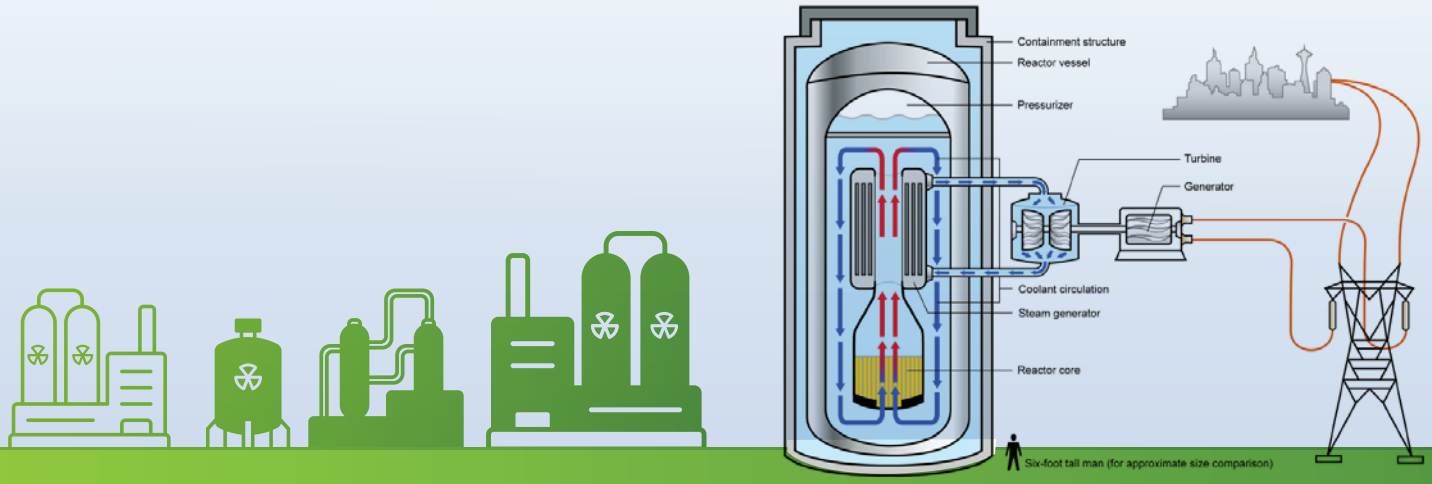
FIRST NATIONS MAJOR PROJECTS COALITION

Primer on Nuclear Energy, SMRs and First Nations

November 2023



Source: GAO, based on Department of Energy documentation | GAO-15-652

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For First Nations Major Project Coalition

About the First Nations Major Project Coalition

The First Nations Major Project Coalition (Canada) is a national 145+ First Nation collective working towards the enhancement of the economic well-being of its members. The FNMPC understands that a strong economy is reliant upon a healthy environment supported by vibrant cultures, languages, and expressions of traditional laws, and supports members to:

- Safeguard air, land, water and medicine sources from the impacts of resource development by asserting its members' influence and traditional laws on environmental, regulatory and negotiation processes;
- Receive a fair share of benefits from projects undertaken in the traditional territories of its members, and;
- Explore ownership opportunities of projects proposed in the traditional territories of its members.

The FNMPC is currently providing business capacity support to its members on 14 major projects located across Canada, each with a First Nations equity investment component, and a portfolio exceeding a combined total capital cost of over CAD$55 billion. FNMPC's business capacity support includes tools that support First Nations making informed decisions on both the economic and environmental considerations associated with major project development.

FNMPC's Operating Principles include being member driven, neutral, unbiased, non-profiting, maximizing value, collaborative, and advancing reconciliation. The FNMPC is project and industry agnostic.

