liabilities emerging from nuclear R&D by AECL at Chalk River Laboratories (Ontario), Whiteshell Laboratories (Manitoba), and other prototype reactor sites, as well as historic low-level radioactive waste for which the Government has taken on the responsibility. These liabilities remain the responsibility of AECL, and are being managed by a private sector contractor through a GoCo model. The following decommissioning activities are underway:

- Work continues on the decommissioning of outdated and contaminated buildings at the Chalk River Laboratories, which represent some of the highest risk facilities at the site in Ontario. Recent progress includes the reduction of significant hazards and inventory, and the demolition of several old, asbestos laden facilities.
- Decommissioning and demolition of the non-nuclear facilities is progressing at the Douglas Point Waste Facility, a shutdown prototype reactor located in Kincardine, Ontario. This follows a licence amendment, approved in 2021, that allowed for phase 3 decommissioning activities to progress. The Turbine Building is the last non-nuclear building remaining and is undergoing final preparations for demolition in spring 2025. Detailed decommissioning plans for the nuclear facilities and systems have now been accepted by the regulator and this work will commence in 2025. The complete decommissioning and dismantling of the Douglas Point Reactor is expected by 2035.
- Planning activities for the in situ decommissioning of the NPD reactor and the WR-1 research reactor (located in Rolphton, Ontario, and Pinawa, Manitoba, respectively) have continued, including work to finalize the Environmental Impact Statements for each project, as well as ongoing Indigenous and stakeholder engagement. The WR-1 Environmental Impact Statement completed its Federal, Provincial and Indigenous Review. A site licence hearing for Whiteshell Laboratories was also held in 2024, with the site receiving a renewed site licence for 3 years. The NPD reactor is currently under Federal, Provincial and Indigenous Review with the regulator and is expecting to receive comments in the spring of 2025.

In January 2024, CNL was granted a licence to construct a near surface disposal facility (NSDF) at the Chalk River Laboratories site in Deep River, Ontario. As an internationally accepted and proven method of disposing low-level radioactive waste, the facility would allow for the permanent disposal of the vast majority of AECL’s waste currently in interim storage, as well as waste which will be generated as a result of contaminated land remediation activities, decommissioning activities, and continued operations of the nuclear laboratories. The decision on the licence is currently subject to several judicial reviews.

TABLE 6: STATUS OF DECOMMISSIONING PROCESS OF NUCLEAR POWER PLANTS

Reactor Unit	Shutdown Date	Shutdown Reason	Decommissioning Strategy	Current Decommissioning Phase	Decom. Licensee
DOUGLAS POINT	1984-05-04	Economic case no longer viable	Dd+SE		AECL
GENTILLY-1	1977-06-01	Economic case no longer viable	Dd+PD+SE	Passive Safe encl. period	AECL/HQ
PICKERING-2	2007-05-28	Economic case no longer viable	Dd+SE	Safe Encl., Passive Safe encl. period	OPG [2064]
PICKERING-3	2008-10-31	Economic case no longer viable	Dd+SE	Safe Encl.	OPG [2064]

ROLPHTON NPD	1987-08-01	Economic case no longer viable	Dd+PD+SE		AECL
Number of reactors: 5					

Data as of 2024-12-31 from IAEA Power Reactor Information System
Please refer to RDS2 Publication Table 17 for more information on status of Decommissioned reactors

2.4.3. Organizations and Institutions

The CNSC regulates the entire life cycle of NPPs. Decommissioning activities are the actions taken by a licensee at the end of the useful life of the reactor. The CNSC's role is to ensure that decommissioning activities are carried out in accordance with CNSC regulatory requirements to ensure protection of the workers, the public and the environment, and to implement Canada's international commitments.

2.5. PLANNED DEPLOYMENT OF NUCLEAR POWER

2.5.1. Planned Nuclear Power Projects

Refurbishment and the continued operation of existing facilities remain core principles for long-term production of nuclear energy. As the second-largest source of non-emitting electricity in the country, nuclear energy is an important part of Canada’s current clean energy mix, providing approximately 15% of Canada’s 2024 electricity supply. Nuclear energy displaces around 50 million metric tons of carbon emissions a year across Canada, and Canadian exports of uranium displace global emissions by roughly 270 to 551 million metric tons of carbon dioxide per year. Development of advanced nuclear technologies, such as those being developed by SMR vendors both domestically and internationally, has been identified as an opportunity that Canada should continue to explore. While it is ultimately up to provinces and their utilities to deploy nuclear technologies, the Government of Canada acts to create the enabling conditions and align priorities for the benefit of all Canadians.

It is also important to note that in addition to maintaining Canada’s large-scale nuclear capabilities through refurbishments and investments in national laboratories, there is increasing interest being driven by provincial and territorial governments in new nuclear power projects as well.

- Both large-scale and SMR technologies are being explored in Canada. SMR planning and project development is advancing in several Canadian provinces, including in jurisdictions that do not currently operate nuclear power facilities. Nuclear-interested jurisdictions in Canada are Ontario, New Brunswick, Saskatchewan, and Alberta.
- The Governments of Ontario, Saskatchewan, and New Brunswick signed a Memorandum of Understanding (MOU) in 2019 to enhance cooperation on the development of SMR technologies. The Government of Alberta subsequently joined the MOU in 2021. Signatory provinces released the joint strategic plan in 2022, outlining the path forward on SMR deployment in Canada. While the MOU has now expired, the provinces continue to collaborate on a bilateral basis with one another to enhance cooperation and alignment on achieving their nuclear priorities.

Federal

While the federal government is not responsible for electricity production in Canada, the federal government, crown corporations, and arm's-length agencies nevertheless play a role in creating the enabling conditions for successful deployment of clean energy technologies, including nuclear technologies, in Canada and of Canadian technologies internationally. Efforts to this effect include

design reviews, investments, and programming to support R&D, pre-development work, and deployment, and other means of bolstering the sector. For example,

- The CNSC is involved in several vendor design reviews (e.g. ARC Clean Technology ARC-100, Westinghouse eVinci): an optional pre-licensing activity designed to support the early identification of fundamental barriers to licensing. Priority for access to the vendor design review process is given to those vendors able to adequately demonstrate that their design is, or may be, deployed in Canada in the near future.
- In addition, the CNSC announced a pre-licensing design review for the CANDU MONARK in November 2024, followed by the Government of Canada's announcement of a CAD $304 million loan over four years in March 2025 to support development for the MONARK technology.
- Furthermore, the CNSC remains a strong advocate of international collaboration and cooperation, regulatory efficiency and effectiveness through harmonization of SMR and other new nuclear requirements to ensure it is well-positioned to regulate new and developing technologies.
- The Federal Nuclear Science and Technology (FNST) Work Plan, launched in 2015 and representing an annual investment of CAD $76 million, is overseen by AECL to support federal government policy and regulation decisions. The FNST work plan focuses on four research themes, with a view to leveraging the vast experience and resources available at the Chalk River Laboratories to contribute to advancing the country's health, science, innovation, and climate change objectives.
- Federal investments towards enabling SMR deployment include funding for R&D projects. In 2023, NRCan launched the CAD $29.6 million Enabling Small Modular Reactors Program to support R&D projects related to the SMR supply chain and waste management. An additional CAD $12.7 million will be invested by NRCan and the Natural Sciences and Engineering Research Council of Canada (NSERC) to co-fund 15 R&D projects at Canadian universities related to SMRs. The CNSC and NSERC are also jointly funding the NSERC-CNSC SMR Research Grant Initiative, supporting 29 projects that aim to increase the scientific information available to support regulatory decision-making and oversight.
- In 2018, CNL announced a four-stage invitation process for vendors interested in siting a demonstration SMR unit. CNL concluded the process, and took lessons learned to develop and expand new invitations to include fusion, hydrogen, and battery storage technologies (February 2025).

Ontario

Ontario is recognized as Canada's leading nuclear jurisdiction, with the majority of nuclear reactors housed within its provincial borders. The province has a long-standing commitment to nuclear innovation, safety, and clean energy production, and is leading in SMR deployment within Canada and internationally. With approximately 51% of its electricity generated from nuclear power, Ontario has demonstrated a long-term commitment to lead in the advancement of nuclear technologies. Over the last five years, the Ontario government and OPG have announced:

- A signed agreement with the CIB who pledged a CAD $970 million loan for the construction of Canada's first SMR reactor, a GE Hitachi BWRX-300 (October 2022), with projected completion by 2029 and commercial operation by 2030.
- In July 2023, the Government of Ontario announced that OPG would begin planning and licensing for three additional SMRs, for a total of four SMRs at the Darlington nuclear site, which would add a total of 1200 MW(e) of new nuclear capacity.
- The CNSC has since granted OPG a licence to construct the first SMR unit, valid until 2035, and OPG has received approval from the Ontario government to commence construction (April/May 2025).

- Potential regulatory amendments to support financing for OPG's major nuclear projects (May 2025). These changes could allow for reduced construction costs and promote opportunities for private equity to invest in the DNNP, while maintaining rate-setting processes.
- Work with the Municipality of Port Hope and the Williams Treaty First Nations to explore potential new nuclear energy generation at the Wesleyville site for up to 10 000 MW(e) (January 2025).

Licensure for each of the above-mentioned projects is in various stages.

In addition, a federal impact assessment process is currently underway as a tool to evaluate the potential for an additional 4,800 MW(e) build at the Bruce Power Bruce C site. This multi-year process includes Indigenous and public engagement, environmental and socioeconomic studies, and permitting activities.

New Brunswick

New Brunswick currently houses one of Canada's 17 commercial nuclear reactors and is keen to see further developments within the province, particularly in the SMR space. NB Power is working with Moltex Clean Energy and ARC Clean Technology to progress advanced SMR technology for use in the province. While New Brunswick continues to advance its partnerships with these project proponents — both focused on deploying advanced SMRs — it is also actively exploring additional alternative reactor technologies for potential near-term deployment at the Point Lepreau Nuclear Generating Station to support its vision to double its nuclear baseload generation by 600 MW(e) by 2035.

- In February 2021, the Government of New Brunswick awarded CAD $20 million to ARC Clean Technology in support of the development and deployment of the ARC-100, a modular advanced sodium-cooled fast reactor, which is expected to generate up to 150 MW(e).
- In 2023, NB Power submitted an application for a licence to prepare a site for the ARC-100 reactor and is currently undergoing a comprehensive EIA.
    - NB Power was issued a Final Guideline on 27 November 2023 and is currently in the process of developing a Terms of Reference for the EIA study.

Saskatchewan

Saskatchewan is a growing key player in Canada's nuclear energy future, leveraging its world-class uranium resources and growing policy support to explore SMR deployment. As part of its broader strategy to diversify energy sources and reduce emissions, the province is actively advancing planning and regulatory groundwork for a potential SMR deployment in the 2030s. A final decision on whether to build an SMR in the Estevan area (SK) is only expected in 2029, however, SaskPower has been working closely with OPG, and through their selection efforts, are considering the BWRX-300 as their technology of choice. The process, among others, involves consultations with Indigenous communities, stakeholders, and the public for potential site selections for a BWRX-300, which was first launched in 2019.

