

Regulatory Approach to the Deployment of Small Modular Reactors in Canada

5th MDEP Conference International Cooperation,
Past, Present and Future

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Canadian Nuclear
Safety Commission

Commission canadienne
de sûreté nucléaire

Canada

Canada's SMR Landscape



Ontario

- Ontario Power Generation Darlington New Nuclear Project – 300 MW_e
- Global First Power – EA and siting ongoing for Micro Modular Reactor - 15 MW_{th}

Saskatchewan

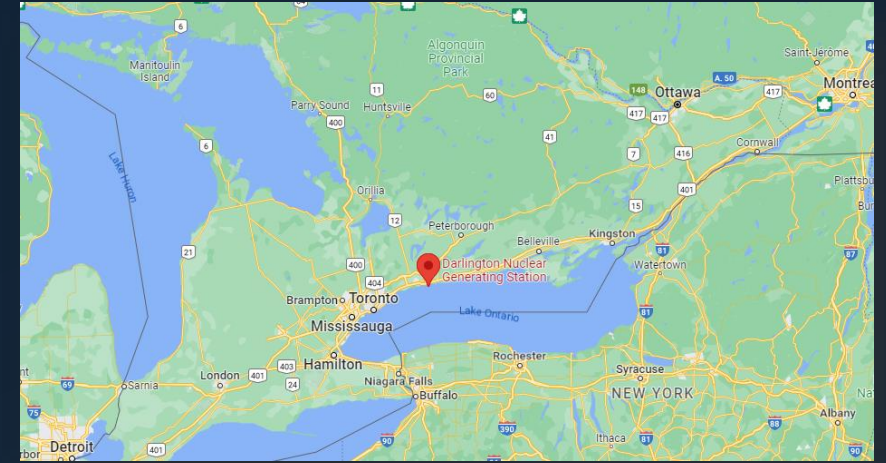
- Siting decision late September
- Collaborating with OPG on deploying BWRX-300

New Brunswick

- Vendor design reviews
- ARC Canada (100 MW_e)
- Moltex (300 MW_e)

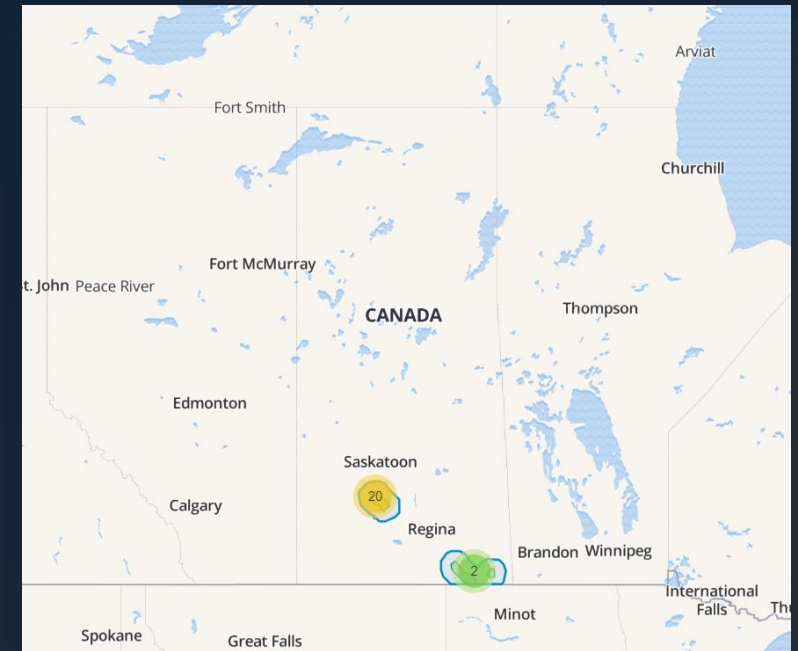
Darlington New Nuclear Project (DNNP)

- OPG's DNNP project is for the construction and operation of up to four new nuclear reactors
- OPG submitted a Licence to Construct application to construct **one SMR** of up to 300 MWe on October 31, 2022
- Proposed for OPG's existing Darlington site, ON
- OPG has selected the **GE-Hitachi BWRX-300 technology** (boiling water SMR)