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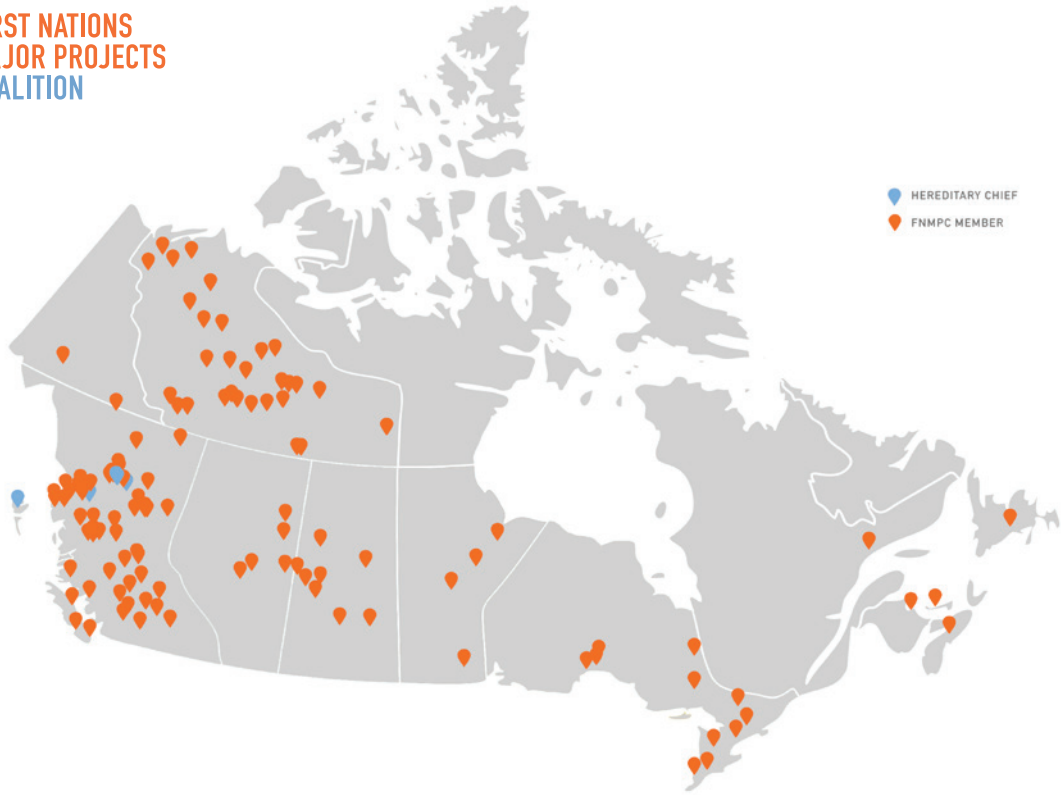

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Introduction

Nuclear energy is an important source of power, representing 10% of global electricity production, and almost 20% of that produced in advanced economies. To its supporters, it is a safe, efficient source of low carbon-emitting energy in a world trying to rapidly decarbonize. To its detractors, it is expensive, susceptible to accidents, entails risk of spread of materials that could be used in nuclear weapons, and generates radioactive waste.

While interest in nuclear energy in the western world declined after the Three Mile Island (1979) and Chernobyl (1986) accidents, and then again after the Fukushima accident (2011), support for this type of energy is again on the rise. Three trends have dramatically shifted public support for nuclear energy in the past three years: (1) the energy transition to net zero and the need for non-greenhouse gas emitting power that is dispatchable, as opposed to intermittent (such as wind and solar); (2) the need for energy security, including reducing fossil fuel dependence from authoritarian regimes; and (3) a new generation of nuclear technology that promises to address safety and cost issues, as well as introduce applications beyond grid power generation.

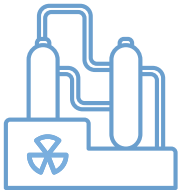
Canada is at the forefront of this re-emergence of interest in nuclear energy. It boasts a number of first-of-a-kind advanced reactors being developed for use domestically, alongside efforts to earn global market share in uranium fuel, nuclear engineering, advanced manufacturing and other services. The continued success of the nuclear industry in Canada depends not only on growing public acceptance of this type of energy, but also early and meaningful engagement of Indigenous nations. There are some positive movements in this regard, but more work to be done.

The FNMPC is sector agnostic in its work, and is guided by the needs of its members, including supporting First Nations that wish to participate in the nuclear sector as it evolves and grows. This paper does not represent the collective views of First Nations nor the individual views of the member First Nations of the FNMPC. Interested First Nations should be individually engaged on the best approaches for their participation in opportunities related to nuclear energy and small modular reactors. Only each First Nation and its members can determine what is best for their nation and their membership.

