Ontario Power Generation: Advancing Small Modular Reactor Deployment in Canada

Presentation to Alberta Innovates

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OPG - Who We Are

18,876
Megawatts
In-service generating capacity

90%+
Free
Of smog and carbon emissions

40%
Average
Lower cost than power from other generators

10,700
Skilled
Employees supporting Ontario's economy





Our Portfolio

2	2	3	1	1	66	85
Nuclear Stations	Leased **Nuclear** Stations	**Thermal** Stations	Co-Owned **Gas-Fired** Station	**Solar** Facility	**Canada Hydroelectric** Stations	**US Hydroelectric** Stations

Our Nuclear Generation

5,728
Megawatts
In-service generating capacity

2
Stations
In Pickering and Clarington (Darlington)

50
Years
Of experience safely operating nuclear facilities in Ontario

5,539
Employees
Working in OPG nuclear division

Pickering Nuclear

- 6 operating reactors, about 3000 MW electric
- Operating safely since 1971; End of commercial operations 2025

Darlington Nuclear

- One of the top performing nuclear plants in the world
- Consistently high ratings in safety and performance (World Association of Nuclear Operators)
- Four reactors produce approximately 20% of Ontario's electricity (about 3600 MWe)
- Only site in Canada licensed for new nuclear build with approved EA

The Challenge Before Us

- Need to bridge the gap between:

  Increasing worldwide demand for energy and needs of countries with great poverty

  and

  Urgency to manage environmental impacts of energy generation and achieve climate change goals

- **No single energy solution; nuclear must be part of the mix**
- New nuclear must be adaptable and scalable = SMRs

What are Small Modular Reactors (SMRs)?

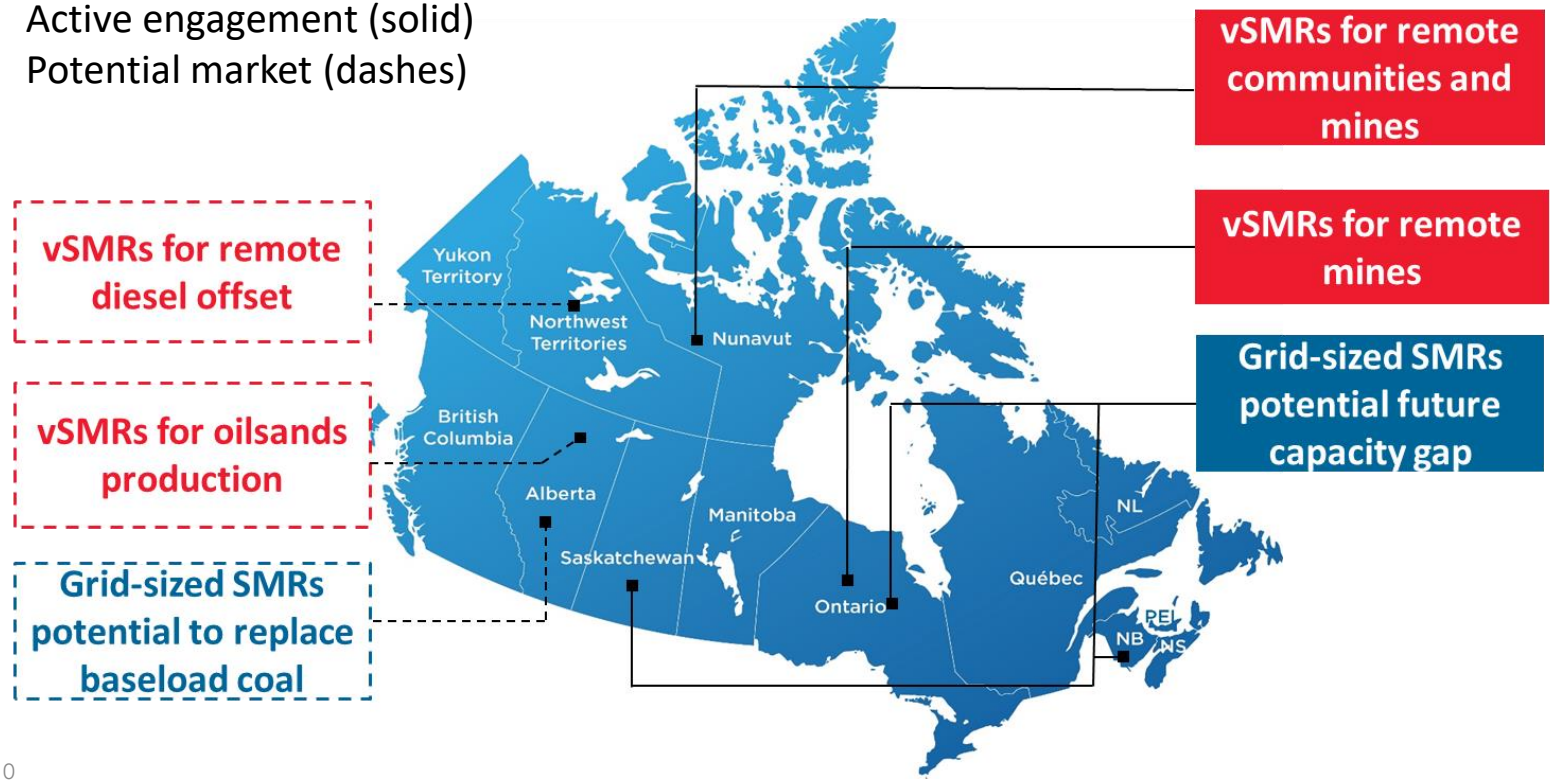
- Smaller than a traditional reactor in output and footprint
- Use fission process like traditional reactors; enriched uranium fuel
- Range from community scale (<1 MW) to utility scale (~300 MW)
- Modern designs based on technology that has existed around the world for 50+ years

