

BIENNIAL CONFERENCE OF SEERIL  
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# Do Small Modular Reactors (SMRs) have a role to play in the energy mix and the energy transition?

Presented By

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# Role of Nuclear in Canada

- Nuclear Generating Facilities have a long history of operating/providing electricity in Canada – principally in Ontario
- Ontario reactors were constructed/completed in the 1970s with the last unit completed in 1993
- Ontario reactors are/have been in the process of being refurbished/life extended
- Nuclear Generating Facilities in Ontario have been critical to providing electricity to the province
- Nuclear is generally widely accepted in Ontario and is expected that SMRs will be equally accepted
- Nuclear and particularly SMRs are being considered elsewhere in Canada – particularly in the Western provinces (Alberta and Saskatchewan) where baseload generation is coal and gas fired

# Nuclear Licensing Regime in Canada

- Nuclear generation is regulated by the Federal Government through the Canadian Nuclear Safety Commission (CNSC)
- The licencing of an SMR is subject to the CNSC's regulatory process, which is generally divided into the following four phases:
  - CNSC Licence to Prepare Site
  - CNSC Licence to Construct
  - CNSC Licence to Operate
  - CNSC Decommissioning License
- In responding to the desire to build SMRs the CNSC has reviewed its regulatory framework and has adopted a new internal process for pre-project vendor design reviews (VDR)

# SMR Projects in Canada

- Most advanced SMR Project in Canada is the 300 MW Darlington SMR (GE Hitachi BWRX-300)
  - Oct 2022 – CNSC provided OPG with License to Prepare Site
  - Nov 2022 – OPG submitted License to Construct
  - March 2023 – CNSC completed combined Phase 1 and 2 pre-licensing vendor design review
  - CNSC Hearings are expected to begin in 2024
  - Preliminary target date of 2028 for completing construction with unit online by end of 2029
- Global First Micro Modular Reactor Project at Chalk River in Ontario
  - Sought approval for a License to Prepare Site in 2019 along with undertaking an Environmental Assessment
  - Additional information provided to CNSC in 2023 – so far – no further development
- New Brunswick Power submitted License to Prepare Site in June 2023 for a single ARC Clean Technology Inc. ARC-100 SMR at Point Lepreau

# Nuclear in the United States

- The US is the world's largest producer of nuclear power
  - Nuclear generation produced 18% of the electricity output in the US
  - 93 operating commercial nuclear reactors at 54 nuclear plants in 28 states
  - Average age of these nuclear reactors is 42 years old
  - Vogtle 4 is the most recent nuclear generation brought into service in the US (Georgia)
- Nuclear Regulatory Commission (NRC) regulates commercial nuclear power plants – like Canada the regulation of nuclear is very robust

# Nuclear in the United States

- NuScale 50 MW (77 MW) advanced light-water SMR
  - January 2023 NRC certified the first SMR design for use in the US – 50 MWs modules (updated design to 77 MW)
  - DOE was working with the Utah Associated Municipal Power Systems to demonstrate NuScale VOYGR plant at Idaho National Laboratory
- NuScale project was cancelled in November 2023
  - Projected user cost per MWh – jumped 53% - surpassing costs of solar and wind energy (from \$58 MWh to \$89 MWh)
  - NuScale received design approval in 2020 – regulatory process – 500 Millions dollars and 2 million pages of documentation
  - DOE – funded NuScale project – to the tune of \$1 Billion dollars and Inflation Reduction Act included \$30/MWH credit for nuclear
- GE-Hitachi BWRX-300 – engaged in pre-application activities with the NRC – process started in late 2019 (precursor to the licensing process to construct or operate)
  - Subject to a Charter by CNSC and NRC under a memorandum of cooperation on SMR

# Things to Note about SMRs/Nuclear

- These are first of its kind projects – question of whether there is an available work force and supply chain for all the potential projects
- Expectation is that SMRs will be more cost effective to build – by prefabricating modules in factory setting – hope to have reduction in on-site labour and installation
- Design was to be simpler and in engineering terms – lower power and operating pressure for the reactor which should be safer
- SMR is expected to have a smaller footprint and lower cooling requirements – greater flexibility on site location (especially inland)
- Generally, the cost to build projects including SMRs have escalated – price of materials increased along with interest rates
- Some research suggests (2023) – SMRs will increase the volume of nuclear waste compared to non-SMRs
- Historically Nuclear Projects are always behind schedule and almost always over budget



# Thank You

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