Briefing Note
Re: Analysis of the use of Small Modular Reactor (SMR) in remote, Indigenous communities

Issue statement:
This briefing note analyzes the following question: How should SMR technology be used to address energy poverty in remote Indigenous communities in Ontario?

Background:
Small Modular Reactors: Use nuclear fission to produce low-carbon energy, and are smaller than traditional reactors. Benefits of SMRs include:
  ○ Can be built at one location and transported to another
  ○ Can be housed on land not suitable for larger plants
  ○ Allows for controlled and reliable increases in output

Remote, Indigenous communities:

- Ontario is home to 25 remote, Indigenous communities which account for 17% of the total remote population and 10% of remote diesel consumption. In the northern Ontario community, an average home consumes the equivalent of 40 barrels (6360L) of diesel each year for heat and electricity. This translates to an energy bill of over $3,000/year.
- The total cost of diesel-generated electricity in Ontario's northernmost communities is $100 million/ year, 56% of which is paid by the federal government and 35% paid by Ontario electricity consumers by tax raising.
- Burning fossil fuels has environmental impacts and creates health concerns for residents.
- One third of Indigenous households in Ontario (42,000 households) are in energy poverty.

Federal and provincial commitments:

- Both the federal government and the Ontario government have made meaningful commitments to Reconciliation with Indigenous peoples, including commitments to improving their economic and social conditions and to support Indigenous-led economic Reconciliation.
- The federal government is working towards UN sustainable development goal #7 which calls for universal access to affordable, reliable, sustainable and clean energy for all, and is targeting 90% sustainable energy production by 2030.
- The Canadian Small Modular Reactor (SMR) Roadmap Steering Committee identified SMR as a source of low-cost electricity generation and safe and clean energy, an opportunity to provide low-carbon heat and power for industry and offset diesel use in remote communities and mine sites.
- In 2016, Ontario Power Generation (OPG) began to refurbish the Darlington reactors with an investment of $12.8 billion. In December 2022, OPG broke ground on the Darlington New Nuclear Project (DNNP) which is estimated to operate by 2028. The DNNP is expected to provide 300 megawatts (for approx. 300,000 homes) of carbon-free, baseload power to the grid before the end of the decade.
- In 2019, Ontario, New Brunswick and Saskatchewan signed a Memorandum of Understanding (MOU) that establishes a framework for SMR development and deployment in each jurisdiction, joined by Alberta in 2021.

Key considerations:

- Cost: An SMR with the power to provide energy to 240,000 homes would cost approximately $1-1.5 billion. Capital costs would decrease as supply chains become stronger.
    - Capital cost (median) $13,565/KW (approximately $270M for 20 MWe system)
    - Fuel cost (median) $64M where the fuel is replaced every 10 years.
- Technology: Ontario already has an extensive nuclear supply chain including the Bruce, Darlington and Pickering Nuclear Generating Stations. OPG, Bruce Power, and SaskPower are collaborating to complete the design selection for an on-grid Stream 1 reactor in 2021 that will first be employed at the Darlington site, and its implementation will confirm Canada's first-mover advantage and support the following SMR development and deployment in the 2030s.
- Indigenous and public engagement: The Roadmap, and federal, provincial, and territorial governments have all recognized the importance of conducting meaningful, two-way engagement with Indigenous communities on the subject of SMR. Diverse opinions and different values exist across Indigenous communities.
- Nuclear waste management: The Chiefs of Ontario expressed major concerns about radioactive waste and contamination of the water systems due to leakage?. Policy frameworks and organizations are in place to manage nuclear waste, but information transparency, ongoing consultations, and public engagement with the Indigenous communities are vital to the long-term operational process.
- Job creation: With the development of SMR technology, there will be continued opportunities for Ontario nuclear supply chain partners to participate, adding good-paying, local jobs. However, an SMR requires less maintenance and refueling which might leave lasting jobs behind in the community.
- Regulatory readiness: More detailed and safety goal-oriented policy is needed to promote a strong nucellar regulatory framework while ensuring reasonable costs and timelines for approval of SMR.
- Public buy-in: More public education is required to increase understanding and acceptance of SMR technology. A 2020 study indicated that many Canadians have concerns regarding the safety of nuclear technology.

Evidence-based policy options:

Option 1: Continue operating with conventional, diesel-based energy while committing to further research and engagement on SMR to build public confidence around the technology.

Option 2: Work in collaboration with private mining companies to implement SMR across multiple sites. Track and report outcomes to use as proof of concept with the goal of implementing in Indigenous communities over time.

Option 3: Identify one pilot community to implement SMR track and report on job creation, changes in emissions, and safety incidents (at the pilot site and other SMR sites) to bolster public confidence with the goal of rolling out at a larger scale in 5 years if the pilot is successful.

Policy recommendation and analysis:
Policy option 3 is recommended. Based on the feasibility work to date by Ontario Power Generation with other utilities and organizations across the province, nuclear power from SMR could provide competitively priced, emissions-free, baseload electricity for remote, Indigenous communities by the 2030s. If successfully implemented in scale, SMR could deliver economic and environmental benefits to the province. There is a relatively assuring level of readiness in terms of finance and funding, technological innovation, and regulatory framework for SMR in Ontario. However, planning, evaluation and ongoing public engagement need to be conducted in a meaningful way before and during the

implementation of SMR in remote, Indigenous communities. The concern over land use and waste management needs to be addressed through information sharing and public engagement. In addition, integrating Indigenous peoples into the economy and jobs enabled by SMR should be prioritized.

Energy poverty should be addressed as a human rights issue with the use of SMR. The successful implementation of SMR in interested remote Indigenous communities creates a potential opportunity for the Ontario government to live up to its obligations under the UN's Declaration of Indigenous Peoples (UNDRIP), in particular Articles 3, 20, 21, and 23, to reduce energy poverty and advance the objectives of equitable wellbeing, reconciliation, and the right to determination.

Work consulted

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New :

https://www.canada.ca/en/natural-resources-canada/news/2023/02/canada-launches-new-small-modular-reactor-funding-program.html