



May 14, 2023

Ministry or Energy, Energy Supply Policy Division 7<sup>th</sup> Floor, 77 Grenville Street Toronto, ON, M7A 2C1

# RE: OCNI Submission in Response to the IESO Pathways to Decarbonization Study (ERO 019-6647)

#### Dear sir/madam:

In response to the IESO's *Pathways to Decarbonization Study* released on December 15, 2022, the Organization of Canadian Nuclear Industries (OCNI) is pleased to provide the following comments for the IESO and Ministry's consideration as part of the feedback for this study.

OCNI is an association representing more than 240 Canadian suppliers, the majority of which are based in Ontario<sup>1</sup>. OCNI member companies collectively employ more than 20,000 highly skilled and specialized workers who manufacture major equipment and components for Small Modular Reactors (SMRs), as well as provide engineering services to the 18 operating CANDU nuclear power plants in Ontario.

Our organization actively promotes the production of safe, clean, and reliable nuclear electricity as a key part of a balanced electricity generation portfolio in Ontario. It is certainly a time of excitement and renewal in our sector, and we were encouraged to see the findings of the study underscore the important need for significant growth of Ontario's nuclear assets, particularly if Net-Zero goals are to be accomplished.

In our reading of the draft Study, we identified the following elements as being of significant importance in achieving Ontario's energy goals:

- 65,000MW of new non-emitting supply including solar, wind, hydro, storage and nuclear, almost triple the amount of non-emitting resources from 2021;
- 10,800MW of additional large nuclear installed capacity; and
- 7,000MW of additional SMR installed capacity.

The system will also require considerable contributions in terms of capital, labour and siting, including a six-fold increase in the 14,000-strong labour force currently working on electricity infrastructure projects; and an estimated cost of \$375-\$425 billion to effectively double the size of the system.

It is clear from the Study that the current system's ability to reduce emissions across the economy and maintain reliability and affordability— while keeping pace with demand growth and electrification— will be a challenge without investment in SMRs and new large nuclear on an unprecedented scale and magnitude.

It is equally clear that investment in a well-developed Canadian nuclear supply chain is going to be essential if this monumental challenge is going to be achieved. Extensive advanced planning, supported by a clear timeline and critical path, will be required to assess the need, as well as the capacity, of

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<sup>&</sup>lt;sup>1</sup> See Appendix A.





Canada's nuclear sector to develop the talent and materials needed to generate an additional 18,000MW of power by 2050.

#### **Executing on the Ready4SMR Program**

In light of the current period of renewal Ontario and Canada's nuclear industry finds itself in, OCNI has already begun to take steps to think about the future, and what we can do to ensure our members are ready to take advantage of both domestic and international growth opportunities. One way our organization has already begun to act is through the development of the Ready4SMR Program.

In line with our commitments under the "Canadian SMR Action Plan<sup>2</sup>", the Program, which was partly modelled off of the Fit For Nuclear (F4N) program launched by the Nuclear Advanced Manufacturing Research Centre (AMRC) in the United Kingdom, focuses on the development and enhancement of local supply chains in the four provinces (Ontario, Saskatchewan, New Brunswick and Alberta) planning on deploying SMRs, creating the structures that will enable them to realize the economic benefits of SMR deployment cited in the April 2021 SMR feasibility study.

The Program has two pillars:

**Pillar One** focuses on the existing supply chain in Ontario by implementing Advanced Manufacturing Methods, promoting SMR workforce diversity, and Indigenous Engagement.

Activities within this Pillar focus on making the nuclear supply chain SMR ready by:

- Leading Advanced Manufacturing Forums and events for companies to analyze and prepare matrices of the unique and cross-cutting construction, component fabrication, installation, and service needs of contending SMR vendors in each of three streams (On-grid, Advanced SMRs, and Off-grid);
- Working with regional partners to understand cross-cutting capabilities that Canadian nuclear suppliers will need to improve / develop, including enhanced fire prevention technologies, materials science, machining of custom metals, robotic inspection systems for new SMR designs, safety code validation; and
- Working with partner "supply chain experts" to compare the SMR "needs matrices" with Canadian nuclear supply chain "capability matrices" and identifying gaps and how they can be filled by training, facility upgrades or expansions, development of new robotic tooling, or investments in advanced manufacturing systems.

