ONTARIO SOCIETY OF PROFESSIONAL ENGINEERS

The Honourable Chrystia Freeland
Deputy Prime Minister and Minister of Finance
Department of Finance Canada
90 Elgin Street Ottawa, Ontario K1A 0G5
Submitted online

RE: Canada 2021 Pre-Budget Submission

Dear Minister Freeland,

The Ontario Society of Professional Engineers (OSPE) is the advocacy body and voice of the engineering profession. Ontario currently has over 85,000 professional engineers, 250,000 engineering graduates, 6,600 engineering post-graduate students and 37,000 engineering undergraduate students. The engineering profession's commitment to safeguarding the public interest has always been extremely important, and in these uncertain times, there is no exception.

Engineers generate wealth for the country, through the development and commercialization of new technologies and by designing innovative and sustainable solutions for the benefit of all Canadians. Engineers also ensure safety and stability, by designing resilient infrastructure and reliable energy and water systems that Canadians rely on daily. During this pandemic, engineers have led the re-design of manufacturing processes to create much needed Personal Protective Equipment (PPE) and ventilators. Engineers use 3D printers to create tens of thousands of face shields and frames for our front-line workers. They are in the med-tech industry working diligently to bio-engineer new medications and new vaccines to combat COVID-19. In times of crisis, you will always find engineers working tirelessly, in the background, without much accolade, diligently supporting the communities they serve.

Unfortunately, the engineering community has been severely impacted by this pandemic, as thousands of engineering jobs are directly linked to the infrastructure, manufacturing, technology and research and innovation sectors. This has not only affected engineers and engineering graduates, but the entire Ontarian and Canadian economies.

Engineering knowledge and talent is beyond capable of leading Ontario and Canada's industries into the future and will play an important role in the immediate, short- and long-term economic recovery of our province and country. As such, the country must now support the engineering community in rebuilding the engine that drives Ontario, and the rest of the country.

Canada's historic funding allocations and strategic planning unfortunately fell short of serving the province's needs during this crisis, and we would like to assist in re-introducing resiliency and value in Canada's workforce and systems. To ensure preparedness for future events and build an economy that is strong and benefits all people, it is imperative that new funding allocations provide a sustainable benefit for diverse, future generations by ensuring a targeted focus on **building sustainability, investing in talent development and retention, and fostering innovation.**

A resilient economy can be supported by:

- Leveraging Canada's existing assets
- Building the assets that both businesses and workers of the future need to succeed
- Strengthening Canada's competitive advantage

Recommendations

Engineering Workforce

1. Train engineers for the skills required to succeed in the energy efficiency and green building sector.

2. Support engineering students and recent engineering graduates.

3. Drive the transformation of engineering education.

4. Invest in talent development, knowledge training, and supports for engineers in Ontario.

5. Support organizations that implement inclusive design principles and the growth of a diverse workforce to enable economic equity and recovery in Canada.

Sustainability

6. Work with the provinces and municipalities to prioritize investment in sustainable infrastructure, including pre-design and design activities.

7. Work with provincial and territorial governments towards a sustainable transition, by encouraging the use of Distributed Energy Resources (DERs) and emissions free technology.

8. Invest in Ontario's Mining Industry to ensure proper clean-up of Ontario's orphaned and abandoned sites.

9. Invest in Ontario's Mining Infrastructure, including the Ring of Fire.

10. Invest in Small Modular Reactors (SMRs) to create jobs in the nuclear energy industry and provide additional sources of low carbon electricity and heat.

Research and Innovation

11. Support local manufacturing innovation and production.

12. Create a dedicated fund to support Ontario businesses in Research and Development (R&D) activities with a strong focus on local commercialization, including development and protection of Intellectual Property (IP) for Ontario and Canada's benefit.

13. Invest in 5G deployment through an efficient, flexible, and sustainable approach to spectrum management and network coverage, in consultation with the engineering community.

14. Support the generation, protection, and commercialization of intellectual property (IP) in small to medium enterprises (SMEs).

