

**Written Submission for the Pre-Budget
Consultations in Advance of the 2020 Budget**

Prepared by NB Power

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Recommendation 1

Provide 20 M\$ to NB Power to perform phase 2 activities associated with SMR development in New Brunswick;

- finalize the study of some site characteristics,
- advance some of the long lead environmental studies,
- support UNB capacity development
- support supply chain capacity development
- develop elements supporting the business case for commercial demonstration

Recommendation 2

The federal government should include nuclear energy in programs, policies and strategies that target the development of clean, non-emitting sources for energy. For example, revising documents such as the Pan Canadian Framework for Clean Growth and Climate Change and the associated Federal Actions for a Clean Growth Economy to include the potential of SMRs as identified under the Pan-Canadian SMR Roadmap. In addition, there should be a technology neutral approach to clean energy funding programs such as expanding the renewable energy tax credits or production incentives to include nuclear energy.

Background

Worldwide energy demand keeps increasing driven in large part from China, India and 3rd world countries. This increasing demand is largely being met with fossil fuel. This increased use of fossil fuel is causing worldwide greenhouse gas emissions to continue to rise, which in turn significantly contributes to climate change. Countries will need a clean (low carbon emission) energy source such as nuclear power to supplement the intermittent nature of the power generated from renewable energy sources. *Backing up renewables with coal (or gas) such as was done in Germany when they closed their existing nuclear plants, led to a substantial increase in the amount of GHG emissions.*

Due to the cost and intermittent nature of power generated by pure renewable sources, it is clear and supported by an independent study conducted by MIT [ⁱ], that nuclear power needs to be part of the climate change solution. This conclusion is further supported by the recent work undertaken by the International Energy Agency [ⁱⁱ]. There is also a substantial growth opportunity for additional nuclear to support deep carbon reductions in the transportation¹ and industrial sectors.

To take advantage of these opportunities the Canadian Nuclear Industry needs, in addition to extending the life of the existing nuclear fleet, to aggressively move towards Gen IV nuclear technologies as these new technologies:

- Significantly reduce the upfront capital cost and construction time making it easier to finance,
- Integrate well with, and support intermittent renewables,
- Mesh seamlessly into existing power grids,
- Be cost competitive, and
- Address issues related to public acceptance such as improve Nuclear Safety for very low probability high consequence events, and improve on the current plans and communication for how Long-term high level radioactive waste will be managed in the future.

Grid sized Advanced Small Modular Reactors can deliver on these challenges. In addition their small size and modular nature offers the potential for a large fleet approach supporting a supply chain mass producing modules that are manufactured, assembled and then shipped all around the world.

The Pan Canadian SMR Roadmap study² recognized there is a tremendous opportunity for Canada as a tier-1 Nuclear Nation to benefit from SMR development, deployment and export due to;

- Our world class well respected Nuclear Regulator, the CNSC whose regulatory approach is technologically neutral
- The extensive capability of our National Nuclear Laboratory – CNL
- The extensive nuclear expertise in design, analysis and operation
- An active extensive supply chain industry, and

¹ Could be an important enabler for electric high speed rail in Canada

² [SMR Roadmap | Canadian Small Modular Reactor](#)

- The excellent safety record of reactors operating in Canada

In addition to the on-grid application, the SMR roadmap also identified two other applications for SMRs. These are for remote community (very small or micro SMRs) and heavy industry (mining or larger process heat or co-gen needs for heavy industry).

The Opportunity

As more and more countries begin to recognize that in order to achieve deep decarbonization goals and targets to combat climate change, they need to turn to nuclear power, there is a tremendous opportunity for those that have a demonstrated product available to meet this demand.

The finance working group of the Pan Canadian SMR Roadmap estimated the potential socio-economic impact to Canada for on-grid SMRs could be worth \$150 Billion per year from 2030 to 2040 with International rollout (\$ 1.5 Trillion).

The SMR roadmap also identified that the current Canadian advantage over the US and the UK is time sensitive and it is important to act now if Canada is to take advantage of this important economic opportunity.

It should be noted that advanced on-grid Small Modular Reactor development and deployment aligns well with a number of key policies of the Canadian Government, such as climate change (both at home and abroad), innovation and science and economic development in Canada. In addition, in cooperation with the world bank, the introduction of SMRs into less developed countries could help them achieve economic prosperity as there is a strong correlation between energy and financial poverty. The reduction of the gap between the have and have not countries also reduces the potential for conflict and thus contributes to peace keeping in a peaceful manner without placing Canadians at risk.