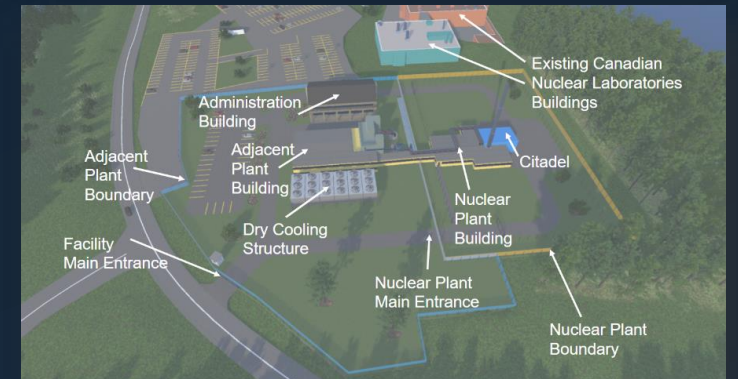
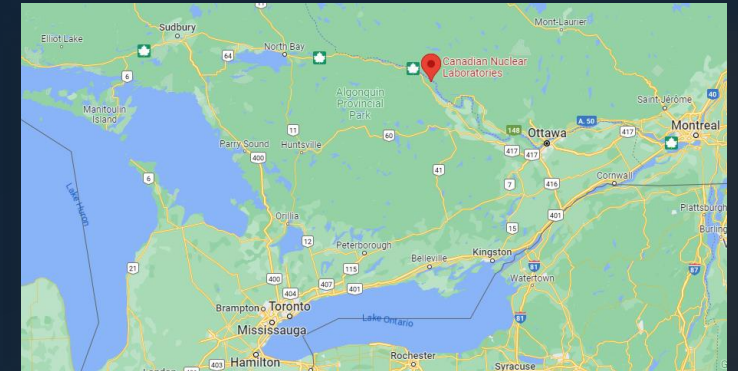
Saskatchewan

- SaskPower exploring 2 sites for potential SMR deployment
- Working closely with OPG and have selected **GE-Hitachi BWRX-300** (boiling water SMR)
- Early planning work
- No licence application received
- Impact Assessment required



Global First Power (GFP)

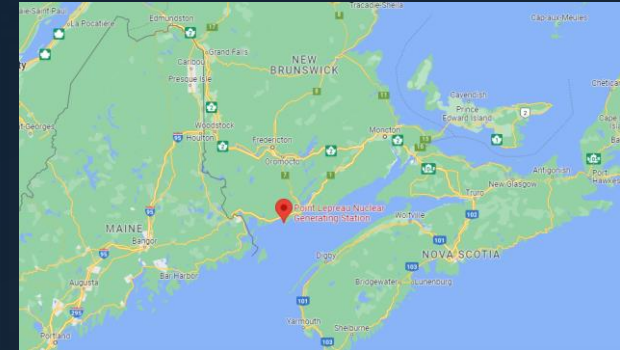
- Proposed site is Chalk River Laboratories, ON
- Initial Licence to Prepare Site application received in March 2019
- Environmental assessment underway – documentation expected in mid-late 2023
- 15 thermal MW facility
- Ultra Safe Nuclear Corporation, Micro Modular Reactor (High temperature gas-cooled reactor)
- Demonstration unit



Source [Our Project - Global First Power](#)

New Brunswick Power (NB Power)

- NB Power is working with 2 developers: ARC Canada and Moltex
- ARC-100, 100-megawatt sodium-cooled fast reactor
- Moltex - Wasteburner (SSR-W), 300-megawatt Stable Salt Reactor
- Moltex - Waste to Stable Salt (WATSS) facility – used CANDU fuel recycled to produce new fuel for the SSR-W
- Proposed location is adjacent to existing Candu unit at Pt. Lepreau
- A licence to prepare site is expected June, 2023 *for one ARC-100 unit



Source: [New Nuclear - World Nuclear News \(world-nuclear-news.org\)](https://www.world-nuclear-news.org)



Approach for SMR Readiness

- DART - Dedicated directorate for SMR
- Matrix approach
- Builds on 10 years of preparing for new nuclear
- Dedicated project and resources addressing SMR Readiness
- International Collaboration
- Executing objectives

Readiness is also part of trust building



SMR Readiness Project

5
Years

Timeline

The project has a 5-year horizon, starting from FY 22-23

Funding

The Government of Canada has pledged \$50.7 million Canadian dollars over the course of the project

\$50.7
mil

New
Staff

Staffing

CNSC will hire additional staff to support the execution of the SMR Readiness Project

Objectives

SMR Readiness will address over 60 objectives, with an evergreen approach to allow for change

60+
Objectives



Scope Examples

- Expanding research program
- Technical/technology capabilities development
- Regulatory Position on Novel Design Features
- Novel Construction Materials and Techniques

- Technology Inclusive Compliance Programs
- Strategic Review of CNSC Regulatory Framework
- Waste Management of SMR Fuels

Capacity and Capability

Regulatory Predictability

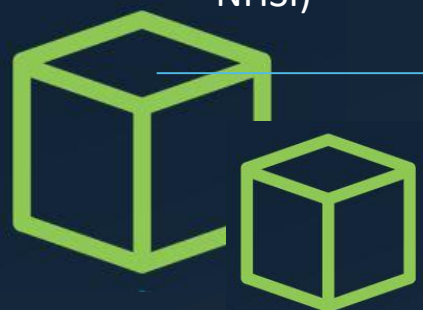
Policy and Shared Responsibilities

International Collaboration



- Leverage International Regulator Reviews
- International harmonization
- Participate in global initiatives (i.e. NHSI)

- Develop, Foster, and Streamline Domestic Partnerships
- Fleet approach considerations
- Support Policy Decisions on Fuel Reprocessing and Recycling



SMR Licensing in Canada

- Lifecycle approach with commensurate regulatory oversight
- Risk-informed decision making and a graded-approach
- International cooperation and collaboration
- Invested in continuous improvement