**Pillar Two** focuses on making the SMR Supply Chain 'pan-Canadian' in regions that do not yet have nuclear suppliers like Saskatchewan and Alberta, or have only a few like New Brunswick. This seeks to develop new suppliers, including Indigenous-owned suppliers, in these regions by coaching, training, and advising "new to nuclear suppliers" on best practices and management tools that are prevalent in the nuclear supply chain. This involves:

OCN01 – Develop a pan-Canadian supply chain

OCN02 – Promote the use of advanced manufacturing methods to reduce SMR costs

OCN03 – Promote SMR workforce diversity and Indigenous engagement



- Encouraging and assisting companies, including Indigenous-owned companies, in adapting the business processes, quality management programs, and overarching "safety culture" that are required of nuclear qualified suppliers and unique to the industry; and
- Recruiting and training regional supply chain advisors who are capable of coaching, guiding, and evaluating companies along the typical 18-month journey to becoming "nuclear-qualified".

A detailed breakdown of the steps associated with implementing each Pillar is contained in Appendix B.

While initial steps have been taken to execute on the Ready4SMR Program, additional investment from the provincial and federal governments will be required to fully realize its potential.

#### **Recommendations:**

- 1. That the IESO recognize in its final report the importance of starting work in the immediate and near-term to further enhance and support Ontario's nuclear supply chain; and
- 2. That, in recognition of the regulatory standards and long timelines in the nuclear sector, the IESO recommend that the Ontario government begin making investments now in enhancing the nuclear supply chain to ensure that the sector is ready to deliver on the increased electricity generation needs and Net-Zero goals outlined in the Study.

#### **Implementing Additive and Other Advanced Manufacturing Methods**

As Canadian nuclear plants continue to age, there is an increasing need to replace many of the ageing or broken components within these plants. Many of these reactors were built with parts supplied by companies who have ceased production sometime between now and initial construction, or no longer produce the same part that was originally supplied. The current solution to these problems requires an expensive engineering and procuring process to find a part of similar function while not compromising the efficiency or safety of the plant. Many utility companies try to avoid these issues by constructing and staffing large warehouses and stockpiling plant components for future use adding to the expense of part replacement, but even in this scenario the parts can deteriorate over time if conditions are not kept within storage specifications.

Reverse engineering and digitization of obsolete components in ageing nuclear plants can enable these components to be directly "printed" quickly and cost-effectively or produced by conventional means using moulds "printed" from the digitized design. A diverse AM supplier base can also provide the ability to complete in-situ repairs and coatings which could be very beneficial to nuclear power plants (NPPs).

Advanced manufacturing can be used to make complex and intricate SMR components that were heretofore beyond the reach of conventional manufacturing or make larger components faster and cheaper than by conventional methods. These AM features combine to promise cost and schedule reductions and enable optimized design features that will help make SMRs cost-competitive with other forms of energy production. Investing in AM as outlined in this roadmap will help make Canada a leader in both domestic and international SMR deployments. However, additive manufacturing requires much more than hitting the print button. High-quality, repeatable production requires a broad range of interlinked capabilities and equipment. Printing is only one element of the additive manufacturing process as demonstrated in Exhibit A below.