SMR Development in New Brunswick

New Brunswick is an attractive location because it has a population that is generally supportive of nuclear power, and has an experienced nuclear operator with a solid reputation with the regulator and for innovation. The Point Lepreau site is attractive and is a valuable strategic asset to the province. It is well characterized and can accommodate at least two demonstration reactors in addition to the existing well run nuclear plant. There have also been a number of environmental and ecological risk assessments performed over the years providing an excellent base to draw upon.

As part of energy planning, NB Power reviewed a large selection of small modular reactors technologies. Based on a number of criteria such as Nuclear Safety, safeguards, reliability, environmental and waste, fuel supply, cost competitiveness, technological readiness, public acceptance and potential for economic benefits, NB Power narrowed the list to two technologies, the ARC-100 [ⁱⁱⁱ] and the Moltex SSR-W [^{iv}]. These advanced Gen IV nuclear technologies have all the benefits listed above, have different market applications and are well suited for the Canadian and international markets.

To take advantage of the potential emerging opportunities, the government of New Brunswick, through the New Brunswick Energy Solutions Corporation, collaborated in the formation of an advanced SMR research cluster. Through this, a relationship with ARC Nuclear and Moltex Energy [v] followed. This led to a Memorandum of Understanding and definitive agreements with each vendor. In this relationship, the government of New Brunswick, through the New Brunswick Energy Solutions Corporation, contributed 5 Million dollars to each vendor which was matched by an equal amount of funding (5 million dollars) from each vendor.

As part of the vendor activities related to the Advanced Small Modular Reactor R&D cluster, the vendors;

- Relocated the headquarters of their Canadian subsidiary companies to Saint John,
- Hired staff for their Saint John offices,
- Working with UNB to establish chair positions, curriculum, and working on plans for upcoming R&D to be performed at CNER/UNB,
- Progressing their designs,
- Progressing through Phase 1 of the CNSC Vendor Design Review,
- Having discussions related to establishing a supply chain in New Brunswick, and
- Having discussions within the province to increase understanding of advanced Small Modular Reactor technologies

To assist in public communication about the potential for SMRs, NB Power has also produced an information booklet entitled “Powering Growth – Building New Brunswick Energy Future”, which outlines some of the potential benefits of advanced small modular reactors. This brochure was also placed on the NB Power website [v1], and is part of the on-going dialogue with the public, aboriginal representatives, supply chain and business leaders.

Representatives from NB Power and the Department of Energy and Resource Development also participated in the development of the Pan-Canadian small modular reactor road map exercise. NB Power is also having discussions with OPG, Bruce Power and SaskPower as well as other members of the federal family to look for common opportunities for SMR development and deployment.

Support for next stage of development in New Brunswick

The next stage of development is referred to preliminary design, verification R&D and completion of the CNSC Vendor Design Review 2. The vendors have applied to various federal funding programs to support their design development. For the purpose of this application, it is assumed that these requests are approved. **NB Power will require funding of 20M\$** to;

- finalize the study of some site characteristics,
- advance some of the long lead environmental studies,
- support UNB capacity development
- support supply chain capacity development

- develop elements supporting the business case for commercial demonstration
- provide advice and support to the vendors

Need for stronger Policies supporting Nuclear Energy

The federal government should include nuclear energy in programs, policies and strategies that target the development of clean, non-emitting sources for energy. For example, revising documents such as the Pan Canadian Framework for Clean Growth and Climate Change and the associated Federal Actions for a Clean Growth Economy to include the potential of SMRs as identified under the Pan-Canadian SMR Roadmap. In addition, there should be a technology neutral approach to clean energy funding programs such as expanding the renewable energy tax credits or production incentives to include nuclear energy.

ⁱ [The Future of Nuclear Energy in a Carbon-Constrained World | MIT Energy Initiative](#)

ⁱⁱ [Nuclear Power in a Clean Energy System | IEA Report](#)

ⁱⁱⁱ [ARC-100 Reactor — ARC](#)

^{iv} [Moltex Energy | Cheap Clean Safe | Stable Salt Reactors | Molten Salt Reactor](#)

^v [Moltex Energy | Cheap Clean Safe | Stable Salt Reactors | SSR](#)

^{vi} [Point Lepreau Nuclear Generating Station](#)