There are three primary ways in which First Nations are likely to participate in the nuclear sector:

» Regulatory consultation

First Nations need to contribute to and inform the nuclear regulatory process, including licensing new technologies and ensuring adequate processes exist to protect the health and safety of workers and surrounding communities. An opportunity exists to meaningfully incorporate the unique perspectives and considerations First Nations have with regards to any nuclear projects, and for proponents and government to earn First Nations' confidence going forward. In Canada, the Canadian Nuclear Safety Commission (CNSC) is primarily responsible for regulating nuclear energy.



» Siting consent

First Nations on whose territory new nuclear reactors will be sited need to be meaningfully consulted and accommodated, consistent with the Canadian Constitution and in accordance with the UN Declaration on the Rights of Indigenous Peoples. There is increasingly positive collaboration at existing nuclear sites; and where small nuclear reactors (SMRs – explained below) are now being planned or proposed in Ontario, New Brunswick and Saskatchewan, First Nations engagement is taking place. As SMRs and smaller 'microreactor' nuclear technologies are sought for remote energy needs, northern communities and First Nations will likely assume greater interest in the nuclear sector.

» Economic participation

There are many new economic opportunities emerging across the nuclear supply chain that some First Nations may be well positioned for and expect to participate in. There is already a decades-long history of robust Indigenous involvement in uranium mining in northern Saskatchewan. Workforce development, construction contracts, component manufacturing, equity participation and other benefit sharing arrangements are options.

Small Modular Reactors Explained

According to the International Energy Agency, nuclear energy must play a significant role in the global pathway to net zero. It is already the world's second largest source of low emissions power, after hydropower. With its 413 gigawatts (GW) of capacity operating in 32 countries, it avoids 1.5 gigatonnes (Gt) of global emissions a year.

Traditional, large nuclear power plants will still have a role in a net zero future. But small modular reactors (SMRs) are being touted for their ability to address some of the challenges that have plagued large nuclear in western societies, including cost overruns, long timelines, lower capital costs, and safety concerns.

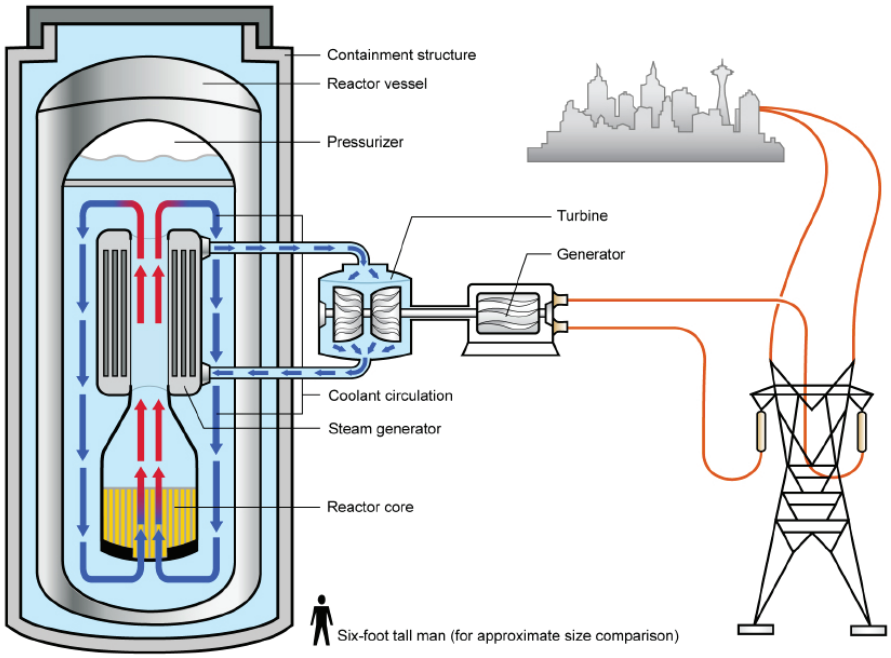
SMRs are advanced nuclear reactors that have a power capacity of up to 300 megawatts (MW) per unit, which is about 30% of the generating capacity of a traditional nuclear power reactor. SMRs are: (1) **small** – physically a fraction of the size of a conventional nuclear power reactor (2) **modular** – systems and components are typically factory-assembled and transported as a unit to a location for installation; and (3) **reactors** – this technology harnesses nuclear fission reaction to generate heat to produce electricity. The size and modularity of SMR technologies are expected to bring their costs and construction times down. These features should make them competitive economically with other sources of electricity generation and address some of the factors that have slowed the deployment of nuclear over the last 30 years or so. Advanced SMR models are being designed using passive and inherent safety features, requiring no human intervention to shut them down. SMR developers have noted that these systems dramatically reduce, and in some models eliminate, the potential for meltdowns.