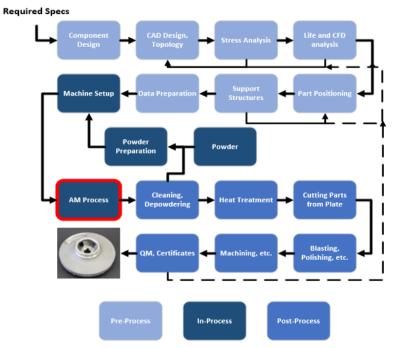


Exhibit A: Additive Manufacturing Flowsheet and Quality Process

Through the Ready4SMR Program, OCNI members and partners can work collaboratively with project proponents to identify technology gaps, and develop a supply strategy for these highly specialized components that considers:

- a. The suitability of using advanced manufacturing methods for some of the parts; and
- b. Whether existing standards and codes for these parts are suitable.

To support this work, OCNI is currently coordinating with Chalk River Nuclear Laboratories on the implementation of additive manufacturing in the Canadian nuclear industry by leveraging our 2021 Advanced Manufacturing Roadmap for the Canadian Nuclear Industry<sup>3</sup>.

### **Recommendations:**

- 3. That the IESO recognize in its final report the importance of Additive and other Advanced Manufacturing Methods in ensuring a strong and healthy nuclear sector; and
- 4. That the IESO and the Ministry of Energy work collaboratively with the Government of Canada and the Canadian Nuclear Safety Commission (CNSC) to identify ways to streamline approval processes on nuclear components manufactured for small modular nuclear reactors using AM methods, where the same components are being replicated consistently from one project to another.

<sup>&</sup>lt;sup>3</sup> <a href="https://www.ocni.ca/wp-content/uploads/2021/12/Advanced-Manufacturing-Roadmap-for-the-Canadian-Nuclear-Industry-December-14-2021">https://www.ocni.ca/wp-content/uploads/2021/12/Advanced-Manufacturing-Roadmap-for-the-Canadian-Nuclear-Industry-December-14-2021</a> .pdf





#### Developing a Workforce Today for the Jobs of Tomorrow

In 2012 the OECD outlined a growing concern for the nuclear industry's labour force; an increasingly large gap between workers aging out of the workforce and a growth in the demand for skilled labour to replace them. Over a decade later, in 2023, this concern remains omnipresent as the industry pushes forward to help Ontario and Canada reach its net-zero targets. At the time of its release, the report recommended that governments engage in long-term human resource development planning, working in tandem with post-secondary institutions to streamline and maintain a pipeline of skilled labour for the growing, high-skill nuclear industry.

As it stands today, just 40% of the industry workforce is under the age of 40, with approximately 90% of jobs falling into the high-skill category. If Ontario's nuclear sector is to meet projected outputs identified in the IESO's Study, work must be start now to connect young people, new Canadians and Indigenous communities to the post-secondary institutions that will equip them with the skills and knowledge needed to fill these good paying, high-skilled positions.

To support this, we recommend the Ontario government begin work immediately on the development of a comprehensive strategy to attract, train, and deploy the next generation of nuclear sector workers.

#### **Recommendations:**

6. That the IESO include in its final report a recommendation to the Ontario government to begin developing a comprehensive strategy to attract, train, and deploy the next generation of nuclear sector workers.

### A Robust Supply Chain Made in Ontario and Canada

As the province with the most robust nuclear supply chain, Ontario has spent decades fostering the innovation and skills needed to grow and service the province's nuclear capacity needs.

Furthermore, provinces such as New Brunswick and Saskatchewan have begun taking steps to cultivate and grow their own nuclear sectors, creating a network of expertise and skills that are leading the way not only in Canada, but on an international scale as well.

As such, given current policy objectives which include net-zero, energy security, and sustainable economic benefits, Ontario would be best serviced by using made-in-Canada technology, equipment, and fuel.

Additionally, relying on equipment and fuel supply chains outside of Canada, poses the risk that Ontario proponents will have to stand in line for access to a global new-build and fuel supply chain that is already being highly strained by a combination of the United States shifting away from Russian-supplied fuel, and the bottle neck created as a result of North America having just a single enrichment facility.



Without a robust domestic supply chain, the energy security and climate change objectives identified in the IESO's Study cannot and will not be met.

#### **Recommendations:**

5. That the IESO include in its final report recognition of the importance of cultivating a strong domestic nuclear supply chain in light of current geopolitical considerations.