Engineering Workforce

1. **Train engineers for the skills required to succeed in the energy efficiency and green building sector.**

As Ontario and Canada transition towards a low-carbon future, the energy efficiency and buildings sector will be at the forefront of change. To accelerate this, we need to strengthen the capacity of the existing workforce and attract more people to work in these sectors, especially engineers. This is why OSPE has joined Workforce Coalition 2030, which is a broad cross-sectoral coalition of employers, educators, and practitioners across the construction ecosystem working to collectively impact government policy, business practice, and education.

Engineers believe that sustainability, investing in talent development and retention, and fostering innovation must be the priority of new government funding allocations. As COVID-19 has proven to be a major disruptor to the world order, causing rapid changes to the work force, this will ensure a strong economy that can withstand future catastrophes.

Prior to COVID-19, some of Canada's most strategic sectors, such as infrastructure and transportation were already facing a talent-gap in their engineering departments. Engineering jobs were being given to international firms because Ontario did not have the right talent to get the job done. This is deeply concerning to the economic recovery of the province and country as the success of the economy depends on the ability to match talent with job vacancies and to ensure that this talent can adapt to market demands. This concern has become magnified by immediate demands for more technologically equipped engineers due to changes caused by the current crisis.

The pandemic has also expedited trends such as digitalization and building information modelling that were already transforming building design and engineering. By aligning with Workforce 2030, OSPE looks to accelerate new approaches for rapid up-skilling, growing women's participation in STEM occupations, and emphasizing continuing professional education to build design capacity and deliver enhanced low-carbon building performance. Canada must invest in engineering talent across the country. One of the primary barriers to innovation and growth is the access to a talent pool that possesses the skills needed to adapt to the future economy. While the labour market has faced severe disarray from the pandemic, it also presents an opportunity to re-skill unemployed and under-employed Canadians, with a focus on sectors with sustainable long-term growth.

In 2018, the green building sector directly employed approximately 436,000 workers across 51,000 establishments in Canada within the following key industries: construction, manufacturing, wholesale trade, professional and business services and utilities, all of which employ engineers. Together, these generated $82.6 billion in estimated energy efficiency operating revenues in 2018. In the next 10 years, targeted investment and policies in support of green buildings can lead to 626,080 direct green building jobs in Canada. Engineers are key to planning and executing the green projects that will provide these jobs. Without engineers this sector will not flourish.

However, despite this growth, research from the Environmental Careers Organization of Canada reveals that **employers are generally experiencing difficulties hiring energy managers/directors/consultants, jobs which engineers can perform well.** Currently the energy efficiency workforce is also, on average, less diverse than the national workforce. Just 18% of workers were reported to be female, and 2% indigenous, both figures below the national average. Proper

government funding towards training in this sector can lead to an increase in diversity and equity seeking groups.

Further investment in this sector, would not only help fight climate change, but would also stimulate the economy by creating more jobs for Ontarians across the entire province. This is extremely important now more than ever, due to high unemployment rates experienced due to the COVID-19 pandemic. Ensuring an adequate supply of skilled workers is crucial to supporting the sector's growth.

Government policies that help the energy efficiency sector thrive will lead to a more productive and sustainable workforce, that will help grow the economy while protecting the environment.

Therefore, OSPE:

a. **Supports the call from the Canada Green Building Council and Efficiency Canada to allocate $500 million ($1000 per employee) to access existing training programs, and a further investment of $1 billion to attract and train new people to create energy efficient and green building careers.**

b. **Suggests the Government of Canada, in partnership with the province of Ontario:**

1. **Ensures an in-depth skills gaps and needs assessment of the energy efficiency sector is conducted,** including the building sub-sector and occupations across the full ecosystem, from design and construction to building operation and management. This would identify the most effective education and training pathways and determine how to update this information regularly and expeditiously as markets and technologies evolve. Such assessment would lead to better understanding of current and future needs.

2. **Strengthen training provision** by increasing the capacity of educators and trainers, specifically with emphasis on green literacy basics, low-carbon skills and latest technologies training content.