- In November 2023, the Government of Saskatchewan announced CAD $80 million for the Saskatchewan Research Council (SRC) to pursue the demonstration of a Westinghouse eVinci microreactor in Saskatchewan. In addition, the SRC has signed an MOU with Westinghouse to explore building and siting an eVinci micro-reactor in Saskatchewan for energy use applications.

- The SRC hopes to leverage and build on their experience as a licensed owner and operator of a SLOWPOKE-2 nuclear reactor to enrich the design and development of new nuclear technologies.

Alberta

As a newcomer to nuclear energy, Alberta is taking initial steps toward exploring the role of nuclear energy in its future energy mix. With a strong industrial base and growing interest in decarbonization, the province is assessing how nuclear technology could support both emissions reductions and energy reliability, particularly in remote and industrial applications. In May 2024, the Governments of Saskatchewan and Alberta signed an MOU to advance the development of nuclear power generation in support of both provinces' need for affordable, reliable, and sustainable electricity grids.

- On 15 January 2024, Capital Power and OPG agreed to partner on the development and deployment of grid-scale SMRs. The two companies will examine the feasibility of deploying SMRs in Alberta, and corresponding ownership and operation structures.
- In April 2025, Energy Alberta submitted its Initial Project Description to the IAA (Canada) for the proposed Peace River Nuclear Power Project, which could produce up to 4800 MW(e), representing 25% of the province's existing electricity generation. The project is considering the CANDU MONARK technology, with up to four 1000 MW(e)-class reactors being considered for deployment.

2.6. FUEL CYCLE AND WASTE MANAGEMENT

2.6.1. Fuel Cycle Activities

Except for enrichment and reprocessing, the Canadian nuclear industry covers the entire nuclear energy fuel cycle from nuclear R&D and uranium mining, milling, refining, conversion and fuel fabrication to nuclear technology design, construction, operation, maintenance, waste management and decommissioning.

Mining and milling

Uranium production in 2022 was 7 380 t U, 55% above the 2021 production of 4 747 tU, as operations at the Cigar Lake mine returned to full production after being affected by the COVID-19 pandemic and the McArthur River mine and Key Lake mill, which had been shut down since 2018, resumed production in November 2022. As a result, Canada's share of the world uranium production increased from 10% to 15%. In 2023, uranium production increased a further 49% to 10 986 t U. Since 1996, all Canadian uranium production has been from mines located in northern Saskatchewan.

Cigar Lake is the world's second largest high-grade uranium deposit. All ore from the Cigar Lake mine, which is operated by Cameco Corporation, is processed at the McClean Lake mill, which is operated by Orano Canada Inc. Cigar Lake returned to full production in 2022, producing 6938 t U and maintaining Cigar Lake's position as the world's largest uranium producer.

McArthur River is the world's largest high-grade uranium deposit. Both the McArthur River mine and the Key Lake mill, which processes all McArthur River ore, are operated by Cameco Corporation. Production at these two facilities had been suspended since January 2018, due to low uranium prices. Production resumed in November 2022 to meet increased uranium demand, with 442 t U produced in 2022 and 5179 t U produced in 2023. Operations at the Rabbit Lake mine and mill, which are wholly owned and operated by Cameco, have been suspended since July 2016 due to low uranium prices.

Uranium conversion and enrichment

Cameco Corporation operates Canada's only uranium refining and conversion facilities, located at Blind River and Port Hope, Ontario, respectively. At the Blind River refinery, uranium ore concentrates from Canada and abroad are refined into uranium trioxide (UO3), an intermediate product. The UO3 is then trucked to the Cameco Port Hope Conversion facility, which produces uranium hexafluoride (UF6) and natural uranium dioxide (UO2).

Canada does not enrich uranium. UF6 is enriched outside Canada for use in foreign light water reactors, while natural UO2 is used to fabricate fuel bundles for CANDU reactors in Canada and abroad.

Fuel fabrication

In Canada, there are two fuel fabrication companies — BWXT Nuclear Energy Canada Inc. and Cameco Fuel Manufacturing Inc., a wholly owned subsidiary of Cameco Corporation — both of which produce fuel pellets and fuel bundles for CANDU reactors. BWXT produces fuel pellets and fuel bundles at facilities in Toronto and Peterborough, Ontario, respectively. Cameco produces fuel pellets, fuel bundles and components at its facilities in Cobourg and Port Hope, Ontario. The fuel fabrication process involves forming the uranium dioxide into pellets, followed by a process of sintering and sheathing in zirconium to make fuel bundles for use in CANDU reactors.

Responsible institutions

NRCan, on behalf of the Government of Canada, is the lead department for the development and implementation of the federal Policy for Radioactive Waste Management and Decommissioning, the Non-Resident Ownership Policy in the Uranium Mining Sector, as well as any other related or future policies on radioactive waste or uranium. This Department also provides support to the Minister of Natural Resources in fulfilling the legislative requirements of the Nuclear Fuel Waste Act (NFWA) and ensuring that the nuclear energy corporations, AECL, and the NWMO comply with the requirements of the NFWA.

As Canada's independent nuclear regulator, the CNSC regulates radioactive waste owners in Canada based on a comprehensive and stringent regulatory regime set out under the NSCA; verifying that waste management facilities comply with established safety requirements through inspections and audits.

AECL is responsible for the Federal Government's radioactive waste and decommissioning obligations stemming from legacy nuclear science and technology operations at its sites as well as for other sites contaminated with historic low level radioactive waste across Canada for which the Government of Canada has accepted responsibility. AECL oversees its contractor, CNL, which manages and operates AECL's sites on its behalf and implements programmes and projects to manage its radioactive waste and decommissioning responsibilities. Further, CNL operates a commercial waste service for small producers and owners of radioactive waste, such as hospitals and universities, on behalf of AECL. This initiative allows them to accept low-level and intermediate-level radioactive waste on a fee for service basis from these organizations for long term management.

Canada's nuclear operators are responsible for managing their own waste and are well positioned and have proven capable of developing and implementing safe, secure solutions. Building from historical success in this area, initiatives are underway to develop long-term radioactive waste management facilities.

Storage and disposal of spent fuel

Nuclear fuel waste (also known as spent fuel) is defined under the NFWA as irradiated fuel bundles removed from commercial or research nuclear fission reactors.

All Canadian nuclear power reactors were constructed with onsite spent fuel storage bays or water pools. Spent fuel is stored in either storage bays or in dry storage facilities at the site where it was produced, with the following exceptions:

- Small quantities that are transported to research facilities for experimental or examination purposes, and which are stored at those facilities.
- The spent fuel produced at the now closed NPD nuclear facility was transferred to Chalk River Laboratories, where it was placed in a dry storage facility.
- Highly enriched uranium (HEU) from research reactors at Canadian universities has been returned to the USA, through the US Department of Energy, to its Savannah River facility. In 2010, Canada and the USA agreed to cooperate in the repatriation of US origin HEU fuel stored at AECL's Chalk River Laboratories to the Savannah River site; and in 2012, this agreement was expanded to include HEU bearing liquids. These repatriation initiatives have been completed.

Reprocessing of spent fuel

The Government of Canada acknowledges that nuclear reprocessing is a sensitive technology and remains committed to ensuring that such technologies do not negatively affect the nuclear non-proliferation priorities of Canada and its allies. While reprocessing is not presently employed in Canada, there is receptivity to exploring the science, benefits, and risks associated with potential technologies that could recycle used nuclear fuel in a safe, secure and environmentally sustainable way, while meeting Canada's non-proliferation obligations. Any potential reprocessing of used nuclear fuel in Canada would be subject to the Canadian regulatory framework under the NSCA as well as safeguards verification by the IAEA. Canada remains committed to the Treaty on the Non-Proliferation of Nuclear Weapons, including the full implementation of safeguards set by the IAEA to provide assurances that nuclear materials are used solely for peaceful purposes in Canada.

2.6.2. Waste Management

Canada has policies, legislation and responsible institutions that govern the management of all categories of radioactive waste.

In March 2023, the Canadian federal government released the Policy for Radioactive Waste Management and Decommissioning (the Policy), which outlines how Canada's radioactive waste is to be safely managed and that disposal must be carried out in a safe, environmentally sound, comprehensive, and integrated manner, including waste from developing technologies such as SMRs. This update to the 1996 Policy Framework was an important signal of the Government's commitment to continuing to meet international best practices, guidelines and standards based on the best available science, and in a manner which reflects the values and principles of Canadians. The Policy is based on four priorities:

1. Protection of health, safety, security of people and the environment, and ensuring nuclear non-proliferation;
2. Inclusive engagement, openness, and transparency on radioactive waste management and decommissioning matters;
3. Recognition of Canada's deep commitment to building partnerships and advancing reconciliation with Indigenous Peoples related to the management of radioactive waste and decommissioning, based on the recognition of rights, respect, collaboration and partnership;
4. Global excellence in the fields of radioactive waste management and decommissioning.

In parallel to the development of the Policy, in November 2020, the Government of Canada tasked the NWMO to work with waste owners and engage with Canadians and Indigenous Peoples to develop an Integrated Strategy for Radioactive Waste to ensure that all of Canada's radioactive waste has a disposal solution. The NWMO finalized and submitted the Strategy to the Minister for review and consideration in June 2023. The Strategy recommends that:

1. Intermediate-level waste and non-fuel high-level waste are to be disposed of in a DGR with implementation by the NWMO;
2. Low-level waste is to be disposed of in multiple NSDFs with implementation by waste generators and waste owners.

Under the Policy, waste owners and producers are responsible for developing, implementing, maintaining and updating the Strategy. In 2024, waste owners and generators established a Radioactive Waste Collaboration Committee to facilitate their collaboration on the Strategy and met with NRCan in January 2025 to provide an update on its current and planned activities, as well as progress in implementing the Strategy.

2.7. EMERGENCY PREPAREDNESS

Within Canada's constitutional framework, emergency management is a shared responsibility between the three levels of government (municipal, provincial/territorial and federal), operators, and non-governmental organizations in a bottom-up approach. Most emergencies are local in nature and are managed at the community or provincial/territorial level. The federal government can become involved where it has primary jurisdiction, or when requested for assistance due to the scope of the emergency.

The Government of Canada's emergency planning, preparedness and response are based on an all-hazards approach. The Emergency Management Act sets out broad policy direction and general responsibilities for Public Safety Canada and all other federal ministers and their respective departments/agencies. It broadens the scope of emergency preparedness at the federal level to include the four pillars of emergency management: prevention/mitigation, preparedness, response, and recovery. Public Safety Canada has prepared the all-hazards Federal Emergency Response Plan (FERP) to address governance and coordination issues for federal entities and to support the provinces and territories. The Minister of Public Safety is responsible for coordinating the Government of Canada's response to any emergency. The FERP is designed to harmonize federal emergency response efforts with those of the provinces and territorial governments, non-governmental organizations and the private sector, through processes and mechanisms that facilitate an integrated response. The Government Operations Centre (GOC) achieved the implementation of this plan by using the incident command system structure. The GOC serves as the operational 24/7 point of contact to trigger or receive notifications at the federal level.