## **Conclusion**

Nuclear power plant refurbishments and new SMR projects that contribute to increased generation capacity will only be able to proceed if Ontario is willing to make the investments needed in growing and strengthening the nuclear supply chain.

As we have outlined in our submission, without the necessary financial investments now to grow the supply chain's technical and human resources capacity, Ontario will not be able to effectively scale up its nuclear electricity generation capacity.

More nuclear generation means fewer emissions, and non-emitting baseload supply is essential for the augmentation of the supply mix, especially with increasing amounts of energy storage as well as the off-peak charging of an increasing number of electric vehicles (EVs).

As such, OCNI supports the province's consideration of refurbishing the Pickering B reactors as a means of securing more than 2,000MW of reliable, non-emitting, baseload supply in the East GTA to support decarbonization and electrification across the region.

OCNI also supports the Ministry of Energy working with the Ontario Energy Board (OEB) and the IESO to develop a process to recover pre-development costs for OEB-regulated and IESO-contracted projects respectively, in particular incremental nuclear power generation which is subject to a lengthy federal regulatory process.

This would allow for proponents to commence the extensive federal requirements for evaluating and permitting incremental nuclear generation in Ontario, a prerequisite to the province having even the option for nuclear to play any role comparable to that suggested in the P2D report.

Per the study recommendations, OCNI supports:

- Streamlining regulatory, approval and permitting processes, citing that it can take five to 10 years to site new clean generation and transmission infrastructure.
- Beginning planning and siting for new resources like new long-lived energy storage (e.g., pump storage), nuclear generation and waterpower facilities.
- Increased investment in new electricity infrastructure due to increasing electricity demand over the outlook of the study.
- Significant transmission capacity increases to help balance intermittent sources of electricity (e.g., wind and solar) and to ensure cost-effective supply can be delivered to meet growing demands from electrification and economic growth.



The nuclear industry has a proven record of providing as many as 30,000 well-paying jobs, both directly and indirectly. It also has a proven record of providing clean, GHG emissions-free, baseload energy.

If we are to hit the goals as identified in the Study, collaboration between the Ministry of Colleges and Universities, the Ministry of Economic Development, Job Creation and Trade, the Ministry of Labour, Immigration, Training and Skills Development, the Ministry of Finance, the President of the Treasury Board, the Minister of Environment, Conservation and Parks, and the Ministry of Energy will be needed if we are to be successful.

On behalf of OCNI's member companies, we appreciate the opportunity to share our feedback on the IESO's *Pathways to Decarbonization* study, and we remain committed to collaborating and supporting the government in any way we can.

Respectfully,

Bill Walker

President and CEO

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### <u>APPENDIX A – OCNI'S Ontario Supply Chain Members</u>



# Member Company Riding Maps 2022-23

Eastern GTA Region (Federal and Provincial)

- 01 Barrie Innisfil
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- Curtiss-Wright Nuclear
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- Framatome Canada Ltd.
- UCC Industries International
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- MPP Hon. Peter Bethlenfalvy (PCO)
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- (07) Whitby
- Aerotek Maufacturing Ltd.
- Quantum CNC Inc.
- Carboline
- The Regional Municipality of Durham
- MP Ryan Turnbull (LPC)
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- MPP Lorne Coe (PCO)
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#### D Barrie - Springwater -Oro-Medonte