SMRs require a smaller amount of land than traditional nuclear power plants, making them more flexible in where they can be located. As an example, the NuScale VOYGR-12 could generate 924MW on 0.13km2 of land. SMRs also offer the potential for **stacking** – building a series of SMRs that can be financed as separate projects, until the desired energy output is achieved. For example, Ontario Power Generation (OPG) is building four 300MW SMRs at its Darlington site and can add additional SMRs later.

Advanced, or Gen IV (fourth generation), nuclear reactors are also introducing new energy applications. While traditional nuclear reactors were almost always developed to generate large amounts of electricity for the grid, new reactor models can produce heat as well as power. This lends them well to industrial applications requiring process heat, where SMRs can be scaled to meet the specific energy needs of a project.

As examples, Dow Chemical is moving ahead with an SMR pilot in Texas to decarbonize its chemicals production, Canadian oilsands companies are studying the feasibility of SMRs for decarbonization of their oil production, and Microsoft is exploring SMRs for their energy-intensive Artificial Intelligence (AI) business. This new mix of industrial actors in the nuclear sector will produce novel and interesting use cases and business models.

SMRs are also being actively considered to supply energy for future mining projects, especially as the need for friendly sources of critical minerals is expected to drive exploration and production in remote areas. Deposits are usually far from established energy infrastructure. As a result, the deposits may either be deemed uneconomic or unfeasible, or have to rely on diesel generation, much like remote communities do. This is an expensive, logistically demanding and environmentally problematic solution. SMRs offer the promise of a "plug and play" clean source of reliable heat and power suitable for mining operations.



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An artist's rendering of NuScale Power's small modular nuclear reactor plant. Photo courtesy of NuScale.

Deployment of SMRs in Canada

SMRs have three main anticipated applications in Canada:

- ***On-grid power*** (100 MW to 300 MW): Grid-scale electrical power generation.
- ***Extractive and heavy industries*** (10 MW to 80 MW): Off-grid SMRs for mining, oil sands, and other heavy industries, where emissions are hard to abate due to the need for high heat.
- ***Remote communities*** (<1 MW to ~13 MW): Heat and power to remote communities that currently rely primarily on diesel generators.

There is support for SMRs from both conservative and progressive sides of the political spectrum, from eastern and western provinces, northern territories, Indigenous nations, utilities, industry, labour and civil society. Coordination among interested parties began in earnest when Natural Resources Canada developed an SMR Road Map in 2018, followed by an SMR Action Plan in 2021. Saskatchewan, Ontario, New Brunswick, and later Alberta, also signed an MOU to work co-operatively on nuclear energy and SMRs in 2019, and put out their own interprovincial strategic plan for the deployment of SMRs in 2022.

On the regulatory side, the CNSC has been facilitating SMR developments through a pre-licensing process to identify fundamental barriers to licensing a new design in Canada and assure that a resolution path exists. Nine models have been submitted to CNSC for pre-licensing:

1. Terrestrial Energy's Integral Molten Salt Reactor;
2. Ultra Safe Nuclear Corporation's MMR-5 and MMR-10 microreactors;
3. ARC Nuclear's liquid sodium ARC-100;
4. Moltex's stable salt reactor;
5. SMR, LLC's pressurized light water SMR-160;
6. U-Battery's high temperature gas U-Battery;
7. GE Hitachi's boiling water reactor BWRX-300;
8. X-energy's high temperature gas Xe-100;
9. Westinghouse's eVinci microreactor.

