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Response to RFEOI on CNL’s Small Modular Reactor Strategy

Dear Ms. Hyland:

The Organization of Canadian Nuclear Industries (OCNI) is pleased to submit this letter in response to the RFEOI on CNL’s Small Modular Reactor Strategy. OCNI is an industry trade association of more than 220 leading Canadian suppliers to the nuclear industry in Canada and offshore. OCNI companies employ more than 12,000 highly skilled and specialized people who manufacture major equipment and components and provide engineering services and support for the 22 CANDU nuclear power plants that have been constructed in Canada as well as to CANDU and LWR nuclear power plants in offshore markets.

Market Demand for SMR’s

Canada now has an opportunity to be leader in providing the world with a timely solution to its clean energy challenge. With increasingly more people enjoying energy intensive lifestyles and increasing priority on decarbonizing heating and transport there is a growing demand for clean energy. Advanced nuclear technologies and especially Small Modular Reactors (SMRs) provide options for meeting this demand. Canada, under the leadership of Canadian Nuclear Laboratories, has an opportunity to be one of the first countries to demonstrate next generation nuclear technology. The market for SMRs has been estimated by the National Nuclear Laboratories of the UK to potentially be between **\$400 and \$600 billion**, if suitable technologies existed, and at its peak could create **40,000** jobs worldwide.

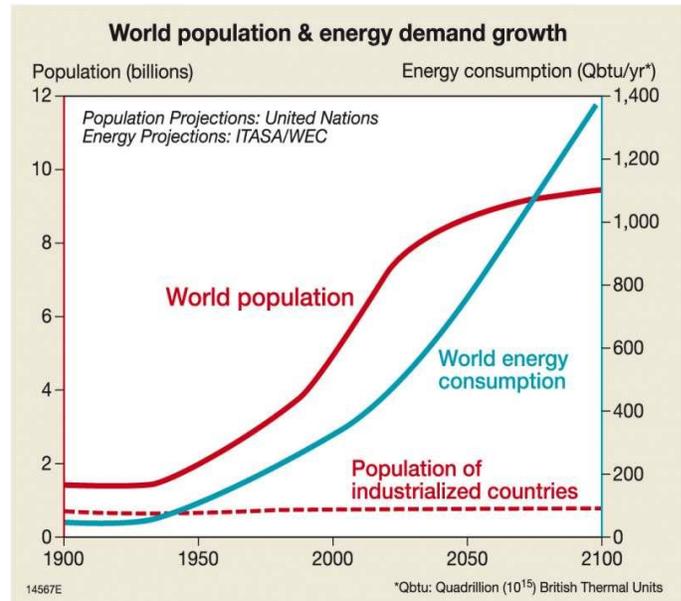


Figure 1. Even as we attempt to decarbonize, world energy use continues to grow. The Diercke International Atlas.

Canadian Leadership in SMR Deployment

Several developed nations have advanced nuclear technology programs. By focusing initially on demonstration of several SMR technologies at the CNL Site, Canada has the opportunity to accelerate commercial deployment of several SMR technologies within with the 10-20 year timeframe in which the world must deal with the climate change challenge.

Advanced SMR technologies must have passive safety systems, be proliferation resistant and minimize environmental consequences. Factory-produced SMR's will have wide range of applications including connection to smaller grids and off-grid applications in remote communities or isolated mining sites. They will be capable of producing both electric power as well as building and process heat and other commodities such as radioisotopes and hydrogen. These next-generation technologies should be capable of load-following to ensure integration with cyclical renewable generation technologies.

Canadian Nuclear Industry – Broad Capability

The Canadian Nuclear Industry includes a strong network of specialized and experienced nuclear equipment suppliers that are poised to support both demonstration SMR projects at CNL as well a long-term commercial deployment of SMR's in many regions of Canada and the world. Most of these companies are members of the **Organization of Canadian Nuclear Industries (OCNI)** whose membership list can be found at <https://ocni.ca/membership/ocni-membership-directory>.

Nuclear is a \$6 billion a year industry which employs 35,000 people in reliable, skilled jobs with another 35,000 people indirectly. The industry delivered, operates, and supports the CANDU reactor fleet that is the backbone of Ontario's low-emission electricity system and which has been exported to five countries.

The need for the Government of Canada to reaffirm its support for Canada's nuclear industry was highlighted in the July 2017 report by the House of Commons Standing Committee on Natural Resources. The Chairman of this committee, James Maloney, stated *"Based on our study it is clear that the Federal Government can and must ensure that the future of the Canadian nuclear industry remains supported."*

Capable Nuclear Supply Chain

The Canadian nuclear supply chain is concentrated in Southern and Eastern Ontario and includes more than 220 Canadian companies spanning small and large, R&D facilities to installation firms, conventional to very high tech. Strong industry associations have been effective in maintaining that cohesiveness through industry meetings, supplier events and export missions.