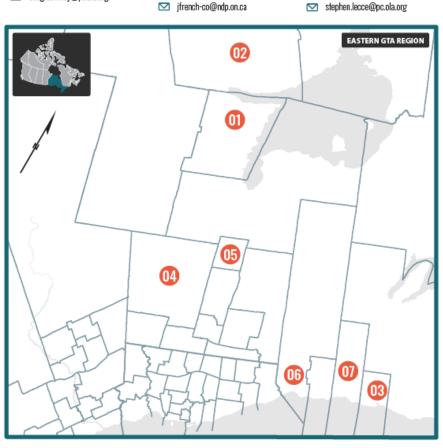
- BWM Industrial Automation
- MP Doug Shipley (CPC)
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- J.A. Plourde Performance Ltd.
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- B.C. Instruments
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- MPP Hon. David Piccini (PCO)
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- Nordion (Canada) Inc.
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- Glengarry-Prescott-Russell
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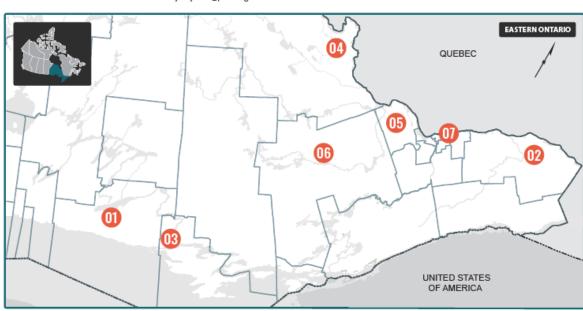
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#### Renfrew - Nipissing -Pembroke

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- Canadian Nuclear Laboratories
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- Nu-Tech
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GTA Centre (Federal and Provincial)

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- LHH Knightsbridge
- MZConsulting Inc.
- Nuclear Insurance Association of Canada
- Westinghouse Electric Canada Inc.
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# 102 Thornhill

- Camfil Canada Inc.
- Mirion Technologies (Canberra CA) Ltd.
- Plan Group Inc.
- Sartrex Power Control Systems Inc.
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- X-Energy Canada
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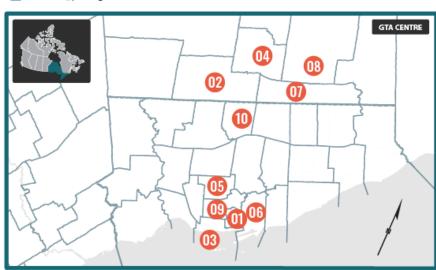
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Hamilton Niagara Region (Federal and Provincial)

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- Niagara Energy Products (NEP)
- Niagara Fasteners Inc
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# 🕕 Hamilton Centre

- **Unified Engineering**
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#### Hamilton East -Stoney Creek

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- Stern Laboratories Inc.
- Toshiba International Corporation
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## 🕦 Niagara Centre

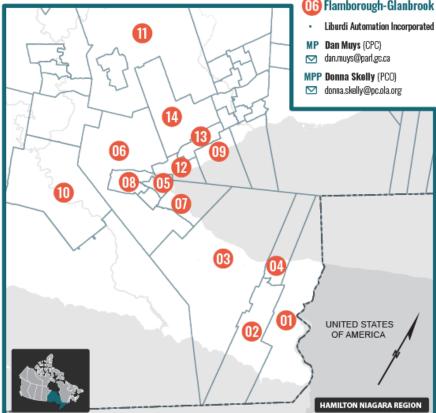
- Canada Forgings Inc.
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Hamilton Niagara Region (Federal and Provincial)

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- Hoskin Scientific Limited
- McCann Equipment Ltd.
- Paiarito Scientific Corporation
- PCL Industrial Constructors Inc.
- Promation Nuclear
- Siemens Energy Canada Limited
- Team Industrial Services
- Terrestrial Energy Inc.
- The lan Martin Group
   Thermon Canada Inc.
- Hooper Welding Enterprises
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# Oakville North Burlington

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- IR Supplies and Services
- Krohne Inc.
- Marsh Instrumentation Ltd.
- Morson International Inc. (CTSNA)
- Toshont Power Products Inc.
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# Wellington - Halton Hills

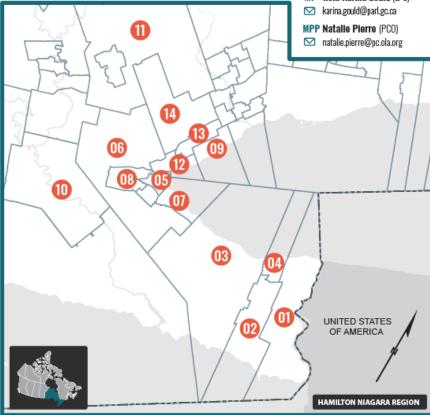
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- Alberici Constructors Ltd.
- Contro Valve Inc.
- Marshield Radiation Protection Products
- Seals Unlimited (1976) Inc.
- Tyne Engineering Inc.

