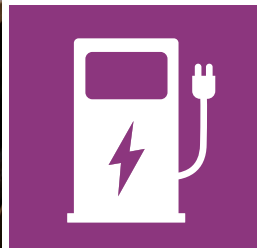
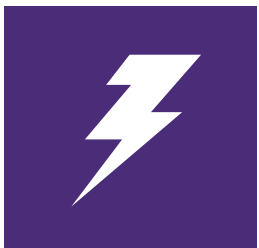
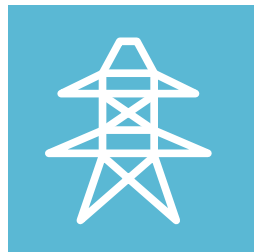
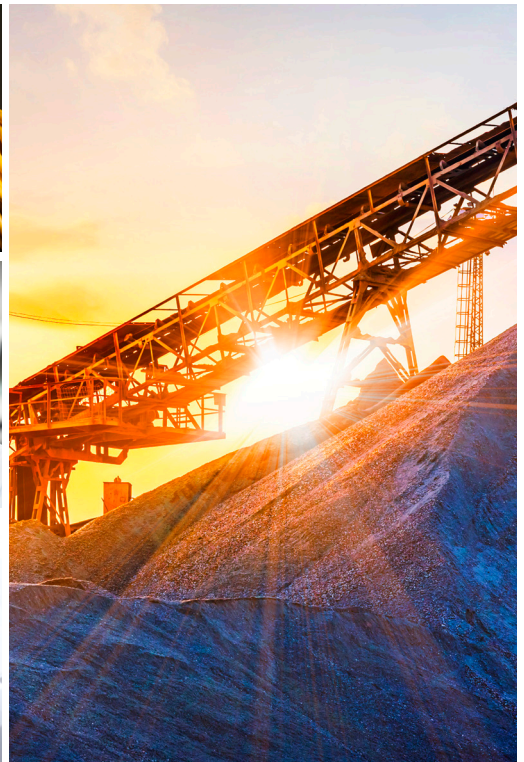
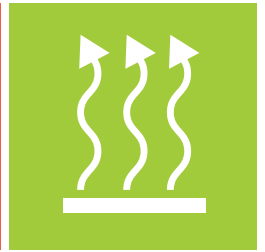


# A Call to Action: A Canadian Roadmap for Small Modular Reactors

## SUMMARY OF KEY FINDINGS



## ■ Meeting Canadians' Energy, Environmental, Social and Economic Needs

There are things Canadians need to prosper in the future:

- To have the energy abundance that goes with longer, healthier lives.
- To produce energy that's clean.
- To participate in the choices we make as communities, as provinces, and as a country.
- To reconcile disparities in energy, life quality, and opportunity.

## ■ Big Challenges? A Full Toolkit

- Energy needs will keep growing.
- New energy options are emerging.
- Some energy options with high atmospheric emissions are no longer desirable.
- Each option has its strengths and limitations.
- No one energy option can supply the human needs that have to be met in this century.
- The need to reduce environmental impacts is urgent.
- We owe it to ourselves, and to the future, to consider our options objectively and clearly.

## ■ Who We Are

- The Roadmap used a collaborative approach to bring together industry, federal, provincial, and territorial governments, as well as utilities and other interested stakeholders that wanted a pan-Canadian conversation about new options for nuclear energy.
- We used a collaborative approach. We reached out through workshops, Indigenous engagement sessions, and working groups.
- Let us tell you more about what we did, heard and learned.
- There is much more to do, hear and learn. We want to keep this conversation going. Please share this with others.



## ■ What Are Small Modular Reactors (SMRs)?

Nuclear reactors – on a much smaller scale in size than today – could deliver affordable, non-emitting energy for many new uses.

They could supply power to homes, offices and businesses, heat for industrial processes, heat to buildings, and energy to produce clean fuels such as battery charging or hydrogen for transport.

The industry making them could:

- Build, fuel and service reactors in more factory-like conditions.
- Achieve economies of scale in design, construction and operation of reactors (the reactors may be smaller, but could be more standardized).
- Simplify designs and add inherent safety characteristics.
- Locate reactors underground, increasing security.
- Integrate SMRs with other forms of energy, such as hybrid nuclear-renewable energy systems.

Most nuclear power reactors are built to a certain scale (600-1400 megawatts of electricity, or MWe). Nuclear reactors can be much smaller.

Reactors that already drive marine vessels (submarines, aircraft carriers and icebreakers) are much smaller than most power plant reactors.

These propulsion reactors have a sixty-year record of operating in hundreds of moving vessels that spend long periods in remote places.

Some ships, including icebreakers, are powered by small reactors.

Canadians have designed small or very small reactors for research, electricity generation, and district heating.