Proposed Advantages of SMRs

- **Safety:**
  - Enhanced, passive safety features
  - Some designs underground, enhancing security
- **Simpler:**
  - Modular designs
  - Fleet-based approach controls cost, schedule
- **Adaptable:**
  - Load-following source of electricity
  - “Scale-to-fit” (can add modules)
  - Generate heat for uses beyond just electricity
- **Environment:**
  - Carbon-free energy; no greenhouse gas emissions
- **Cheaper:**
  - Lower, up-front capital investment
  - Fewer staff (construction; operations and maintenance)
  - Factory constructed
- **Enabler for other energy sources**:
  - Energy for battery charging or hydrogen for transportation
  - Desalination
  - Enable solar, wind

Potential Canadian Market

Active engagement (solid)
Potential market (dashes)



“Three Streams” of Deployment in Canada

Stream One

- “Ready now” technologies to meet desired in service date (late 2020s)
- Canada must retire coal plants by 2030 to meet climate targets; need emissions-free energy sources like nuclear
- Unit in service at Darlington by 2028; first in a “fleet approach” to de-risk SMRs in other provinces

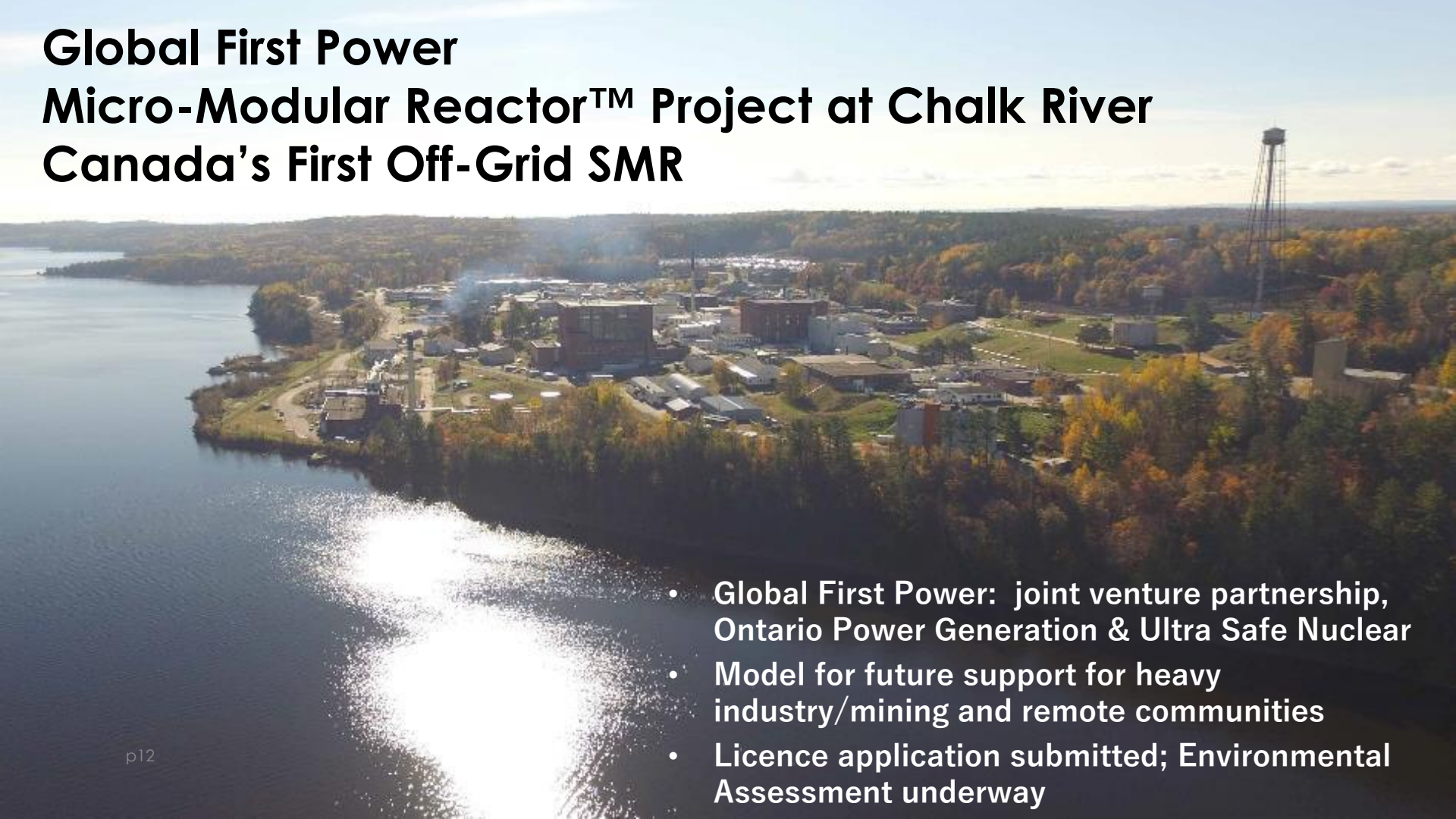
Stream Two

- Advanced reactors with great promise; for example, “burn” used fuel
- Not likely deployable until mid-2030s; work needed now to advance opportunities
- New Brunswick Power – working with ARC and Moltex to better understand fuel challenges, technology, licensing, waste

Stream Three

- Very small modular reactors (vSMRs) for remote mines and off-grid communities currently dependent on diesel power
- Global First Power commercial demonstration project, Chalk River Laboratories

Global First Power