Health Canada, through the Radiation Protection Bureau, administers the Federal Nuclear Emergency Plan (FNEP). The FNEP is integrated with and forms an annex to the FERP to coordinate the Government of Canada's scientific and technical response and to support the provinces/territories in managing the radiological consequences of any domestic, transboundary or international nuclear emergency. The FNEP provides supplemental and specific multidepartment and interjurisdictional arrangements necessary to address the health risks associated with a radiological or nuclear emergency. Health Canada also leads the Federal Nuclear Emergency Management Committee and co-leads the Federal/Provincial/Territorial Nuclear Emergency Management Committee (FPT NEMC). These two committees provide a forum for information exchange and the development of plans and joint projects to improve nuclear emergency management in Canada.

Health Canada coordinates federal scientific and technical nuclear emergency response operations with provincial and territorial operations as required. The FNEP includes provincial annexes for Ontario and New Brunswick as they have nuclear power

stations, and for Nova Scotia and British Columbia as they have ports which are visited by nuclear-powered vessels. The FNEP also supports provinces and territories without specific annexes as required.

In alignment with IAEA guidance and requirements, Canadian nuclear emergency response responsibilities are subdivided into on-site and off-site nuclear emergency responses. On-site nuclear emergency preparedness and response pertains to all actions and measures taken within the boundary of the licensee site, whereas off-site nuclear emergency preparedness and response pertains to actions and measures taken outside and beyond the boundary of the licensee site.

These two areas of preparedness and response — off-site and on-site — require specific roles and responsibilities from different stakeholders yet, closely related as they are, they also require coordination between all levels of government and the CNSC licensee; for example,

- CNSC licensees are responsible for on-site nuclear emergency response and emergencies related to their activities that may occur off-site.
- Provincial governments are responsible for off-site nuclear emergency response.
- If requested by the provincial government, the federal government may provide support to the province.
- During an integrated Government of Canada response to a nuclear emergency under the FERP/FNEP, all levels of government and various agencies and organizations have the responsibility to develop and implement emergency response plans to deal with the consequences and impacts outside the boundaries of the nuclear facility licensed by the CNSC. The licensee is responsible for the response within the boundaries of its facility.
- An integrated Government of Canada response is required when:
    - A province/territory requests federal support to deal with an emergency.
    - An emergency affects multiple jurisdictions and/or government institutions and requires a coordinated response.
    - An emergency directly involves federal assets, services, employees, statutory authority or responsibilities, or affects confidence in government.
    - An emergency affects other aspects of national interest.

For nuclear emergency preparedness and response:

- The provincial/territorial governments are responsible for overseeing public health and safety and the protection of property and the environment within their jurisdictions. Accordingly, they assumed lead responsibility for the arrangements necessary to respond to the off-site effects of a nuclear emergency by enacting legislation and providing direction to the municipalities where the NPPs are located. Typically, their administrative structures include an emergency measures organization (or the equivalent) to cope with a wide range of potential or actual emergencies in accordance with defined plans and procedures. The provinces maintain emergency operations centres to coordinate protective actions for the public and to provide the media with information. The two provinces with operating NPPs, Ontario and New Brunswick, have dedicated plans for managing nuclear emergencies that could occur within their borders.
- The CNSC plays a dual role. First, under the mandate established by the NSCA, CNSC maintains regulatory oversight of the on-site nuclear emergency preparedness and response activities of the licensee. Second, as a federal agency, the CNSC participates in the whole-of-government preparedness and response to a nuclear emergency, in accordance with the requirements of both the FERP and the FNEP.
- Global Affairs Canada (GAC) is responsible for the international coordination which encompasses the conduct of foreign relations, the application of the international law, and the coordination of international assistance during an emergency. GAC

also provides advice and assistance on the handling of offers and requests for assistance from foreign governments and contributes to maintaining official communications between Canada and the IAEA through Canada's Permanent Mission to the International Organizations in Vienna.
- Health Canada, in conjunction with Public Safety Canada, coordinates with relevant emergency preparedness committees, including the Federal Exercise Working Group, which looks at exercise development for the entire federal government. FNEP identifies the need for an ongoing exercise programme. Health Canada maintains an evergreen five-year nuclear emergency training, drill and exercise programme.This programme includes the development and implementation of a long-term programme for training, drills and exercises, and participation in federal, provincial/territorial and international drills and exercises, including those organized under the auspices of the IAEA and the OECD Nuclear Energy Agency (NEA). Targeted drills and exercises are conducted on a routine basis. The FPT NEMC, co-led by Health Canada, oversees a national radiological/nuclear exercise strategy. As agreed by the FPT NEMC, this strategy includes a full-scale priority exercise (FSX-P) every 7 ± 1 years. The last FSX-P took place in October 2021 with New Brunswick Power and New Brunswick Emergency Measures Organization. Each exercise and drill are followed by an after-action report and a management action plan. Relevant lessons learned are then integrated into plans and procedures and the exercise is repeated as necessary to continuously increase the level of preparedness.

The Canadian nuclear regulatory framework places the onus on the licensees to perform a detailed assessment of their risk environment to identify potential hazards that could lead to a nuclear emergency. In turn, this licensee risk assessment is overseen by the CNSC. As part of the licensing process, the licensees are required to have measures and plans in place to prevent, mitigate, respond and recover from a nuclear emergency. In the event of a nuclear emergency at a licensed facility and/or involving a CNSC licensed nuclear substance, the main responder is the licensee and the CNSC will monitor and provide regulatory oversight of the licensee in the emergency response.

In the spirit of continuous improvement and learning, Health Canada, as the lead department for the Federal Nuclear Emergency Plan, requested the IAEA to conduct an Emergency Preparedness Review (EPREV) mission of Canada's nuclear emergency preparedness and response arrangements and capabilities. The mission, the first ever hosted by a G7 country, took place in June 2019. Following the mission, Health Canada and EPREV participating organizations developed an Action Plan to address the findings of the EPREV team. In June 2023, the Government of Canada hosted the EPREV follow-up mission, which consisted of interviews and the review of reference materials provided by Canada. The IAEA review team identified that all the recommendations and suggestions formulated in 2019 were addressed and closed. In addition, the IAEA review team acknowledged the amount of work that Canada had completed since the 2019 EPREV mission even while managing the COVID-19 pandemic and the conflict situation in Ukraine.

Communication with the IAEA and the international community is coordinated through Public Safety Canada's Government Operations Centre as the National Warning Point (NWP), Health Canada as the National Competent Authority for Emergencies Abroad (NCA-A) and the National Competent Authority for Domestic Emergencies (NCA-D), CNSC as the National Competent Authority for Domestic Emergencies (NCA-D), GAC through the Permanent Mission in Vienna, and the Public Health Agency of Canada for communications with the World Health Organization. Health Canada also maintains a 24/7 notification service to receive notification of any nuclear emergency.

In 2018, the Government of Canada updated its existing guidelines for intervention during a nuclear emergency. The revised guidelines provide recommendations for Generic Criteria and Operational Intervention Levels (OILs), based on IAEA recommendations, to assist emergency response authorities when developing protection strategies for nuclear emergencies. The Generic Criteria and OILs described in the national guidelines have been adopted by provinces operating NPPs to provide a

harmonized approach for protective action strategies, including establishing emergency planning zones and emergency exposure reference levels.

Health Canada, with contributions from CNSC, NRCan, Public Safety, and the Department of National Defence published the Guidance on Planning for Recovery Following a Nuclear or Radiological Emergency in 2020. This document provides guidance for the planning and execution of off-site recovery operations following a nuclear or radiological emergency and provides recommendations on best practices for recovery operations including the characterization, classification and management of off-site radioactive waste arising from nuclear emergencies. The guidance document does not establish roles and responsibilities; rather, it is expected to be the starting point to formalizing roles and responsibilities for Recovery in Canada. Its aim is to engage stakeholders to begin planning for the recovery arrangements following a nuclear emergency.

2.8. RESEARCH AND DEVELOPMENT

National Laboratories and Organizations

AECL is mandated by the Government of Canada to enable nuclear science and technology and to protect the environment by fulfilling Canada’s radioactive waste and decommissioning responsibilities. Since 2015, AECL has delivered this mandate through a GoCo model, in which CNL is responsible for managing and operating AECL’s sites including the Chalk River Laboratories. AECL manages the Federal Nuclear Science and Technology Work Plan, supporting the Government of Canada's priorities in areas such as health, nuclear safety and security, energy, and the environment. AECL/CNL leverage Canadian expertise in nuclear technology and innovation to support the delivery of clean energy technologies and improve the quality of life for all Canadians. AECL/CNL help maintain Canada’s national and international nuclear leadership by conducting research activities in nuclear technologies, health and biological applications, including medical isotopes, developing and strengthening nuclear national security and emergency preparedness, and conducting reconciliation activities with Indigenous partners to identify opportunities to build long lasting relationships. CNL is undergoing a major revitalization project and has expanded their facilities at Chalk River to include the addition of the Science Collaboration Centre, a hydrogen laboratory, a materials research laboratory, and a tritium laboratory. CNL engages in federal projects while also providing commercial services to the broader nuclear industry.

AECL has launched a competitive procurement process to continue the management and operation of CNL beyond the contract expiry period in September 2025, with announcements anticipated for summer 2025.

NRCan also launched the CAD $29.6 million Enabling SMR Program in 2023 to support R&D projects related to the SMR supply chain and waste management.

Other federally supported national laboratories that support nuclear research, but do not have a specific nuclear mandate, include organizations such as the National Research Council Canada and NRCan CanmetMATERIALS research centre. Similarly, the Canada Research Chairs Program also funds nuclear research Chairs but does not have a specific nuclear mandate.

NSERC is a federal organization that funds research in engineering and the natural sciences, including nuclear research. NSERC also supports nuclear-specific academic research programmes through funding partnerships with the University Network of Excellence in Nuclear Engineering (UNENE), the CNSC, and NRCan to ensure sustainable R&D in the nuclear sector and continued innovation and expertise development. This collaborative ecosystem bolsters Canada’s capacity to advance nuclear science and technology across multiple domains.

The CNSC regulates the entire life cycle of NPPs and has established several tools and mechanisms to help support Indigenous Peoples, individuals, environmental non- government organizations, and civil society organizations in participating meaningfully in CNSC regulatory activities. This includes funding R&D programmes and other initiatives to support its regulatory mission to enhance public and Indigenous participation in CNSC's decision-making and regulatory process, capacity building for Indigenous Peoples and communities, and knowledge and information sharing support for regulatory decisions.

Private Organizations

Conexus Nuclear Inc., formerly known as the CANDU Owners Group, is a private non-profit corporation funded by CANDU operating utilities worldwide. Conexus Nuclear Inc. shares operating expertise, undertakes joint R&D projects, works towards regulatory acceptance, and strengthens human performance. It funds R&D projects in six key programme areas critical to industry needs, alongside a strategic R&D programme.