3. **Support training uptake** by aiding new entrants and incumbent workers to build in-demand skills and rapidly up-skill for re-employment, especially work such as building retrofits for energy efficiency and indoor air quality improvements. It is recommended that design and engineering professionals, and skilled trades workers, who have been impacted by COVID-19 pandemic job losses, are given the opportunity for immediate skills training in areas already identified by employers and unions in order to meet urgent demand for low-carbon building skills and associated occupations. Some of these include energy modelling, low-carbon materials, mechanical/electrical and building automation systems, geothermal heat pumps, photovoltaic systems, plumbing and pipefitting, etc.

4. **Create incentives to support a strong culture of lifelong learning across Ontario and Canada**, where employers and employees are provided with the tools and resources to up-skill and retrain local talent. This year, OSPE is launching the Ontario Engineering Academy (OEA) to up-skill/re-skill engineering graduates exclusively to meet industry needs in Ontario. Your support of this initiative by mandating companies be responsible for the up-skilling of local employees is critical for engineering graduates

to adequately support Ontario's economic recovery. There is an opportunity for the government to incentivize engineering companies to invest in the professional development of their employees, to ensure that they are equipped with the knowledge and know-how to design and execute based on new realities.

2. Support engineering students and recent engineering graduates.

COVID-19 has negatively impacted engineering students and new engineering graduates in numerous ways. Specifically, students and engineering graduates are having difficulty accessing co-op/work integrated learning (WIL) opportunities. Co-op placements provide practical training experience that is needed as part of the work experience requirement for licensing and to obtain the necessary applied skills to succeed in the workplace.

Moreover, the decrease in access to co-op placements/WIL opportunities has a significant impact on engineering students, who use these as a source to finance their studies. As outlined in OSPE's 2019 report *Engineering Students and Graduates: Perspectives on Tuition, Job Prospects, and Co-op/internships*, tuition for engineering students in Ontario is higher than the national average and considerably higher than some other undergraduate degree programs. While survey results indicated that this did not dissuade students from pursuing an engineering degree, most respondents expressed significant concern regarding their ability to pay off student loans or debt, needed to finance these higher tuition fees and educational expenses.

OSPE recognizes that the federal government has taken significant steps to support students and recent graduates during this crisis. Specifically, through changes to the Canada Student Loans program, the Canada Emergency Student Benefit (CESB), and the Canada Student Service Grant (CSSG), as well as supports to help postdoctoral and international students.

However, the current structure of the student loans program coupled with escalating tuition costs have placed engineering students in a precarious situation. As a result, engineering students often seek loans from banks and credit unions to pay higher tuition fees and are further disadvantaged because (i) commercial bank/credit union student loans typically carry higher interest rates than federal/provincial student loans and (ii) interest paid on student loans provided by banks and credit unions are not eligible for tax deduction purposes.

Government support programs for students and new graduates must recognize that:

- Engineering programs are far more expensive than arts programs so current financial support programs, are effectively less supportive for engineering students than arts students/other programs.
- Engineering sources of income are being significantly impacted during the COVID-19 pandemic.
- Historical pre-COVID-19 earnings tests from parents are effectively irrelevant to determining whether a student can pay forthcoming engineering tuitions.
- Parental earnings may not be available to support students going forward.
- The value of traditional tax incentives available to students and parents (RESP, Textbook tax credit, tuition credits etc.) have either been cancelled or significantly atrophied as a percentage of real student educational and living costs.

Without effectively addressing this we are compromising access to engineering programs and ultimately constraining the future engineering talent pool, and the industry's future ability to innovate in support of Canada's economy.