A number of SMR projects are advancing or planned in Canada. These include:

- (Ontario) The Darlington New Nuclear Project, which aims to deploy four GE-Hitachi BWRX-300, a 300 MW SMR, at OPG's Darlington site in Ontario for on-grid power. The first is planned to be constructed by 2028, with commercial operation beginning in 2029.
- (Ontario) The Ultra Safe Nuclear Corporation's commercial demonstration project of its Micro Modular Reactor (MMR) at Chalk River laboratories in Ontario, for operation by 2028.
- (New Brunswick) A 100 MW liquid sodium-cooled fast reactor, the ARC-100, at NB Power's Point Lepreau site in New Brunswick, for on-grid power by 2030.
- (New Brunswick) Another ARC-100, at the Port of Belledune's Green Energy Hub in New Brunswick, to produce clean hydrogen for export in collaboration with Cross River Infrastructure Partners in the mid-2030s.
- (Saskatchewan) The GE-Hitachi BWRX-300 in Saskatchewan for potential deployment by SaskPower for on-grid power in the mid-2030s.

Opportunities and Challenges for First Nations

In the first wave of nuclear power generation in Canada, little or no consideration was given to the rights of or impacts on Indigenous nations in Canada. Canada's affirmation of Indigenous and treaty rights, as well as endorsement of UNDRIP, mean that the coming wave will require a different way of doing things.

There are ongoing concerns from a number of First Nations in Ontario experiencing nuclear developments on their lands:

- The Anishinabek Nation Grand Council Assembly in Chippewas of Georgina Island First Nation unanimously endorsed a Grand Council Resolution in 2019 stating their clear opposition to the construction, operation, storage or disposal of SMRs in the territory of the Anishinabek Nation, including bodies of water.
- The Kebaowek Nation expressed their opposition regarding storage and operations at the Canadian Nuclear Laboratories Near Surface Disposal Facility and Chalk River Laboratories, and have argued against the proposed microreactor there.

These concerns must be taken seriously and addressed.

For other First Nations and some First Nations-owned businesses, there are opportunities in the latest wave of nuclear development that they are actively engaging in.

Equity Ownership

Within FNMPC's portfolio, the majority of deals made that include First Nations members have taken place in energy assets such as transmission lines, hydroelectricity, solar, wind power, and pipelines. What they have in common is that they provide predictable rates of return based on long-term purchase agreements and contracts: streams of revenue that can pay off equity loans while generating own source revenues (OSRs) for First Nations. SMRs are generally consistent with this financing model.

In addition to entering into equity partnerships with utilities that build nuclear reactors, First Nations may have the opportunity to own, independently or in partnership, SMRs and sell the heat and power to industrial partners with high energy needs, or to the grid. In Canada, mining and oilsands companies are obvious candidates as industrial end-users of this power/heat. SMRs are being advanced for commercial production of hydrogen as well.

There are no SMRs operating yet in Canada, and as such there are no Indigenous equity partnerships in particular assets. However, Moltex, which is developing a reactor that uses recycled nuclear waste as fuel, and ARC Resources, who are advancing the ARC-100s in New Brunswick, announced with the North Shore Mi'kmaq Tribal Council and its seven First Nations members in September 2023 financial investments in both, via separate agreements, that resulted in them receiving $2 million in share value from Moltex and $1 million in share value from ARC; a first of its kind agreement in the SMR sector.

There is an important distinction to be made between investing at an owner/operator level (i.e., selling energy to utilities or industrial consumers) and investing in a particular technology (i.e., the ARC and Moltex shares). However, both have the potential to be viable options for consideration by interested First Nations.

Supply chain

As the SMR supply chain builds out, and as the nuclear sector begins expanding again in Canada, there are enormous opportunities for new entrants. Proponents will be motivated to achieve significant proportions of procurement spending on First Nations businesses to earn both public and government support for their projects.

Some First Nations and First Nations-owned businesses have already positioned themselves for this trend. Kitsaki Management, Athabasca Basin Development, and Des Nedhe Group signed an MOU in May 2021 to jointly pursue SMR investments. The Saugeen Ojibway Nation announced a partnership with Bruce Power in June 2023 to jointly produce, advance and market new medical isotopes, which will be essential to support the global fight against cancer.

In anticipation of growing opportunities, federal and provincial governments are allocating supports to enable First Nations and businesses to maximize opportunities in the nuclear sector. For example, the federal government initiated an "Enabling Small Modular Reactors Program" in February 2023 to develop supply chains for SMR manufacturing and SMR fuel supply, and address waste generated from SMRs. While open to anyone, it allowed projects led by Indigenous applicants to access funding support up to 100% of the total project costs, the average size of which was expected to be $500,000-$2,500,000.