As per the NFWA, the NWMO is responsible to implement Canada's plan for the long-term management of all Canada's nuclear fuel waste. As such, NWMO funds projects related to deep geological repository R&D and collaborates with international organizations.

Kinectrics, formerly the R&D arm of Ontario Hydro, offers technological consulting across North America on nuclear-related areas. It provides specialized services to industry and has independent laboratory and testing facilities, a diverse fleet of field inspection equipment, and a large team of engineers and technical experts. As part of its services and capabilities, it performs R&D activities and actively collaborates with academic and industrial partners.

Stern Laboratories performs nuclear reliability and safety experiments for both private and public sector customers. These projects support pressurized water reactor, boiling water reactor, and CANDU reactor technology.

TRIUMF, located in Vancouver, British Columbia, serves various nuclear R&D interests, including detector development, high-temperature superconductor testing, and cyclotron-based medical isotope production.

The Saskatchewan Research Council, Canada's second largest research and technology organization, is leading a project to locate a demonstration micro-reactor in Saskatchewan for the testing and development of industrial, research and energy use applications.

Universities

UNENE partners with NSERC, Canadian universities, and industry partners to fund a sustainable portfolio of eleven Industrial Research Chair programmes as well as Research Cooperative Projects in areas important to the nuclear industry. These collaborations support R&D and the creation of specialized facilities, and the training of skilled professionals, fostering a pool of technical expertise.

Three universities host on-site nuclear research reactors together with active nuclear research programmes: McMaster University's McMaster Nuclear Reactor, which is currently the largest research reactor in Canada, and the Royal Military College of Canada and Polytechnique Montréal, which both host SLOWPOKE-2 research reactors.

The Sylvia Fedoruk Canadian Centre for Nuclear Innovation, based at the University of Saskatchewan, funds research projects on nuclear topics, supports new faculty positions, operates a cyclotron facility as a user-accessible resource for nuclear imaging science and training, and provides advice on nuclear topics. Also located at the University of Saskatchewan is the Canadian Light Source, Canada's only synchrotron, which supports aspects of nuclear research.

The Centre for Nuclear Energy Research (CNER) is an R&D institute within the University of New Brunswick that provides interdisciplinary applied R&D and services to research organizations and industry leaders and works closely with AECL and NB Power.

2.8.1. Development of Novel Technology and Applications

The Government of Canada supports the development of advanced nuclear power technologies. Among such technologies are those being developed by SMR vendors in Canada and internationally, as well as large-scale technologies. With fusion being an emerging technology, the Government of Canada, in conjunction with other jurisdictions (e.g. United Kingdom, United States of America, Singapore, and the Government of British Columbia) has provided investments, with in-kind and cash supports totalling over CAD $450 million, to General Fusion. This funding is intended to enable the accelerated development of Magnetized Target Fusion (MTF) technology.

Small Modular Advanced Reactor Training programme

In September 2019, Canada launched the Small Modular Advanced Reactor Training (SMART) programme, a federally funded initiative to promote training and research in the field of SMRs. The vision for the SMART training programme, hosted by McMaster University, is to provide and promote training and research in the field of SMRs. This programme has operated with the goal of addressing the evolving needs of the nuclear sector in Canada and providing students with experience and both technical and non-technical skills in the nuclear field. While the programme was completed in 2024, the Government of Canada continues to work with sector partners to identify future opportunities for support R&D and advanced technologies.

2.9. HUMAN RESOURCES DEVELOPMENT

Educational Initiatives

Education and job training opportunities are critical to ensure the future growth of the nuclear industry in Canada. A recent report commissioned by the Canadian Nuclear Association and the OCNI noted that approximately one-third of the industry's workforce is nearing retirement age. This same report notes that the nuclear industry has created approximately 76 000 jobs across Canada, with approximately 40% of the industry workforce being under the age of 40. To that end, there is a pressing need for a substantial increase in the labour force within Canada, with in demand occupations projected to be nuclear engineers, boilermakers, and pipefitters/welders (as well as many others). As a result, the future of the workforce in Canada will require continuous skilling and upskilling across the labour force. Approximately 90% of jobs cited in the report fall into a 'high-skill' category, providing potential good paying and educational opportunities for communities.

Currently, seven Canadian universities offer nuclear science and engineering undergraduate programmes in Canada, 14 universities offer nuclear-related engineering and science Master's and PhD degrees, and three colleges offer programmes related to the nuclear trades. Additionally, there are many other opportunities available such as internships and co-op placements,

professional development training, and standalone courses and workshops, as well as Indigenous-specific educational and apprenticeship opportunities.

UNENE was created in 2002 through a partnership of leading Canadian universities, along with major nuclear plant operators, to advance research and education in nuclear technologies. UNENE has now grown to a partnership of thirteen Canadian universities, two international universities, and seven industrial partners. UNENE delivers an M.Eng. programme, as well as a course-based diploma and other educational and training initiatives. Industry members of UNENE additionally support nuclear R&D via Industrial Research Chairs and Research Cooperative Projects at UNENE-partnered universities. These initiatives work to fund and advance nuclear research and innovation, build capacity to support the needs of the Canadian nuclear industry, and create a pool of nuclear experts. UNENE-partnered programmes are regularly updated to reflect the challenges and opportunities for nuclear energy and technology in Canada. UNENE also cooperates closely with the IAEA, acting as chair of the IAEA-endorsed consortium of regional educational networks and coordinating an initial IAEA Nuclear Energy Management school in Canada.

The NSERC-NRC partnership to fund research on SMRs as well as the NSERC-CNSC Small Modular Reactors Research Grant Initiative will enhance the capabilities of Canadian universities to undertake research related to SMRs as well as increase training and help produce a new generation of nuclear scientists, engineers and policymakers.

In 2021, Ontario Tech University received an IAEA Collaborating Centre designation for research related to integrated energy systems with advanced nuclear reactors and hybrid nuclear–renewable energy systems. Through the Collaborating Centre, Ontario Tech supports educational opportunities in Member States of the IAEA.

Chalk River Laboratories, managed by CNL, also play an important role in educational development and training and support Canada’s nuclear sector by fostering the development of highly qualified people. The laboratories offer several educational development opportunities, including a reactor school programme, and an active Academic Partnership Program that facilitates student participation and internships as well as collaboration with visiting scientists. In the spirit of generating interest among the future workforce, Chalk River also hosts a summer camp and tours. TRIUMF, a publicly funded subatomic physics laboratory operated by a consortium of Canadian universities, offers lectures and seminars to students on nuclear medicine and particle accelerator development. TRIUMF possesses leading-edge scientific facilities including a cyclotron and a proton therapy cancer treatment centre.

New in May 2025 was the first Canadian IAEA National Nuclear Energy Management School (NEMS) held at the University of Saskatchewan — an intensive two-week programme offering participants a comprehensive understanding of the nuclear energy life cycle from greenfield deployment to the opportunities and complexities of introducing nuclear energy in new jurisdictions — for 50 early and mid-career professionals.

Gender Diversity

The energy sector is one of the least gender diverse sectors worldwide: internationally, women represent only 26% of the global energy workforce. While women make up 39% of roles at the entry level, they represent just 26% of all executives and C-Suite leaders. The gender gap is even more pronounced within the nuclear security sector, where it is estimated women comprise approximately 20% of the international workforce, with similar participation levels in Canada.

In an effort to address this inequality, Canada is involved in multiple international efforts, and leads the Equality in Energy Transitions Initiative, formerly the C3E International Initiative, which works to advance gender equality in the energy sector. The

Equality in Energy Transitions Initiative is a joint initiative of the Clean Energy Ministerial (CEM) and the International Energy Agency (IEA). Under the umbrella of the Equality in Energy Transitions Initiative, Canada and Sweden co-launched the Equal by 30 Campaign, which is a global commitment by both public and private sector organizations to work towards equal pay, equal leadership and equal opportunities for women in the energy sector by 2030. Equal by 30 asks companies and governments to endorse principles, then take concrete action to increase the participation of women in the energy sector and close the gender gap by 2030. Signatories are also asked to report on progress made against their commitments.

The Equal by 30 campaign has successfully recruited over 225 signatories, including over 110 Canadian companies and all of the G7 countries. Over 18 nuclear organizations, both domestically and internationally, have signed on to the campaign, including Women in Nuclear (WiN) Canada — the Canadian chapter of the Women in Nuclear worldwide association, which is dedicated to advancing the meaningful participation of women in the nuclear energy sector. Many of the campaign's nuclear energy signatories, including the CNA and OCNI, have also made their commitments to supporting women and enabling a more inclusive and innovative clean energy sector.

Specific to nuclear, the CNSC is a member of the Nuclear Regulators for Gender Equity (NRGE), a community of heads of regulatory agencies or organizations that are committed to address gender issues in their institutions, countries and with international partners. Canada's Weapons Threat Reduction Program is supporting a variety of international initiatives to address this under-representation, notably co-funding (with Norway) the publishing of the *WINS Special Report on Gender and Nuclear Security* and *International Best Practice Guide on Advancing Gender Parity in Nuclear Security*. This report, along with Canada's support for capacity-building efforts which include dedicated workshops, scholarship opportunities and self-assessment tools developed by the World Institute for Nuclear Security (WINS), has served to build international momentum towards gender parity in the field.

2.10. STAKEHOLDER INVOLVEMENT

Public Engagement in Canadian Nuclear Policy

The Government of Canada keeps members of the public and Indigenous Peoples informed and engaged on national nuclear energy policy and events through regular communication via online publications, social media, news releases, participation at conferences and workshops, as well as reporting to Parliament as applicable. NRCan also engages with the nuclear industry and other stakeholders on a regular basis through the Nuclear Energy Leadership Table (NELT). The NELT is comprised of representatives from the federal government, interested provincial and territorial governments, Indigenous communities, industry (nuclear and high-emitting sectors), utilities, and non-governmental organizations. Current priorities are to review progress, assess shared challenges, and identify opportunities to determine what concrete actions and strategic partnerships are required to support the advancement and anchoring of the nuclear sector in Canada. The NELT also provides an important opportunity for decision makers to engage on a regular and predictable basis.

In Canada, Indigenous peoples are culturally and legally distinct from other, non-Indigenous, publics. Indigenous peoples in Canada have Indigenous rights identified in and protected by Canada's constitution and Treaty rights, established through treaties between the Crown and Indigenous Nations. Indigenous peoples are rightsholders, not stakeholders. Over time, these rights have been clarified by Canadian courts. The Government of Canada continues to collaborate with Indigenous Peoples on nuclear matters through a variety of mechanisms to seek Indigenous perspectives and priorities regarding nuclear energy policies and projects. Through these discussions, the Government of Canada aims to incorporate Indigenous knowledge and rights into decision-making processes, respecting their cultural and legal distinctiveness. This engagement also underscores Canada's

commitment to fostering a respectful relationship and ensuring meaningful participation in matters that affect Indigenous communities.