A different nuclear industry

- SMR deployment offers a new paradigm
- Smaller reactors, potentially shorter construction timelines
- Fleet approach – national and international



Responsibility to be an effective and efficient regulator

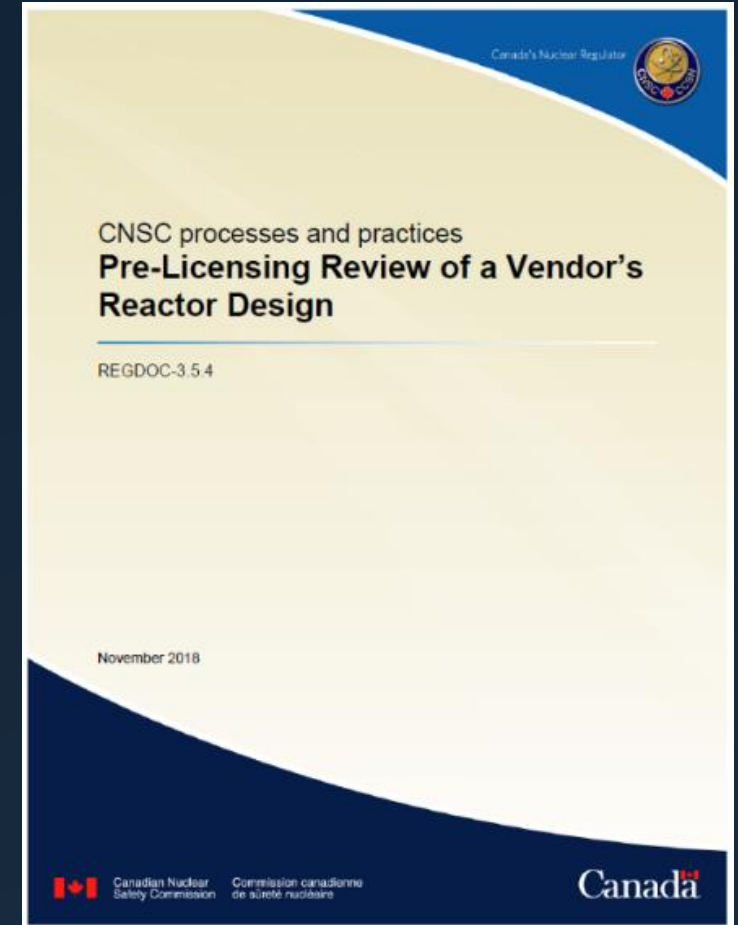
Vendor Design Reviews (VDR)



An **optional** process for CNSC to provide early feedback to the technology developer (vendor) on:

- How the vendor is addressing Canadian requirements in their design and safety analysis activities taking into account new design features and approaches
- Key issues emerging in a design that could impact a licensing process for a future project referencing the vendor's design
- Progress by the vendor to address outstanding issues

The VDR process does not “approve” a generic design



VDR Phases

Phase 1

- Duration approximately 18 months: 5000 hours
- The vendor demonstrates, through its design program and associated design processes as well as available design information, intent to meet CNSC design requirements

Phase 2

- Duration approximately 24 months: 10 000 hours
- The vendor demonstrates, through design processes and system level design information that requirements are being met
- CNSC identifies where potential fundamental barriers to licensing may exist or are emerging in the design



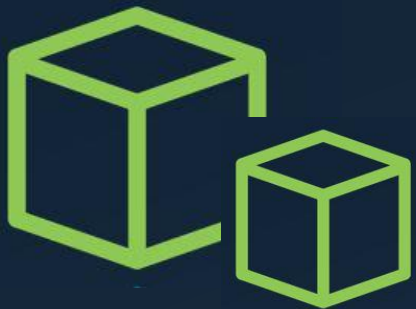
Canadian International Collaboration

- CNSC has been strengthening its collaboration with partners:
 - United Kingdom Office of Nuclear Regulation (UK ONR)
 - United States Nuclear Regulatory Commission (US NRC)
 - Recent signing of Memorandum Of Understandings (MOU) with Authority for Nuclear Safety and Radiation Protection (ANVS), National Atomic Energy Agency (ANEA/PAA)
- CNSC Memorandum of Collaboration (MOC) with USNRC has been successful
 - 5 Party Agreement for review of GE-Hitachi BWRX-300
 - Bringing together experience and expertise while maintaining Canadian sovereignty



Canadian View on Collaboration and Harmonization

- Harmonization is an avant-garde approach that can brace newcomer and mature nuclear nations
- International organizations must guarantee that their harmonization initiatives complement each other
- Leadership from national governments is required for the progression of legal frameworks, policies and supporting the capabilities to work in new ways
- Make use of lessons learnt from formerly successful harmonization when developing new regulations for advanced technologies



Ongoing and Future Work

- Continued cooperation and information sharing with several countries and organizations on advanced reactor technologies
- Conditions for increased mutual recognition of regulators' assessment activities and the ability to conduct joint assessments, where circumstances warrant
- Nuclear Harmonization and Standardization Initiative
 - Regulatory Track; CNSC participating in three working groups
- Cooperation and collaboration to address regulatory questions on technology selected for the OPG Darlington New Nuclear Project



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