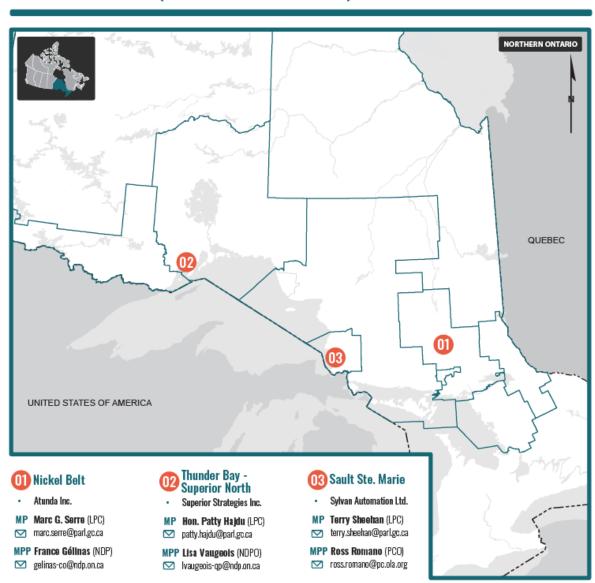
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Northern Ontario (Federal and Provincial)







Western GTA Region (Federal and Provincial)

# 🕕 Mississauga - Malton

- **Bird Construction**
- Hitachi Canada (Branch of Hitachi America, Ltd
- Aecon Nuclear
- Conval Process Solutions Inc.
- Cummins Canada ULC
- Earle M. Jorgensen Canada
- KSB Pumps Inc
- Lokring Eastern Canada
- NEFAB INC
- North American Crating Inc.
- Pacer Air Freight
- PinAcle Stainless Steel
- **RN Tooling Corporation**
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- Pall (Canada) ULC
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- Lakeside Process Controls Ltd.
- Rotork Controls (Canada) Ltd.
- SciWise Solutions

### MP Rechie Valdez (LPC)

# 03 Mississauga Centre

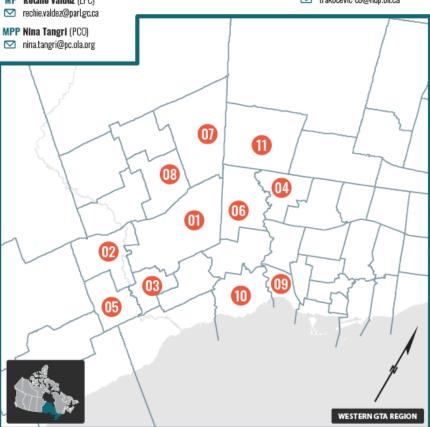
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### 🚻 Vaughan - Woodbridge

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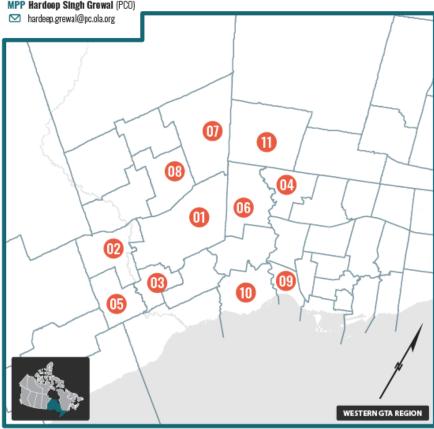
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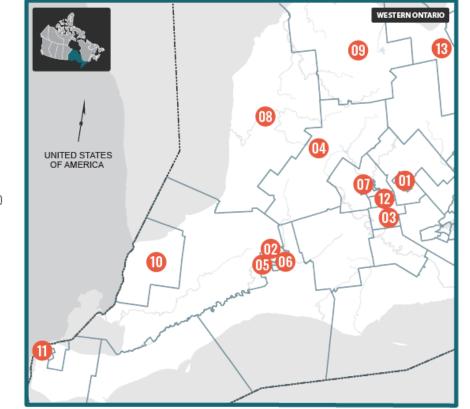