International Engagement and Business Development in Canada's Nuclear Sector

GAC and NRCan, on behalf of the Government of Canada, have also adopted a proactive approach to supporting the success of Canadians and Canadian businesses in the international nuclear marketplace through the International Markets Working Group (IMWG).

Members of the IMWG provide the Government of Canada with advice on the capabilities, interests and needs of the nuclear industry and provide feedback on proposals for international export sector-related programmes and services delivered by GAC and NRCan across Canada and around the world. The IMWG also offers an opportunity for the Government of Canada to provide updates, insight, and advice to Canada’s nuclear industry. This allows members of the Working Group, and Canada’s nuclear industry more broadly, to capitalize on international opportunities in the nuclear space and to leverage existing connections with key global partners.

Canadian Nuclear Safety Commission

Commission proceedings are public and Indigenous Nations and communities, stakeholders and the public are encouraged to participate by intervening in the proceedings either through written submission or oral presentation, as appropriate.

The CNSC has established several tools and mechanisms to help support Indigenous Peoples, individuals, environmental non-government organizations and civil society organizations in participating meaningfully in CNSC regulatory activities, including the CNSC’s Participant Funding Program which was established in 2011. Through this funding programme, the CNSC seeks to support the participation in its environmental assessment and licensing processes for major nuclear facilities, and to help Indigenous Nations and communities, the public, environmental non-government organizations and civil society organizations bring value-added information to the Commission.

The CNSC also offers funding support through the Indigenous and Stakeholder Capacity Fund (ISCF) which helps address capacity needs expressed by Indigenous Nations and communities and stakeholders. The ISCF aims to reduce financial and capacity barriers for Indigenous Nations and communities and interested parties to enable them to participate in the CNSC’s full life cycle of regulatory process, programmes and initiatives more meaningfully, and builds on guidance, best practices and lessons learned from other federal departments as well as CNSC’s own funding programmes.

As an Agent of the Crown, the CNSC has a set of constitutional obligations and responsibilities to Indigenous Peoples to work towards advancing Reconciliation, support a Nation-to-Nation relationship, and uphold the honour of the Crown through meaningful consultation and engagement on decisions and activities that could impact them and their rights. A key part of Crown obligations is fulfilling the Duty to Consult, and where appropriate, accommodate, which flows from Indigenous and treaty rights outlined in Section 35 of the 1982 Canadian Constitution Act. In 2016, the CNSC published regulatory document REGDOC-3.2.2, Indigenous Engagement, which sets out requirements and guidance for Indigenous engagement to licensees and applications whose proposed projects may raise the Crown’s formal Duty to Consult. By following the requirements in REGDOC-3.2.2, licensees assist the CNSC in fulfilling the Duty to Consult with Indigenous Nations and communities whose established or potential Indigenous and/or treaty rights may be impacted by a proposed project. The CNSC is committed to meaningful engagement, fostering long-term relationships, and advancing Reconciliation with Indigenous Peoples. As part of its consultation and engagement processes, the

CNSC is committed to implementing the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP). Additionally, it supports Canada's implementation of the United Nations Declaration on the Rights of Indigenous Peoples Act and related efforts. To date, the CNSC has signed 11 different Terms of Reference (ToR) for long-term engagement with Indigenous Nations and communities, which has provided a formalized approach and mechanism to discuss, collaborate and engage on topics and issues of interest related to CNSC regulated projects and facilities and CNSC's regulatory processes. This is in addition to terms of reference for consultation on environmental assessments and licensing processes for specific projects.

Licensees of the CNSC are required to adhere to Regulatory Document 3.2.1 *Public Information and Disclosure,* to inform and engage their own audiences, including media, the public, stakeholders and Indigenous Nations and communities, about their operational activities and project details. CNSC staff are reviewing regulatory documents REGDOC 3.2.2, Indigenous Engagement, and REGDOC 3.2.1, Public Information and Disclosure, for modernization to reflect the evolving expectations, policies and legal requirements in Canada, as well as best practices in consultation, engagement and communications. There are also other organizations in Canada who have an interest in communicating information on nuclear power to the public, including the Canadian Nuclear Association, the Canadian Nuclear Society, Conexus Nuclear Inc. and OCNI.

2.11. INTERNATIONAL COOPERATIONS AND INITIATIVES

International Cooperation

Canada is an active supporter of the peaceful uses of nuclear energy and has concluded 31 nuclear cooperation agreements (NCAs) covering 48 countries, including members of the European Atomic Energy Community (Euratom) as well as an agreement with the ITER Organization. The Canada-Poland NCA is the most recent one, signed on 28 January 2025.

Canada's NCAs are a key requirement of its policy on nuclear non-proliferation and are the responsibility of GAC. NCAs are negotiated by GAC, NRCan and the CNSC; the respective administrative arrangements that implement Canada's NCAs are established by the CNSC. Canada's NCAs commit Canada and its bilateral nuclear partners to complying with a set of requirements which help implement Canadian nuclear non-proliferation policy.

Canada has also concluded various bilateral MOUs in support of greater cooperation, including on regulatory technical exchanges, R&D and for information sharing pertaining to best practices and experience.

At COP28 in December 2023, Canada endorsed the declaration to triple nuclear energy capacity by 2050, an initiative that now includes over 30 participating countries. The declaration acknowledges nuclear energy as one potential tool to support global efforts to reach net-zero emissions by mid-century. By endorsing, Canada signaled support for greater international collaboration on nuclear energy and interest in its role within a clean, reliable, and diverse energy mix. It also calls on international financial institutions to consider nuclear energy in their lending policies and encourages investment in advanced nuclear technologies, including SMRs.

Support for Export Projects

The Government of Canada continues to support Canadian industry in providing products and services for existing nuclear plants in Canada and abroad, and in pursuing CANDU export opportunities.

In November 2024, Candu Energy Inc., in a joint venture with international partners, was awarded a contract to build two new CANDU reactors at Cernavoda (Units 3 and 4), which once completed would be the first CANDUs built in the world since 2007. Financing is to be supported by up to CAD $3 billion from the Government of Canada, administered by Export Development Canada and subject to due diligence, with additional capital from other governments.

In December 2024, Nuclearelectrica, subject to approvals, awarded a contract to Candu Energy and the Canadian Commercial Corporation (a Canadian crown corporation), in a consortium with other international partners, to life-extend Unit 1.

In December 2024, Export Development Canada issued a letter of intent to Polskie Elektrownie Jądrowe, offering up to CAD $2.02 billion to potentially support Poland's first NPP project in Pomerania. The financing aims to facilitate the involvement of Canadian suppliers and reflects Canada's interest in supporting European energy security.

Multilateral Initiatives

Canada is a member of NEA-OECD, the IAEA, the SMR Regulators' Forum, the Generation IV International Forum (GIF), the International Framework for Nuclear Energy Cooperation (IFNEC), and the Nuclear Suppliers Group (NSG).

Nuclear Energy Agency (NEA)

Canada is an active and important contributor to the NEA, providing expertise in areas such as international best practices, nuclear regulations, decommission and waste, nuclear safety and codes and standards, nuclear financing, nuclear law and economics. Canada is actively participating in a number of NEA working groups related to the safe deployment and licensing of SMRs and advanced reactors. This includes the Expert Group for Small Modular Reactors (EGSMR) and the Working Group on New Technologies (WGNT), the Working Party on Nuclear Energy Economics (WPNE), the Joint NEA/IAEA Group on Uranium (UG), and the Working Group on Small Modular Reactors Economics (SMR-ECON). Canada is also a founding member and active participant in the NEA Nuclear Education, Skills and Technology (NEST) Framework, an international, fellowship-based initiative to help address important gaps in nuclear skills capacity building, knowledge transfer and technical innovation.

International Atomic Energy Agency

Canada is an important contributor to the IAEA through its assessed and voluntary contributions, which include support to the Agency's Technical Cooperation Programme, Peaceful Uses Initiative, and Nuclear Security Fund. Additionally, Canada provides in-kind contributions to the IAEA through the participation of experts from government, regulators, industry and academia in various IAEA activities, such as technical meetings, peer review missions, conferences and consultancy meetings. Through its regular participation in IAEA events, Canada can ensure that its national guidance, policies and technical standards remain current and on par with international standards, including with regards to the physical protection of nuclear materials and facilities, nuclear safety and security, nuclear regulation, and nuclear non-proliferation. Increasingly, innovation in the development of nuclear technologies is merging the design for security, safeguards and safety into one cohesive approach, requiring increasingly close cooperation between experts to achieve effective outcomes. Canada continues to be a strong supporter of the IAEA's mandate and activities, including nuclear safeguards verification.

The CNSC actively leads important IAEA initiatives, including presiding over the 8th Review Meeting of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management and chairing the Regulatory Cooperation

Forum. The CNSC also participates in the Nuclear Harmonization and Standardization Initiative (NHSI) on all Regulatory Track working groups aimed at promoting regulatory harmonization amongst nuclear regulators.

SMR Regulators' Forum

The SMR Regulators' Forum, officially established in 2015, focuses on nuclear safety by identifying, discussing and resolving common safety issues that may challenge regulatory activities associated with SMR technologies and their deployment. SMR technologies include both water-cooled and advanced reactor concepts.

The work of the Forum draws from the extensive nuclear safety experience of member regulators who:

- Are actively involved in regulatory activities concerning SMR technologies;
- Bring other relevant regulatory experience from new and existing nuclear power facilities.

The SMR Regulators' Forum is self-funded from member countries and has retained a scientific secretary and administrative support functions from the IAEA.

The Forum has published all major reports to-date transparently, and in a timely manner, on the SMR Regulators' Forum Website. Subject areas addressed by the Forum to-date include:

- Use of a graded approach in risk informed decision making;
- Application of defence in depth to SMR technologies;
- Considerations in proposing flexible emergency planning zones;
- Factors to be considered in the licensing of SMR facilities;
- Developing an integrated approach to safety, security, and safeguards;
- Containment considerations for non-water cooled SMR designs.

Generation IV International Forum (GIF)

The GIF is a significant international nuclear R&D initiative which enables the coordination of advanced nuclear research among major nuclear countries. Canada was a founding member of the GIF and has a representative currently serving as the Policy Director of the GIF Policy Group. CNL continues to participate in collaborative R&D of the supercritical water cooled reactor and the very high temperature reactor and the exchange of information associated with molten salt reactor technologies.

Canada also participates in the GIF working groups for the development of methodologies for the assessment of Generation IV reactors against the GIF goals, related risk and safety, proliferation resistance, as well as physical protection and economics. Canadian representatives are active in other crosscutting activities of the GIF including, advanced manufacturing, education and training, and non-electric applications of Generation IV concepts.

International Framework for Nuclear Energy Cooperation (IFNEC)

Canada is one of 34 member countries of IFNEC, a multilateral forum focused on ensuring that the global expansion of nuclear power occurs in a safe and secure manner, and in a manner that ensures nuclear technology is used only for peaceful purposes.