In Saskatchewan, the Crown Investments Corporation provided $479,000 in August 2023 to the Saskatchewan Industrial and Mining Suppliers Association (SIMSA) and its partners to prepare local companies for their future participation in provincial, national and SMR development. This included enabling the Organization of Canadian Nuclear Industries (OCNI) to deliver its Ready4SMR program to develop local suppliers, including Indigenous-owned companies. The same funding allocation engaged the First Nations Power Authority (FNPA) to establish a new database on Indigenous-owned businesses to build nuclear capacity and track certifications both provincially and nationally.

Similarly, in October 2023 Prairies Economic Development Canada, announced a federal investment of $832,500 to the same partnership (SIMSA, FNPA and OCNI) to help Saskatchewan businesses become qualified suppliers in nuclear and clean mining supply chains.

Energy production in Indigenous and remote communities

Often referred to as "microreactors," there are some Gen IV reactor models being designed specifically with remote applications in mind, to provide a combination of heat and power. These include Westinghouse's eVinci, Ultrasafe Nuclear Corporation's Micro Modular Reactor, and a design from X-energy that is expected to be announced soon.

One anticipated use for these microreactors is to provide an alternative to diesel generation for some of the almost 300 communities in Canada that are not connected to the electrical grid or natural gas distribution pipeline systems. Many diesel generators in northern Canada are aging and reaching the end of their service life, and an attractive replacement is sorely needed. In addition to being much quieter than diesel generation, microreactors are also emissions-free, not only of greenhouse gases, but of black carbon particulates. Black carbon exacerbates climate impacts by making snow and ice darker, as well as harms human health through respiratory impacts.

The Yukon government released a feasibility study for SMRs in September 2023 that concluded that "SMRs have a lower Levelized Cost of Electricity (LCOE) than comparable systems of diesel, wind and diesel, solar and diesel, wind and battery, solar and battery, hydro, and liquified natural gas. The overnight capital costs for SMRs are higher initially, with lower fuel costs over time." This was the finding for Yukon grid, off-grid mine sites, and microgrid communities.

The prospect of nuclear reactors in many small, remote communities often raises concerns about both safety and operations capacity. Microreactor models are being designed to address these, and their licensing will be contingent on their ability to do so.

Advanced reactors include passive safety systems that greatly minimize the risk and impact of accidents, especially in microreactors where the amount of fuel is very small. To address weather-related concerns, microreactors can be built underground so that neither snow nor wind nor cold will affect performance. The below-ground siting also limits opportunity to steal nuclear fuel for nefarious purposes, and facilitates advanced detection, delay, and response capabilities.

With regards to the human resource capacity of northern communities to operate microreactors, they are being designed to be capable of autonomous operation and have minimal moving parts. They are factory built and then assembled on site. They only need refuelling every few years, or even as long as a decade. Because of their small size, they can be easily decommissioned and the site fully remediated.

Consent and Consultation

The Crown has a duty to consult and accommodate First Nations, Métis and Inuit nations when it contemplates conduct that could have an adverse effect on Indigenous rights and title. Furthermore, Canada's commitments to UNDRIP and the Truth and Reconciliation Commission mean that a consent-based framework should be at the centre of nuclear development.