Western Region (Federal and Provincial)

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- 03 Cambridge
- Cambridge Materials Testing
- Eclipse Automation Inc.
- Excello Marketing
- Mirion Technologies (IST Canada) Ltd.
- ATS Automation
- BWXT Canada Ltd.
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## 07) Waterloo

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Western Region (Federal and Provincial)

## 08 Huron - Bruce

- Abraflex (2004) Ltd.
- KEPCO E&C
- Special Electronics & Designs Inc./Rescom Sales Inc.
- United Engineers & Constructors, Inc.
- Cahill Constructors Limited
- CRG Energy Projects Inc.
- Nuclear Promise X (NPX)
- Revenew International LLC
- Sargent & Lundy Canada Company
- The Municipality of Kincardine
   Wild Matriarch Inc.
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## 🔟 Sarnia - Lambton

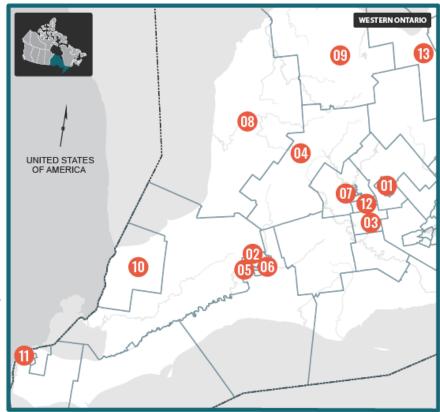
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#### APPENDIX B - Ready4SMR Program Details

## Step One: Program Development 2023/2024

- Implement Ready4SMR Pan-Canadian program through a pan-Canadian SMR Supplier Hub led by OCNI and with support from OCNI member SMR vendors who comprise the seven main SMR vendors active in Canada. Led by OCNI's Director of Supply Chain Development, this hub will coordinate the various regional projects underway to ensure that companies in New Brunswick, Saskatchewan or Alberta will have access to the same opportunities and programs as the existing Ontario supply chain. These regional programs are 'shorter lived' and so through this Supplier Hub the new-to-nuclear suppliers will be able to maintain involvement in the pan-Canadian supply chain beyond the duration of their regional program, therefore realizing an incremental benefit above the regional program. SMRs will be operational in Canada starting in 2028 at OPG's Darlington facility and then through the next decade in New Brunswick, Saskatchewan, and Alberta, meaning that the supply chain development program will need to be active for this duration. The pan-Canadian SMR Supplier Hub, through OCNI's connections to the nuclear utilities, will be able to pull operating experience and knowledge from the first SMR projects that can reduce cost and construction time of subsequent units across Canada, rather than just within one utility. This activity supports action OCN01.
- Conduct a detailed assessment of nuclear quality/nuclear management system requirements to ensure that SMRs are competitively priced. Today, approximately 70% of the components supplied to a large (CANDU) Canadian nuclear utility require a nuclear management system (CSA N286.12) and at least one, separate nuclear quality program. In Europe, a company can provide most of the Turbine Steam System to a nuclear facility under an ISO 9001 management system and some specific requirements on the components. By allowing more components to be supplied without a distinct nuclear management system or by reducing the number of components that require distinct nuclear quality programs, without compromising safety, would likely lower the potential costs of SMRs in Canada and allow Canadian companies to compete more effectively in the global market. This assessment can be led through the pan-Canadian SMR Supplier Hub together with the nuclear utilities, SMR vendors, CNSC and the CSA in 2023/2024 and be completed before much of the 'component' level procurement for SMR projects is started. This activity also supports action OCN01.
- Conduct a detailed analysis of using advanced manufactured parts, specifically 3-D printed parts, in a nuclear environment. The industry recognizes that advanced manufacturing in general and 3D printing specifically could reduce the component cost of single or small-scale items and improve their functionality by "printing" configurations/shapes not possible with conventional manufacturing methods. There is not yet a path to having 3D parts accepted for use in a nuclear environment and detailed tests, analysis, and development of codes and standards are required to determine and prove their fitness for use. The pan-Canadian supplier hub, together with Chalk River Nuclear Laboratories, the Canadian Advanced Manufacturing in Nuclear Alliance, nuclear utilities and OCNI suppliers, can use OCNI member testing facilities in Canada to determine and conduct the necessary testing to prove the suitability of using 3D printed parts in a nuclear environment. This activity supports action OCN02.
- Assign or retain a Director of Supply Chain Development to lead the pan Canadian SMR Supplier Hub. This person will be responsible for the overall execution of activities related to