IFNEC serves as a network for states to share knowledge and experience when dealing with nuclear energy and safety and has recently increased its focus on exploring the integration of nuclear technologies, such as SMRs, in broader clean energy systems.

Nuclear Suppliers Group (NSG) and Zangger Committee (ZC)

The NSG and ZC are multilateral export control regimes providing guidelines for the supply of nuclear-related materials, equipment and technology. Canada is actively engaged in ongoing efforts to counter the proliferation of nuclear weapons through participation in the NSG and the ZC. Canada implements its commitments under these groups through the Export and Import Permits Act (EIPA) and the NSCA, as well as bilateral Nuclear Cooperation Agreements.

Clean Energy Ministerial (CEM)

Canada has been a co-lead in the NICE Future initiative within the CEM since its launch at CEM9 in 2018. Initially formed with the United States of America and Japan, the initiative has grown to include countries such as Argentina, Brazil, France, and the United Arab Emirates, as well as international organizations and industry partners. At CEM10 in Vancouver, Canada highlighted progress with the release of the publication *Breakthroughs: Nuclear Innovation in a Clean Energy System*, showcasing advancements in nuclear technology and launching a campaign focused on integrating nuclear and renewable energy for more flexible energy systems.

Subsequent CEM meetings expanded on these efforts: CEM11 introduced the Flexible Nuclear Campaign for Nuclear-Renewables Integration (FNC), exploring nuclear energy's role in adaptable energy systems. By CEM12 in 2021, the focus shifted to net-zero pathways with nuclear innovation, culminating in a publication on leveraging nuclear energy to meet global climate goals. In 2022, the FNC evolved into the RISE3 initiative, emphasizing the societal and economic benefits of nuclear energy.

Sapporo 5

Canada is a member of the group colloquially known as the ‘Sapporo 5’, alongside Japan, France, the United Kingdom, and the United States of America. Together the five state actors are collectively responsible for 50% of the world’s uranium conversion and enrichment production capacity. The Sapporo 5 first convened at the Nuclear Energy Forum held alongside the G7 ministers' meeting in Sapporo, Japan in April 2023. This forum highlighted the profound impacts of the Ukraine war and climate change on the global energy landscape and emphasized the urgent need for collaboration among like-minded allies to ensure stable nuclear fuel supplies, reduce dependence on Russian sources, and advance nuclear technologies for both current and future reactors. The Sapporo 5 aim to bolster energy security, support climate objectives, and enhance economic resilience while promoting fair competition in international markets. In Sapporo, the five countries also reaffirmed their commitment to accelerating the transition to clean energy and recognized nuclear energy's role in achieving these goals despite some member nations phasing out nuclear power.

In the December 2023 agreement, the Sapporo 5 committed to promoting public-private investment in enriched uranium production independent of Russian influence, establishing a resilient global uranium supply market, and enhancing their own production capacities. The agreement aims to generate at least USD $4.2 billion in investments over three years to strengthen nuclear fuel supply chains and invites other like-minded nations to join efforts in securing reliable nuclear energy partnerships.

3. NATIONAL LAWS AND REGULATIONS

3.1. REGULATORY FRAMEWORK

3.1.1. Regulatory Authority(s)

On 31 May 2000, the CNSC was created as the successor to the Atomic Energy Control Board (AECB), which had served as the regulator of Canada's nuclear industry for more than 50 years. The CNSC's creation followed the entry into force of the NSCA and its regulations. The NSCA represented the first major overhaul of legislation governing Canada's nuclear regulatory regime since the AECB was established in 1946. It created an independent administrative tribunal (the CNSC's Commission) to regulate the nuclear industry and authorized the hiring of technical and support staff. The CNSC reports to Parliament through the Minister of Natural Resources.

The CNSC's mission is to regulate 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.

Core regulatory operations represent the bulk of the CNSC's everyday work to deliver on its mandate. These include the administration of the regulatory framework, licensing, certification, and compliance activities, with the ultimate goal to make sure that the Canadian nuclear industry is operating safely and securely.

The Canadian regulatory system is designed to protect people and the environment from the risks associated with the development and use of nuclear energy and nuclear substances. Individuals, companies and medical or academic institutions wishing to operate nuclear facilities or use nuclear substances for industrial, medical or academic purposes must first obtain a licence from the CNSC. It is a fundamental tenet of Canada's regulatory regime that licensees are primarily responsible for safety. The CNSC's role is to ensure that applicants live up to their responsibility. The onus is therefore on the applicant or the holder of the licence to justify the selection of a site, method of construction, and mode of operation of a facility, and the decommissioning plan for the facility or activity, to the satisfaction of the Commission.

The Commission is an independent, quasi-judicial tribunal and a court of record, with the powers, rights, and privileges necessary to carry out its duties and enforce its orders. It operates at arm's length from the Government and with no ties to the nuclear industry. The Commission has up to seven permanent members who are appointed by the Governor in Council for terms of up to five years. One member is designated as President of the Commission and Chief Executive Officer of the CNSC.

Subject to the Governor in Council's approval, the Commission may make and amend regulations as it deems necessary for attaining the objects of the NSCA. The Commission is also empowered to grant licences to conduct nuclear activities. Commission decisions are science and safety based; they may not be overturned by the Government of Canada. They are reviewable only by the Federal Court of Appeal. These measures help ensure the independence of the Commission.

The Governor in Council may issue directives to the CNSC. Any such directive may only be of general application on broad policy matters with respect to the objects of the Commission, and not in respect of a particular case before the Commission.

To maintain its adjudicative distance from CNSC staff, the Commission communicates with staff only through the Commission Registrar and through formal proceedings. This separation serves to maintain the Commission's independence.

Key Regulatory Acts

While the management of energy supply and electricity generation infrastructure, including decisions on the construction of new nuclear projects in Canada, is within the jurisdiction and responsibility of each province, nuclear regulations are federally regulated by the CNSC throughout their life cycles (i.e., starting from site preparation phases through to decommissioning and long-term radioactive waste management).

The 2019 *Impact Assessment Act* (IAA) (replaced the *Canadian Environmental Assessment Act 2012*, CEAA 2012), identifies certain proposed nuclear facilities requiring a federal impact assessment and review under the *Nuclear Safety and Control Act* (NSCA, 1997) as 'designated projects.' The federal impact assessment process serves as a planning tool that takes into account not only environmental impacts, but also social, health, and economic impacts.

Designated nuclear projects are reviewed by an integrated review panel to satisfy the requirements of both the IAA and NSCA. The process is led by the IAAC in collaboration with the CNSC. The review panel must include at least one member of the CNSC's decision-making body, the Commission Tribunal.

The Governor in Council is responsible for making impact assessment decisions under the IAA. If a project is deemed to be in the public interest, the CNSC Integrated Review Panel will make the licensing decision under the NSCA. Once authorized to proceed, the CNSC will oversee its subsequent regulation in accordance with the NSCA. Non-designated projects subject to the NSCA would be assessed solely by the CNSC. Ongoing nuclear projects with federal environmental assessments, initiated under CEAA 2012 and led by the CNSC, will continue under its current processes. The IAA contains provisions to enable these projects to advance in this way.

The Governor in Council is responsible for making the impact assessment decision under the IAA. If it is determined that the project is in the public interest, the CNSC would make the licensing decision under the NSCA. If the project is authorized to proceed, subsequent regulation would be the responsibility of the CNSC under the NSCA. Non-designated projects subject to the NSCA would be assessed by the CNSC only.

Ongoing nuclear projects with federal environmental assessments, initiated under CEAA 2012 and led by the CNSC, will continue under its current processes. The IAA contains provisions to enable these projects to advance in this way.

The CNSC has also continued to review the NSCA and to modernize its regulations, regulatory requirements, and guidance documents to ensure rigorous and enforceable requirements for compliance as well as a clear regulatory direction, which provides industry with the regulatory requirements to make its investment decisions, in particular with respect to new NPPs and SMRs.

3.1.2. Licensing Process

Licensing matters for major facilities are carried out in public hearings by the Commission (CNSC). When issuing a licence, the Commission must be satisfied that the proponents have taken adequate measures to protect health and safety, the environment, ensure security, respect Canada's international commitments, and that the companies are qualified to carry out the licensed activities. Licensing matters for major facilities are carried out in public hearings by an independent administrative tribunal — the CNSC's Commission. This is one of the most visible functions of the CNSC in the regulation of the nuclear industry.

As part of its implementation of international obligations and commitments, the CNSC regulates the import and export of nuclear substances, nuclear equipment, and nuclear technology in order to ensure that Canada's nuclear non-proliferation policy and international obligations are respected, including those arising from the Treaty on the Non-Proliferation of Nuclear Weapons. In

addition, the CNSC works in collaboration with GAC to fully implement the provisions of Canada's nuclear cooperation agreements. CNSC and GAC staff also provide technical support and policy guidance in support of Canada's participation in international non-proliferation activities and initiatives.

The CNSC has developed a suite of regulatory documents, which are a key part of the CNSC's regulatory framework for nuclear activities in Canada. They provide additional clarity to licensees and applicants about how to meet the requirements set out in the NSCA and the regulations made under the NSCA. They also provide guidance on how the requirements might be met. Regulatory documents generally present both requirements and guidance in a single document and distinguish between the two through the use of mandatory (e.g. shall, must) and non-mandatory (e.g. should, may) language.

The Commission has an extensive suite of regulatory enforcement measures available to enforce licensee compliance including increased regulatory scrutiny, orders, licence amendments, monetary penalties, and prosecution for regulatory offences set out in the NSCA.

Before any person or company can prepare a site to construct, operate, decommission or abandon a nuclear facility, they must obtain a licence from the CNSC.

There are four major steps in the licensing process for a new nuclear facility (such as an NPP):

1. *Submission of licence application*
    - The licensing process begins when an application is received by the CNSC. An assessment plan and timeline are then developed for each individual application. The assessment plan identifies the scope and depth of the technical assessment needed to evaluate the application and considers a number of factors, including:
        - Historical licensing information
        - Licensing experience
        - Performance and compliance reports
        - CNSC staff recommendations

2. Environmental review

- Under the NSCA, the CNSC has a legislated mandate to regulate the use of nuclear energy and materials in order to protect health, safety, security, and the environment. To meet this responsibility, the CNSC staff considers and evaluates the potential environmental effects of all nuclear facilities or activities when making licensing decisions. An environmental review is required for licensing decisions, and the type of review is dependent on the environmental risk of the facility. For those projects designated under the IAA, a federal impact assessment is required. Should an impact assessment not be required, an environmental review is conducted by the province/territory and/or the CNSC.

3. *Technical assessment*

- CNSC staff undertake a variety of technical assessments according to the prescribed assessment plan to ensure that each application complies with all regulatory criteria as defined by the NSCA, relevant regulations, international and domestic standards, and international obligations. As part of the assessment, the CNSC will request expertise from relevant federal departments, such as those responsible for species at risk, fish and fish habitat, noise and the transportation of dangerous goods, as well as from the province, academics and/or international experts.