Demonstration units (Canada's early Nuclear Power Demonstration and Douglas Point reactors) and research units (currently operating at Canadian universities and at research institutes around the world) are also small, extremely low-power, very safe, easy to regulate, and easily secured.



Some ships, including icebreakers, are powered by small reactors



The research reactor at McMaster University in Hamilton, Ontario

## ■ What We Did

The Roadmap team took a collaborative, pan-Canadian approach. Interested provinces, territories and power utilities from across Canada were invited to join in.



Our work followed a number of tracks, including technical and Indigenous sessions, and expert analysis by five working groups.

Over 180 individuals participated, representing 55 organizations across 10 sectors and sub-sectors.





## ■ What We Heard

We studied several areas that bear on SMR deployment in Canada:

- Stakeholder and Indigenous engagement, with a focus on demand-side, community and end-user requirement.
- Economic analysis, including market valuation, costing, and financial models.
- International strategies to understand Canada's niche and the role of global partnerships.
- Regulatory readiness, enabling frameworks, and transportation policy.
- Waste management and long-term storage liabilities.
- Social and environmental factors, including gender-based analysis, strategic environmental assessments, carbon pricing and climate change.
- Technology assessments, advantages, disadvantages, and risks.

## ■ What We Learned

The team formed five working groups, and we invited key experts to participate. Here's what they learned:

- SMRs are real and happening now.
- Canada has what it will take to succeed at adding SMRs to the energy mix.
- There are many SMR technologies with different advantages and considerations.
- SMRs can compete with other low-cost forms of electricity generation.
- SMRs will most likely be deployed in a fleet approach, limiting the number of reactor designs in order to manage costs and shorten project schedules.
- More engagement is recommended to understand Indigenous views on nuclear, covering more regions.
- There is an important historical context, beyond nuclear power. Work is needed to rebuild trust in many relationships. Indigenous engagement is not a one-time checklist exercise.
- Canada's existing legislative, policy, and technical framework around waste management is sound.
- Canada's technical solution for long-term disposal of spent fuel waste is sufficiently flexible to accommodate new fuel types from SMRs.
- Currently, the most practical and economic solution for low- and intermediate-level waste from SMRs is safe storage at regulated sites. The ultimate solution is long-term disposal in a safe repository.
- While Canada's enabling regulatory framework for SMRs is sound, some refinements would improve efficiencies.
- Canada's domestic market potential for SMRs is significant, and SMRs could be economically competitive.

## ■ Canada's Opportunity

Potential benefits for Canada include:

- Creation of a new industrial sub-sector
- Anchoring cutting-edge research in Canada
- Canada at the centre of a global export market
- Leadership in the mining sector
- Global leadership in SMR policy expertise
- Canada as an international standard-setter
- Meeting Canada's climate change commitments
- Unlocking regional growth opportunities
- Constructive partnerships and a positive energy dialogue

Given the timing of key investment decisions, Canada's opportunity to lead is now.

## ■ Roles, Responsibilities, Recommendations

Canada is good at this.

We are one of the few countries to combine expert capabilities in many areas of nuclear energy with world-leading regulation and governance.

We are one of an even more select few that have been able to build cross-sectoral consensus on a path forward.

That path forward requires more extensive public engagement.

It also requires collaborative activities in each of four areas:

- Demonstration and deployment - to realize benefits for Canadians and for Canada.
- Capacity-building and stakeholder engagement – to increase access to information.
- Policy, legislative and regulatory measures – to make the framework more efficient.
- International partnerships and marketing – to position Canada for leadership in global value chains.





To move forward, key players must act in concert: federal, provincial and territorial governments, the regulator (Canadian Nuclear Safety Commission), Crown corporation (Atomic Energy of Canada Limited), Canada's premier nuclear science and technology organization (Canadian Nuclear Laboratories), and many others in the public and private sectors including energy utilities, technology developers, universities and laboratories.

The Roadmap report makes detailed recommendations for each essential enabling partner.

**THE OPPORTUNITY IS REAL**

**CANADA HAS WHAT IT NEEDS TO SEIZE IT**

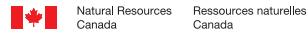
**STRATEGIC PARTNERSHIPS ARE THE KEY**



## Our Project Partners

Canada's SMR Roadmap Project is led by a Steering Committee comprised of:

Natural Resources Canada (non-voting Chair)



Alberta Innovates



Bruce Power



New Brunswick Department of Energy and Resource Development



New Brunswick Power



Northwest Territories Department of Infrastructure



Ontario Ministry of Energy, Northern Development and Mines



Ontario Power Generation



Qulliq Energy Corporation



SaskPower



Atomic Energy of Canada Limited (non-voting)



## Learn More



[www.smrroadmap.ca](http://www.smrroadmap.ca)



[SMRS@cna.ca](mailto:SMRS@cna.ca)

Information in Indigenous languages may be available on request.