Micro-Modular Reactor™ Project at Chalk River
Canada's First Off-Grid SMR



- Global First Power: joint venture partnership, Ontario Power Generation & Ultra Safe Nuclear
- Model for future support for heavy industry/mining and remote communities
- Licence application submitted; Environmental Assessment underway

Micro Modular Reactor™ Technology

15 MW thermal
(5 MW electrical) high temperature gas reactor

Commercial demonstration project to prove viability of technology and commercial business case

Canada's First On-Grid SMR Project: On-Grid SMR - Darlington New Nuclear

- Only site in Canada licensed for new nuclear with approved EA
- Significant advantage over other options for future nuclear

Vision for New Nuclear at Darlington

- OPG resuming planning activities
- Envision additional nuclear capacity towards end of the decade
- Will provide low-carbon, reliable energy to meet Ontario's energy demand, support Canada's climate change goals
- Currently evaluating options that will support a sound business case:
  - Advanced safety features
  - Approximately 300 MW output
  - Meets targeted timeline
  - Supports Canadian nuclear industry (jobs, supply chain)
  - Advances pan-Canadian nuclear goals (future deployment to provinces reducing fossil fuel use)
  - Within bounding envelope of EA

OPG Capability

- Largest nuclear operator in Canada
- Clean energy generation profile
- Demonstrated history of safe operations
  - 100 years of electricity production
  - 50 years of nuclear experience
- Proven project management success
- Skilled employees – expertise and experience
- Extensive experience with Indigenous communities, stakeholders and site host communities