Some example companies in the Southern Ontario Nuclear cluster

The Canadian nuclear supply chain is ideally suited to support the construction of several demonstration SMR projects at CNL because:

- specialized CANDU equipment manufacturers have the machine tools and experience in fabricating **precision small scale** components that are required in CANDU plants and in SMR's;
- CANDU equipment manufacturers have maintained their **high-quality standards** by supplying to CANDU refurbishment projects in New Brunswick, Ontario, South Korea, and Argentina on recent years;
- **Strong collaboration** across the supply chain and among designers, fabricators, and R&D facilities has resulted in integrated and innovative product design and fabrication capabilities.

Benefits for the Canadian economy

The CNL Strategy to support the construction of several demonstration SMR reactors at its licensed and well equipped/full-service Chalk River Site will create wealth, jobs and have a positive impact on the Ontario and Canadian economies. This economic opportunity will arise in three ways:

1. Direct economic benefit arising from the success of the SMR developers

These benefits arise in three phases;

- i. Immediate attraction of advanced technology companies to Canada by giving confidence to their investors and by helping them secure the billions of dollars needed for development/deployment. With the technology companies anchored in Canada, much of that money will be spent here on advanced R&D, giving an almost immediate return on investment.
- ii. Equipping Canadian companies with the capabilities to provide services to other global advanced nuclear technology development projects
- iii. Sales of the developed advanced nuclear product will be supported by a supply chain almost entirely based in Canada. With a market size estimated to be anything up to \$600 billion and creating 40,000 jobs at its peak, this has the potential to transform the high-tech portion of the Canadian economy. The jobs created will not just be in manufacturing but also in offering a full service that will engage Canadian companies in engineering, construction, legal, financial, and regulatory aspects of the project.

2. Indirect economic benefit to other industries through the investment in R&D and development of other capabilities to support the SMR demonstration projects.

The nuclear industry draws together technological capabilities at the forefront of science.

Deployment of a new SMR technology in Canada will see R&D investment in a diverse range of fields including;

- IT/Quantum Computing/data collection/secure communications
- Advanced materials manufacture
- Materials science
- Robotics and remote handling

In supporting Canada’s transitions to a low-carbon economy, other uses of SMR-based nuclear energy could also be investigated, creating the potential for developments in the fields of:

- Radioisotope production for medical and industrial purposes
- Direct use of neutrons in industrial processes
- Hydrogen production

One example is a proposed project to develop a nuclear quality 3D print capability to fabricate complex components for SMR designs. When fully developed this capability could be applied to the aerospace and pharmaceutical industries.

3. By creating competitive advantage for Canadian communities and Industries

Many remote communities in Canada are reliant on diesel generation for power production and burn wood for heat. The power is expensive and dirty. Energy poverty is restricting the economic development and health of citizens in these communities. The development and demonstration of SMR technology at Chalk River and eventual commercial deployment of SMR’s in Canada will:

- Create economic opportunity through the availability of reliable cost-effective energy
- Allow water to be desalinated, giving access to plentiful clean water
- Enable environmentally responsible development of Canada’s natural resources
- Provide reliable, cost-effective, and non-GHG emitting heat energy
- Provide ownership, management, and economic partnership possibilities with the local and indigenous communities

Other industries also have specific needs that can be met by advanced SMR technologies. The energy intensity of the extraction processes for Canada’s oil-sands may limit the realization of its full resource potential as there is currently no viable alternative to the use of fossil fuels. The proposed new SMR technologies could provide emissions-free steam for the SAGD process and emissions-free hydrogen for upgrading.

Once the technical and economic effectiveness of SMR technologies are demonstrated at Chalk River their broader deployment current fossil fuel-based jurisdictions will help to decarbonize heating and transportation. Access to reliable, clean, and cost-effective SMR supplied energy will make Canada attractive to a wide range of industries and ensure the competitiveness of industries already located in Canada.

OCNI strongly supports the CNL Strategy to demonstrate several SMR technologies at its Chalk River Site. We encourage the Canadian government to continue to support and invest in nuclear innovation in partnership CNL and the Canadian nuclear industry. A strong partnering culture and mandate will help Canada’s private sector compete with other world-class nuclear suppliers through development of innovative SMR products and solutions. We encourage early engagement of the Canadian supply chain in shaping R&D programs with strongest commercial potential.

Yours sincerely



Dr. Ron Oberth
President and CEO