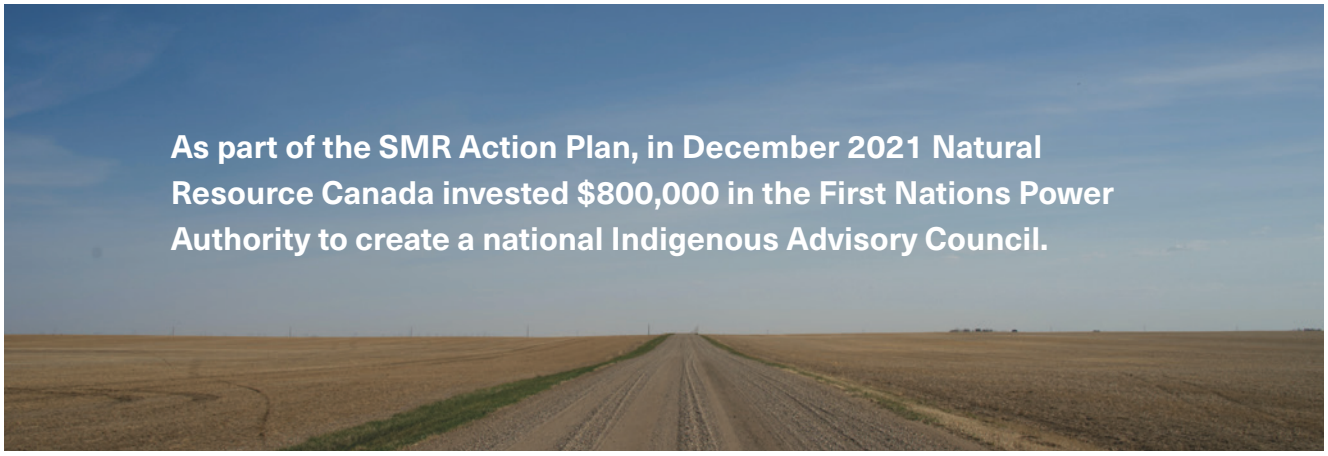
The Canadian Nuclear Safety Commission (CNSC) has primary responsibility for consultation on behalf of the federal government, including for licensing and for decision making in environmental reviews. Where allowed and feasible, CNSC staff will coordinate Indigenous consultation efforts with other federal, provincial, and/or territorial regulatory departments and agencies through a one-window approach. It has established tools and mechanisms, including funding, to support Indigenous nations in participating meaningfully in regulatory activities. It has also implemented an Indigenous Knowledge Policy Framework.

Many nuclear activities may also be subject to designation under the *Impact Assessment Act*. If a project is designated it must undergo a federal assessment by the Impact Assessment Agency of Canada.[1]

As part of the SMR Action Plan, in December 2021 Natural Resource Canada invested $800,000 in the First Nations Power Authority to create a national Indigenous Advisory Council. It is composed of individual First Nations, Métis, and Inuit members from Saskatchewan, New Brunswick, Ontario, Alberta, and the territories to ensure a coordinated, Indigenous national leadership voice on the development of SMRs. It will provide ongoing multi-year engagement with Indigenous nations about clean energy options relevant to the Treaty and traditional territory of Indigenous Peoples' customs, traditions, and values.

Engagement is not just a Crown responsibility; it is for proponents of nuclear projects as well. OPG, Bruce Power, SaskPower and NB Power have articulated Indigenous engagement policies, which build off strategies implemented in their other power generation activities, and are conducting ongoing consultation where relevant.

Atomic Energy Canada Limited, Canadian Nuclear Laboratories and Algonquins of Pikwakanagan First Nation (AOPFN) signed a ground-breaking long-term relationship agreement (LRTA) in June 2023 to address key areas of concerns and create a Neya Wabun (Guardian) Program. This program establishes a regular AOPFN monitoring presence at designated AECL sites, providing for their influence and knowledge in areas of environmental protection, radioactive waste management, cultural protection & promotion, and the pursuit of collaborative economic and business opportunities.



[1] The Supreme Court of Canada recently issued an opinion that many elements of the *Impact Assessment Act* are unconstitutional. In response to the judgement, the Government of Canada has paused discretionary designations of major projects and will be reviewing and updating the legislation.

Addressing Nuclear Waste

Used nuclear fuel must be safely managed long-term. While the Canadian Nuclear Safety Commission is responsible for regulatory oversight, the management of radioactive waste is the responsibility of waste owners. In 2002, Canada's nuclear energy producers established the Nuclear Waste Management Organization (NWMO) to develop solutions for used nuclear fuel management. The NWMO is implementing the Adaptive Waste Management approach that was selected by the Government of Canada for the long-term management of Canada's used nuclear fuel, and is proposing to construct a deep geological repository for that purpose.

First Nations engagement is critical to successfully implementing Canada's plan for the long-term management of used nuclear fuel. The NWMO is committed to applying Indigenous knowledge to both technical safety and community well-being aspects of the site selection process.