To address this, the federal government should:

a) **Create accessible and predictable funding opportunities for companies that are looking to hire interns, recent engineering graduates and students.**
b) **Evaluate and restructure the Canada Student Loans Program (CSLP) and other educational government support programs to account for the impact of COVID-19 on historical income data.**
c) **Provide additional income support to students and their parents in the form of tax credits through a system that bases financial supports on the cost of their educational program (i.e. implementing transferrable tax credits that are capped based on a percentage of tuition paid rather than a dollar cap).**
d) **Review and enhance the amount of tax incentives and supports available to students and their families to account for diverse family structures and dynamics (multiple children in college and university, child support payments, disabled children, high health care, financial support for aging parents etc.)**

3. Drive the transformation of engineering education.

To rebuild the Ontarian, as well as the Canadian economy in the years to come, the provinces will require engineering talent that possesses the skills to innovate and succeed in new market realities. Engineering is changing, and the requirements for engineers to demonstrate new competencies is needed. As such, the learning objectives and outcomes need to shift to recognize this reality. However, while engineers are highly competent and ready to perform in today's economy, engineering training and education has been constrained by an outdated accreditation system, which impacts the ability for higher educational institutions (HEIs) to adapt curriculum and train the engineers of the future.

Canada has an inputs-based (time allocated to learning) and not outcomes-based (what students have learned) accreditation system. Assessment is based on a measure of curriculum content and quality by Accreditation Units (AU). AUs are an inputs-based metric which measures in-class learning time, instead of focusing and organising programs around clearly defined outcomes that students should demonstrate when they leave school.

Engineering Deans Canada (EDC) has been requesting that the accreditation model be changed from an inputs-based to an outcomes-based model, allowing HEIs increased flexibility to be innovative, creative, and inclusive with their curriculum.

Changes to the accreditation model have focused on increasing the curriculum requirements that must be met by university programs, without improving the learning outcomes and skills acquired by students. This has placed an increased burden on students to acquire knowledge that does not reflect current engineering practices. An outdated model means that engineering students are graduating without the skills needed by employers.

To address this the federal government, in partnership with the provinces should:

a) **Convene a meeting with the provincial Ministries of Colleges and Universities and other key stakeholders, including but not limited to OSPE, Engineering Deans Canada (EDC), and Engineers Canada, to discuss this issue and ensure that all provinces are taking action to improve student outcomes.**

4. Invest in talent development, knowledge training, and supports for engineers in Ontario.

Ontario boasts a diversified economy with a strong entrepreneurial base and impressive innovation capacity. The province continues to lead the country in key sectors of the economy including manufacturing and mining. Ontario generates on average 37% of Canada's GDP and is home to almost 50% of employees in knowledge industries. While COVID-19 put significant strain on the economy, forcing millions of people out of work, there is an opportunity to rebalance demand and supply for labour, and ensure that Canada is retaining its top talent.

Prior to COVID-19, some of Ontario's industries, such as infrastructure and transportation were already facing a talent-gap in their engineering departments. Engineering jobs were being given to international firms because Ontario did not have the right talent to get the job done. This is deeply concerning to the economic recovery of the province and the country as a whole, as the success of the economy depends on the ability to match talent with job vacancies and to ensure that this talent can adapt to market demands. This concern has become magnified by immediate demands for more technologically equipped engineers due to changes caused by the current crisis.

The federal government should work with the Ontario Government, to create incentives that support a strong culture of lifelong learning across Ontario, where employers and employees are provided with the tools and resources to upskill and retrain local talent. This year, OSPE launched the Ontario Engineering Academy (OEA) to up-skill/re-skill engineering graduates exclusively to meet industry needs in Ontario. Your support of this initiative is critical for engineering graduates to adequately support Ontario's economic recovery and by extension the economic growth of the country. There is an opportunity for the government to incentivize engineering companies to invest in the professional development of their employees, to ensure that they are equipped with the knowledge and know-how to design and execute based on new realities. Investing in engineering talent allows the economy to shift towards more innovative and efficient processes and systems, which in turn creates jobs for other professionals, stimulating job creation and growth.

5. Support organizations that implement inclusive design principles and the growth of a diverse workforce to enable economic equity and recovery in Canada.

Inclusive Design:

In many ways, COVID-19 has highlighted the need for innovative solutions aided by the implementation of new technologies. Though this provides numerous recommendations regarding nuanced and innovative processes that can generate economic benefits for the nation, the federal government must emphasize and incentivize industry to ensure that the design of these new systems and processes is inclusive and benefits all Canadians.