4. *CNSC decision*

- The final step in the licensing process is the Commission tribunal's decision, which considers submissions by the applicant, all CNSC staff recommendations, and the views and concerns expressed at public hearings. The public hearings provide interested parties and Indigenous Nations and communities an opportunity to participate in the licensing process by voicing any views or concerns to the Commission members, which constitutes an important part of informing licensing decisions.
- Throughout this licensing process, there is ongoing consultation and engagement with Indigenous Nations and communities, stakeholders, and the public. The CNSC aims to promote transparency of staff technical review processes and engages through status updates, topical discussions with two-way dialogue, and releasing products to contextualize the project, such as videos, project bulletins and responding to requests or questions. As an Agent of the Crown, the CNSC is also responsible for meeting the Crown's duty to consult and for upholding the honour of the Crown.

3.2. MAIN NATIONAL LAWS AND REGULATIONS IN NUCLEAR POWER

Regulation of the nuclear industry is a federal responsibility, whereas Canada's provinces have constitutional responsibility for resource and industrial development, including authority for decisions regarding the development of uranium resources and the commercial development and use of nuclear power. While the CNSC has sole responsibility for licensing nuclear facilities and nuclear activities, a number of other federal agencies are involved in the regulation of the industry. Provinces may also have regulations that deal with off-site activities of licensees, such as provisions for off-site emergency preparedness.

The main national laws relevant to Canada's nuclear programme are the *Nuclear Energy Act* of 1985; the NSCA—which repealed the *Atomic Energy Control Act* of 1946 and entered into force in 2000; the *Nuclear Liability and Compensation Act* (NLCA)—which repealed the former *Nuclear Liability Act* and entered into force on 1 January 2017; the NFWA of 2002; and the *Nuclear Terrorism Act* (NTA) that entered into force in 2013.

- ***Nuclear Energy Act***: outlines activities, including research and investigations that may be undertaken in the development and utilization of nuclear energy by the Minister responsible. The Act declares nuclear energy as an area of federal jurisdiction.
- ***Nuclear Safety and Control Act*****:** established the CNSC and set out the CNSC's mandate, responsibilities and powers. This Act provided the CNSC with the authority to regulate the development, production and use of nuclear energy and the production, possession and use of nuclear substances, prescribed equipment and prescribed information in Canada. This law implements Canada's obligations under the Convention on Nuclear Safety.
- ***Nuclear Liability and Compensation Act*****:** The NLCA established the absolute and exclusive liability limit of nuclear operators to be CAD$1 billion and permitted Canada to become a signatory to and implement the International Convention on Supplementary Compensation for Nuclear Damage (CSC). The NLCA provides a provision for a review of the liability limit for power reactors every five years so that the limit can remain current and relevant, and the first review concluded by the end of 2021. The NLCA broadens definitions of compensable damage to include economic loss, preventive measures and environmental damage, improves the procedures for delivery of compensation and extends the limitation period for submitting compensation claims for bodily injury to 30 years. During June 2019, the Government of Canada hosted the Inaugural Meeting of the Parties and Signatories to CSC, acted as the Chair to the Second Meeting of the Parties and Signatories to CSC in Vienna during June 2022, and participated in the third meeting, which took place in Japan during June 2023. The June 2024 meeting was once again hosted by the IAEA in Vienna. The CSC is an international treaty that sets out

obligations for civil liability and compensation arising from nuclear incidents occurring within member countries and during nuclear material transport.

- ***Nuclear Fuel Waste Act*:** The NFWA requires nuclear energy corporations to form a waste management organization, the NWMO, whose mandate is to propose to the Government of Canada approaches for the long-term management of spent fuel, and to implement the approach that is selected by the Government. The NFWA also requires the nuclear energy corporations and AECL to establish trust funds to finance the implementation of the selected long-term spent fuel management approach.
- ***Nuclear Terrorism Act*:** The NTA helps to strengthen the security of nuclear materials and facilities in Canada, and to combat nuclear terrorism by including offences related to nuclear terrorism in the Canadian Criminal Code and thereby enhancing the domestic legal framework available to respond to the threat posed by acts of nuclear terrorism. The NTA also implements Canada's key international nuclear security obligations, including the criminalization provisions under the 2005 Amendment to the Convention on the Physical Protection of Nuclear Materials, and the International Convention for the Suppression of Acts of Nuclear Terrorism.

3.2.2 *Main regulations in nuclear power:*

Regulations under the NSCA include:

- *Administrative Monetary Penalties Regulations (Canadian Nuclear Safety Commission)* (SOR/2013-139)
- *Canadian Nuclear Safety Commission By-laws* (SOR/2000-212)
- *Canadian Nuclear Safety Commission Cost Recovery Fees Regulations* (SOR/2003-212)
- *Canadian Nuclear Safety Commission Rules of Procedure* (SOR/2000-211)
- *Class I Nuclear Facilities Regulations* (SOR/2000-204)
- *Class II Nuclear Facilities and Prescribed Equipment Regulations* (SOR/2000-205)
- *General Nuclear Safety and Control Regulations* (SOR/2000-202)
- *Nuclear Non-proliferation Import and Export Control Regulations* (SOR/2000-210)
- *Nuclear Security Regulations* (SOR/2000-209)
- *Nuclear Substances and Radiation Devices Regulations* (SOR/2000-207)
- *Packaging and Transport of Nuclear Substances Regulations, 2015* (SOR/2015-145)
- *Radiation Protection Regulations* (SOR/2000-203)
- *Uranium Mines and Mills Regulations* (SOR/2000-206)

The CNSC uses a risk-informed approach to regulation that is focused on protecting the health, safety, and security of Canadians and the environment, as well as ensuring that Canada meets its international nuclear obligations on the peaceful use of nuclear energy.

Regulations under the *Nuclear Energy Act* include:

- *Uranium Mines (Ontario) Occupational Health and Safety Regulations* (SOR/84-435)

Regulations under the *Nuclear Liability and Compensation Act* include:

- *Nuclear Liability and Compensation Regulations* (SOR/2016-88)

- *Order Designating Ministers under Certain Federal Acts* (SI/2015-112)

Regulations under the *Canada Labour Code* include:

- *Canada Labour Standards Regulations* (SOR/79-32)
- *Occupational Health and Safety Regulations* (SOR/86-304)
- *Radiation Protection Regulations* (SOR/2000-203)
- *Nuclear Safety and Control Act* (SOR/2000-204)

APPENDIX 1. INTERNATIONAL, MULTILATERAL AND BILATERAL AGREEMENTS

Agreements with the IAEA

Agreement : Additional Protocol to the Comprehensive Safeguards Agreement (INFCIRC/164/Add.1)
Countries : Canada
Signature Date :
Ratification Date :
In-Force Date :
Notes : Entry Into Force; 8 September 2000

Agreement : Agreement on the Privileges and Immunities of the IAEA
Countries : Canada
Signature Date : 1966-06-15
Ratification Date : 1967-08-18
In-Force Date :
Notes : Entry Into Force; 15 June 1966

Agreement : Amendments to Articles VI and XIV of the IAEA Statute
Countries : Canada
Signature Date :
Ratification Date : 2000-09-15
In-Force Date :
Notes :

Agreement : Comprehensive Safeguards Agreement (INFCIRC/164)
Countries : Canada
Signature Date :
Ratification Date :
In-Force Date :
Notes : Entry Into Force; 21 February 1972

International Treaties

Agreement : Amendment to the Convention on Physical Protection of Nuclear Material
Countries : Canada
Signature Date :
Ratification Date : 2016-04-01
In-Force Date :
Notes : Entry Into Force; 8 May 2016

Agreement : Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency
Countries : Canada
Signature Date :
Ratification Date :
In-Force Date :
Notes : Entry Into Force; 12 September 2002

Agreement : Convention on Early Notification of a Nuclear Accident
Countries : Canada
Signature Date :
Ratification Date :
In-Force Date :
Notes : Entry Into Force; 8 February 1990

Agreement : Convention on Nuclear Safety
Countries : Canada
Signature Date :
Ratification Date :
In-Force Date :
Notes : Entry Into Force; 24 October 1996

Agreement : Convention on Physical Protection of Nuclear Material
Countries : Canada
Signature Date :
Ratification Date :
In-Force Date :
Notes : Entry Into Force; 8 February 1987

Agreement : Convention on Supplementary Compensation for Nuclear Damage
Countries : Canada
Signature Date :
Ratification Date :
In-Force Date :

Notes : Entry Into Force; 4 September 2017 Date of Deposit; 6 June 2017

Agreement : International Convention for the Suppression of Acts of Nuclear Terrorism
Countries : Canada
Signature Date :
Ratification Date :
In-Force Date :
Notes : Entry Into Force; 21 December 2013

Agreement : Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management
Countries : Canada
Signature Date :
Ratification Date :
In-Force Date :
Notes : Entry Into Force; 18 June 2001

Agreement : Treaty on the Non-Proliferation of Nuclear Weapons
Countries : Canada
Signature Date :
Ratification Date :
In-Force Date :
Notes : Entry Into Force; 5 March 1970

Other Relevant International Treaties

Agreement : Agenda 21 of the UN Conference on Environment and Development
Countries : Canada
Signature Date :
Ratification Date :
In-Force Date :
Notes : Agreed; 1992

Agreement : Bilateral Nuclear Cooperation Agreement (NCA)
Countries : Australia, Canada
Signature Date :
Ratification Date :
In-Force Date :
Notes :

Agreement : Bilateral Nuclear Cooperation Agreement (NCA)

Countries : Canada, Ukraine
Signature Date :
Ratification Date :
In-Force Date :
Notes :

Agreement : Bilateral Nuclear Cooperation Agreement (NCA)
Countries : Canada, Jordan
Signature Date :
Ratification Date :
In-Force Date :
Notes :

Agreement : Bilateral Nuclear Cooperation Agreement (NCA)
Countries : Canada, India
Signature Date :
Ratification Date :
In-Force Date :
Notes :

Agreement : Bilateral Nuclear Cooperation Agreement (NCA)
Countries : Canada, Spain
Signature Date :
Ratification Date :
In-Force Date :
Notes :

Agreement : Bilateral Nuclear Cooperation Agreement (NCA)
Countries : Canada, Egypt
Signature Date :
Ratification Date :
In-Force Date :
Notes :

Agreement : Bilateral Nuclear Cooperation Agreement (NCA)
Countries : Canada, United States of America
Signature Date :
Ratification Date :
In-Force Date :
Notes :

Agreement : Bilateral Nuclear Cooperation Agreement (NCA)
Countries : Canada, Mexico

Signature Date :
Ratification Date :
In-Force Date :
Notes :

Agreement : Bilateral Nuclear Cooperation Agreement (NCA)
Countries : Canada, China
Signature Date :
Ratification Date :
In-Force Date :
Notes :

Agreement : Bilateral Nuclear Cooperation Agreement (NCA)
Countries : Canada, United Arab Emirates
Signature Date :
Ratification Date :
In-Force Date :
Notes :