OCNI's actions under the SMR Action Plan and will ensure coordination between OCNI's current regional programs and this national program. The person will also coordinate/participate in other national SMR committees, such as NRCan's SMR Leadership Table at which OCNI has already proved update in its Ready4SMR initiative.

- Retain and train three (3) Regional Supply Chain Coordinators to represent OCNI in New Brunswick, Saskatchewan, and Alberta (Pillar Two).
- First Nations Engagement Noting that there are many organizations active in First Nations Engagement activities, OCNI has partnered with North Shore Micmac District Council in New Brunswick and First Nations Power Authority in Saskatchewan to lead our combined efforts to ensure all regional First Nations are given an opportunity to learn about the supply chain and skilled trades opportunities associated with the SMR projects. We will continue this partnership through the pan-Canadian SMR Supplier Hub in order to provide OCNI's nuclear capability and experience to First Nations communities across Canada, including through an expanded version of OCNI's 2021 Ontario government funded "Skills Development Program" that placed 25 Indigenous youth into skilled trades or other nuclear jobs in Ontario. This activity supports action OCN03.

### **Step Two: Program Execution**

- Under oversight by the OCNI CEO the "Director of Supply Chain Development", supported by Supply Chain Experts and the three Regional Supply Chain Advisors, manages the Pillar One and Pillar Two programs through the pan-Canadian SMR Supplier Hub. The annual roles and activities would include:
- Events: With SMR sites being identified and SMR detailed designs being completed the pan-Canadian SMR Supplier Hub will begin focusing on more specific projects in 2024, allowing for more detailed understanding of the components and systems that can be supplied in any given jurisdiction. Canadian suppliers who participated in OCNI's Ready4SMR program will now be ready to actively engage the nuclear supply chain and compete for procurement opportunities. OCNI will organize and host SMR supplier days in partnership with the proposed site-operator and SMR vendor to support the highest degree of localized content as possible. This will allow each region to receive a higher economic benefit than if the Ontario supply chain dominates each procurement opportunity.
- Engagement: OCNI will continue to work with its partners across Canada to ensure awareness
  and equal participation for First Nations, Metis and Innuit in the pan-Canadian nuclear supply
  chain.
- Growth: OCNI will increase the number and broaden the scope its international trade missions to help Canadian SMR suppliers to compete and grow a higher market share in the global industry. Countries around the world already recognize that Canada is a leader in the deployment of SMRs and are asking for Canadian support. Canadian companies who join the pan-Canadian SMR Supplier Hub will gain valuable experience here in Canada that will give them a competitive advantage in the global market that is estimated (reference NRCan) to become a \$150B market between 2025 and 2024. Capturing even 10% of that market would double the contribution of the Canadian nuclear market to our GDP. (CNA November 8, 2019 news release Canada's nuclear industry adds \$17B to GDP).