The NWMO's search for a site for the deep geologic repository began in 2010 by asking communities to express an interest in being a host community. Twenty-two communities responded. These communities were evaluated on the suitability of their geology as well as their willingness to host the repository. The NWMO has since narrowed the list down to two areas in Ontario: Ignace and South Bruce. The NWMO plans to choose the final site in 2024 and has held dialogues with the Wabigoon Lake Ojibway Nation and Saugeen Ojibway Nation, among others, regarding these possible siting locations.

The NWMO is actively engaging with the Georgian Bay Traditional Territory Consultation Committee and the Treaty #3, Lake of the Woods – Lac Seul, and Rainy Lake – Rainy River Consultation Committees. These committees are learning more about the project, determining its potential impacts, and collecting feedback from citizens to decide if their region would be a willing host community. Should a region decide that it might be a willing host community, the committees would work to determine what conditions the NWMO would have to meet for this to happen.

The cost of the project is estimated at $26 billion (in 2020 dollars) over the approximately 175-year life cycle of the project. Equity is not being considered as an option, since the repository is not a profit-making venture; it is an expense. However other economic benefits are being negotiated for this megaproject.

The Value Proposition of Nuclear Partnerships

Nuclear energy is on the verge of a significant rebirth both in Canada and globally. In its first wave, in the 1960s-1990s, there was little consideration of its impacts on Indigenous nations. This new wave must be different: not only has the legal and regulatory space shifted to account for the needs and concerns of Indigenous peoples, but the political and economic context has changed as well. As the sector continues to grow and evolve in Canada, it will do so with Indigenous partnerships. The resource sector has learned a number of lessons, many of them difficult, in the past two decades about ways to engage and earn consent from Indigenous peoples for their activities. The nuclear sector can build on that.

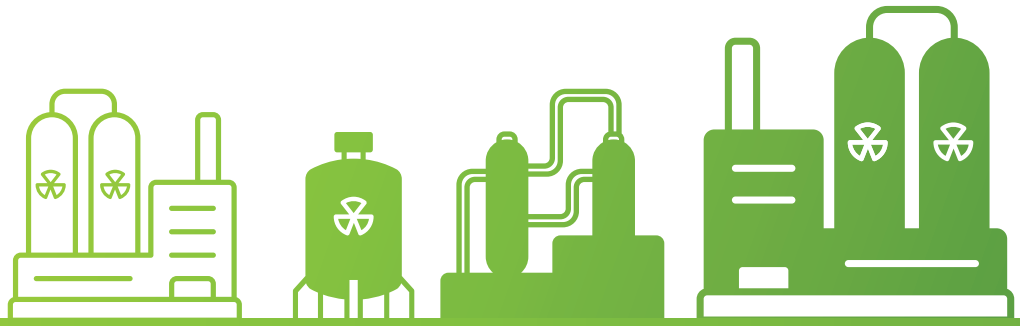
Strong Indigenous-industry relations should be a value add, rather than an obstacle or a cost. For nuclear proponents, Indigenous partnerships can strengthen the nuclear workforce and supply chain and provide opportunities for new equity partnerships. Importantly, they can also improve the social acceptance of nuclear energy, allowing for smoother regulatory and construction processes.

For interested First Nations, partnerships can provide new economic opportunities, the ability to develop new technical skills, and the enhancement of business capacity. In leadership/ownership positions, First Nations can provide better influence over how nuclear projects proceed, and facilitate ways to address environmental and safety concerns of First Nations membership.

For governments and regulators, Indigenous perspectives and knowledge can enhance the safety and suitability of regulations, and enhance public confidence in nuclear projects.

It is very important that First Nations in Canada are aware of the emerging trends and advances in the sector, and are empowered to participate in it to the full extent, should they so choose. FNMPC has a mandate to advance Indigenous engagement and participation in the sector, in particular positioning interested members for equity participation in future projects.

Not every Indigenous community will conclude that nuclear energy is the right option for them, and many continue to express concerns with nuclear waste management and safety. But for others, nuclear energy and SMRs are an exciting opportunity and one they are actively engaging in. The nuclear industry in Canada is getting a second chance to involve Indigenous nations in its development and success.



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Accessing FNMPC Business Capacity Support for Major Projects

Did you know that most project capacity services FNMPC provides to its national First Nation membership are in the electrification sector? Does your First Nation need help with an electrification project that is over $100 million in value? FNMPC has in-house experience, tools, and advice that may be able to help. To access these services, please contact:

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Further Reading

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