Agreement : Bilateral Nuclear Cooperation Agreement (NCA)
Countries : Canada, Japan
Signature Date :
Ratification Date :
In-Force Date :
Notes :

Agreement : Bilateral Nuclear Cooperation Agreement (NCA)
Countries : Canada, Finland
Signature Date :
Ratification Date :
In-Force Date :
Notes :

Agreement : Bilateral Nuclear Cooperation Agreement (NCA)
Countries : Canada, Kazakhstan
Signature Date :
Ratification Date :
In-Force Date :
Notes :

Agreement : Bilateral Nuclear Cooperation Agreement (NCA)
Countries : Canada, Sweden
Signature Date :

Ratification Date :
In-Force Date :
Notes :

Agreement : Bilateral Nuclear Cooperation Agreement (NCA)
Countries : Argentina, Canada
Signature Date :
Ratification Date :
In-Force Date :
Notes :

Agreement : Bilateral Nuclear Cooperation Agreement (NCA)
Countries : Canada
Signature Date :
Ratification Date :
In-Force Date :
Notes : # ITER Organization

Agreement : Bilateral Nuclear Cooperation Agreement (NCA)
Countries : Canada, Russian Federation
Signature Date :
Ratification Date :
In-Force Date :
Notes :

Agreement : Bilateral Nuclear Cooperation Agreement (NCA)
Countries : Canada, Colombia
Signature Date :
Ratification Date :
In-Force Date :
Notes :

Agreement : Bilateral Nuclear Cooperation Agreement (NCA)
Countries : Canada, Czech Republic
Signature Date :
Ratification Date :
In-Force Date :
Notes :

Agreement : Bilateral Nuclear Cooperation Agreement (NCA)
Countries : Canada, Hungary
Signature Date :
Ratification Date :

In-Force Date :
Notes :

Agreement : Bilateral Nuclear Cooperation Agreement (NCA)
Countries : Canada, Switzerland
Signature Date :
Ratification Date :
In-Force Date :
Notes :

Agreement : Bilateral Nuclear Cooperation Agreement (NCA)
Countries : Canada, Korea, Republic of
Signature Date :
Ratification Date :
In-Force Date :
Notes :

Agreement : Bilateral Nuclear Cooperation Agreement (NCA)
Countries : Canada, Romania
Signature Date :
Ratification Date :
In-Force Date :
Notes :

Agreement : Bilateral Nuclear Cooperation Agreement (NCA)
Countries : Brazil, Canada
Signature Date :
Ratification Date :
In-Force Date :
Notes :

Agreement : Bilateral Nuclear Cooperation Agreement (NCA)
Countries : Canada, Türkiye
Signature Date :
Ratification Date :
In-Force Date :
Notes :

Agreement : Bilateral Nuclear Cooperation Agreement (NCA)
Countries : Canada, Slovakia
Signature Date :
Ratification Date :
In-Force Date :

Notes :

Agreement : Bilateral Nuclear Cooperation Agreement (NCA)
Countries : Canada, Philippines
Signature Date :
Ratification Date :
In-Force Date :
Notes :

Agreement : Bilateral Nuclear Cooperation Agreement (NCA)
Countries : Canada, United Kingdom
Signature Date :
Ratification Date :
In-Force Date :
Notes :

Agreement : Bilateral Nuclear Cooperation Agreement (NCA)
Countries : Canada, Indonesia
Signature Date :
Ratification Date :
In-Force Date :
Notes :

Agreement : Bilateral Nuclear Cooperation Agreement (NCA)
Countries : Canada, Slovenia
Signature Date :
Ratification Date :
In-Force Date :
Notes :

Agreement : Bilateral Nuclear Cooperation Agreement (NCA)
Countries : Canada
Signature Date :
Ratification Date :
In-Force Date :
Notes : # Euratom Euratom encompasses 27 European Union countries: Austria; Belgium; Bulgaria; Croatia; Cyprus; Czech Republic; Denmark; Estonia; Finland; France; Germany; Greece; Hungary; Ireland; Italy; Latvia; Lithuania; Luxembourg; Malta; Netherlands; Poland; Portugal; Romania; Slovakia; Slovenia; Spain; and Sweden. Some countries are currently covered by both the Canada–Euratom agreement and separate bilateral agreements with Canada.

Agreement : Comprehensive Test Ban Treaty
Countries : Canada
Signature Date :

Ratification Date : 1998-12-31
In-Force Date :
Notes :

Agreement : Improved procedures for designation of safeguards inspectors
Countries : Canada
Signature Date :
Ratification Date :
In-Force Date :
Notes : Accepted; 8 June 1989

Agreement : Nuclear Export Guidelines
Countries : Canada
Signature Date :
Ratification Date :
In-Force Date :
Notes : Adopted; 1978 1992

Agreement : Nuclear Suppliers Group
Countries : Canada
Signature Date :
Ratification Date :
In-Force Date :
Notes : Member 1978

Agreement : Zangger Committee
Countries : Canada
Signature Date :
Ratification Date :
In-Force Date :
Notes : Member 1974

APPENDIX 2. MAIN ORGANIZATIONS, INSTITUTIONS AND COMPANIES INVOLVED IN NUCLEAR POWER RELATED ACTIVITIES

National Authorities

Organization Name	Address	Contact	Website
Canadian Nuclear Safety Commission	280 Slater Street P.O. Box 1046, Station B Ottawa, Ontario K1P 5S9	Tel.: (+1-613) 995-5894 Fax: (+1-613) 995-5086	
Non-Proliferation and Disarmament Division	125 Sussex Drive Ottawa, Ontario K1A 0G2	Tel.: (+1-613) 218-2957	

Global Affairs Canada		
Uranium and Radioactive Waste Division Natural Resources Canada	580 Booth Street Ottawa, Ontario KIA 0E4	Tel.: (+1-343) 292-6049 Fax: (+1-613) 947-4205
Health Canada	960 Carling Ave Ottawa, Ontario K1A 0K9	Tel.: (+1-613) 957-2991
Atomic Energy of Canada Limited	286 Plant Rd, Stn 508A Chalk River, Ontario K0J 1J0	Tel.: (+1-613) 589-2085
Nuclear Energy Division Natural Resources Canada	580 Booth Street Ottawa, Ontario K1A 0E4	Tel.: (+1-343) 292-6199 Fax: (+1-613) 995-0087

Nuclear Research Institutes

Organization Name	Address	Contact	Website
Canadian Light Source			
Canadian Nuclear Laboratories			
Sylvia Fedoruk Canadian Centre for Nuclear Innovation			
Saskatchewan Research Council			
TRIUMF			

Other Nuclear Organizations

Organization Name	Address	Contact	Website
SaskPower	2025 Victoria Ave Regina, Saskatchewan S4P 0S1	Tel.: (+1-888) 757-6937	
Hydro-Québec	75, boul. René-Lévesque ouest Montréal, Québec H2Z 1A4	Tel.: (+1-888) 385-7252	
Canadian Electricity Association	275 Slater Street, Suite 1500 Ottawa, Ontario K1P 5H9	Tel.: (+1-613) 230-9263 Fax: (+1-613) 230-9326	
Nordion (Canada) Inc.	447 March Road Kanata, Ontario K2K 1X8	Tel.: (+1-800) 465-3666 x1090	
SNC-Lavalin	455 boul. René-Lévesque Ouest, Montréal, H2Z 1Z3	Tel.: +15143931000	
Cameco Corporation	2121 11th Street West Saskatoon, Saskatchewan S7M 1J3	Tel.: (+1-306) 956-6200 Fax: (+1-306) 956-6201	
CANDU Owners Group	655 Bay Street, 17th Floor Toronto, Ontario M5G 2K4	Tel.: (+1-416) 595-1888 Fax: (+1-416) 595-1022	
Canadian Standards Association	178 Rexdale Blvd. Toronto, Ontario, M9W 1R3	Tel: (+1-416) 747-4124 Fax: (+1-416) 747-2510	
BWXT Medical Ltd.	447 March Rd, Kanata, ON K2K 1X8	Tel.: 1 800-267-6211	
Canadian Nuclear Association	130 Albert Street, Suite 1610 Ottawa, Ontario K1P 5G4	Tel.: (+1-613) 237-4262 Fax: (+1-	

		613) 237-0989
Nuclear Waste Management Organization	22 St. Clair Avenue East, Sixth Floor Toronto, Ontario M4T 2S3	Tel.: (+1-416) 934-9814 Fax: (+1-416) 934-9526
BWXT Nuclear Energy Canada Inc.	1160 Monaghan Road Peterborough, ON K9J 0A8	Tel.: (+1-855) 696-9588
Canadian Nuclear Laboratories	286 Plant Rd Chalk River, Ontario K0J 1J0	Tel.: (+1-613) 584-3311
NB Power	515 King Street, P.O. Box 2000, Stn A Fredericton, New Brunswick E3B 4X1	Tel.: (+1-506) 458-4444
Orano Canada Inc.	817 45th Street West, Box 9204 Saskatoon, Saskatchewan S7K 3X5	Tel.: (+1-306) 343-4500 Fax: (+1-306) 653-3883
Canadian Nuclear Society	700 University Avenue, 4th Floor Toronto, Ontario M5G 1X6	Tel.: (+1-416) 977-7620 Fax: (+1-416) 977-8131
TRIUMF	4004 Wesbrook Mall Vancouver, BC V6T 2A3	Tel.: 604.222.1047
Bruce Power	P.O. Box 1540 177 Tie Road Tiverton, Ontario N0G 2T0	Tel.: (+1-519) 361-2673
Ontario Power Generation	700 University Avenue Toronto, Ontario M5G 1X6	Tel.: (+1-416) 592-2555
Organization of Canadian Nuclear Industries	1550 Kingston Road, Suite 219 Pickering, Ontario L1V 1C3	Tel.: (+1-905) 839-0073 Fax: (+1-905) 839-7085

Universities

Organization Name	Address	Contact	Website
University of Victoria			
York University			
University of Ontario Institute of Technology			
Université de Sherbrooke			
University of Ottawa			
McMaster University	1280 Main Street West NRB A333 Hamilton, Ontario Canada L8S 4M1	Tel.: 905-525-9140 x24279	
Simon Fraser University			
Mount Allison University			
University of British Columbia			
Polytechnique Montréal			
University Network of Excellence in Nuclear Engineering (UNENE)			
University of Alberta			
Université Laval			

Ryerson University
McMaster University
University of Manitoba
Carleton University
University of Toronto
Queen’s University
University of Waterloo
University of Guelph
Memorial University of Newfoundland
University of Saskatchewan
University of Calgary
Dalhousie University
University of New Brunswick
Trent University
University of Western Ontario
Royal Military College

REFERENCES

Number	Source	Link
[1]	Atomic Energy of Canada Limited	
[2]	Canadian Nuclear Safety Commission	
[3]	Natural Resources Canada	
[4]	Global Affairs Canada	

Not Applicable

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