Inclusion in design is an important component to ensuring that new products, services, and technological advancements serve the needs of all taxpayers. Engineering inclusive designs are a key component that embeds critical considerations/aspects of everyday life into solutions, and existing engineering talent in Ontario and across Canada, is beyond capable of leading industries in this initiative for the immediate, short- and long-term economic recovery of our province. Without this, monetary and discriminatory repercussions could ensue as solutions will likely fall short of objectives, serving some segments of the population well and overlooking others, ultimately negatively impacting the health and prosperity of our country.

As engineers also have an ethical mandate to safeguard the public interest, Canada should engage the engineering community as technological stewards to rebuild the engine that drives the economy.

The engineering community recommends that the Government of Canada:

a. **Require organizations to demonstrate a commitment to inclusive design to access funding. Projects must account for our diverse population, be flexible and adaptable, employ inclusive processes and tools, and have a broad beneficial impact. The requirements outlined in this funding framework should be measurable generating accountability from industry to advance a vibrant, thriving ecosystem across Canada.**

Diverse and Inclusive Workforce:

The impacts of the COVID-19 pandemic on the workforce continues to be assessed, however, it appears that groups that were historically under-represented in the workplace, have once again been most impacted by layoffs amid the pandemic. A report released by the Royal Bank of Canada shows that women's participation in the labour force is the lowest it has been in three decades, with 1.5 million Canadian women losing their jobs or choosing to quit to better support households in the first two months of the pandemic alone.

This is increasingly problematic throughout sectors of the economy, where women, racialized persons, and members of other equity seeking groups remained highly under-represented. For example, based on most recent data women accounted for only 18.1% of engineers in Canada. OSPE's report *Calling All STEM Employers: Why Workplace Cultures Must Shift to Change the Gender Landscape* demonstrated that women in STEM continued to face significant barriers to success. These barriers included being undervalued and disrespected in the workplace, lack of mentorship and sponsorship, and the existence of a gender-wage gap. These barriers were a contributing factor to the trends above and likely mirror the barriers to other under-represented groups. As a result, conditions are now exacerbated for those who remain in the labour market.

OSPE has been an avid advocate of building a diverse and inclusive engineering sector across Canada. We have seen incremental progress made across industry, academia, and government that is now being threatened by the disproportionate impact of COVID-19 on labour force participation. We can quantify the impact on women as this has historically been measured, however, the impact on other under-represented groups with diversity dimensions including race, ethnicity, ability, and sexual orientation cannot be determined, as these trends have not been widely analyzed and studied.

We urge the government to implement policies that encourage the participation of under-represented groups in the workplace by:

a. **Addressing the wage gap.**
   OSPE's census analysis revealed that the wage gap between men and women working in engineering was 12% or $11,000 annually in Ontario alone. While the *Pay Equity Act* requires employers to examine compensation practices to ensure men and women receive equal pay for

equal work, it is limiting as it only applies to federal regulated workplaces. Further, the wage gap for other under-represented groups should also be assessed and mechanisms similar to those developed for gender, should be introduced. The government must work with the provinces to create accountable and enforceable tools to truly address this issue.

b. Reducing the burden of unpaid care.
Research shows that caregivers continue to face the brunt of responsibilities in Canadian homes and has been cited as one reason for women leaving the workforce during the COVID-19 pandemic. Since women's inclusion in the workforce began during the last century, caregiving responsibilities now impacts all professionals regardless of gender – including engineering graduates and engineers – limiting career progression. Work with provinces to improve access to affordable and quality childcare and eldercare to facilitate the participation, attachment, and retention of professionals in the labour market. Specifically, as the population of senior citizens is expected to double to 4.5 million in Canada by 2041, it is important that the governments implement programs to support all caregivers, perhaps through tax credits, that facilitate household outsourcing of child and elder care.

c. Investing in robust labour market analysis.
In a data driven economy it is imperative that the provincial government continue to make investments in data collection, analysis, and evaluation. For the Science, Technology, Engineering, and Math (STEM) sectors, most data pertaining to the unique experiences of equity seeking groups in the Canadian labour market focuses on gender. This remains consistent during the current crisis. It is therefore important to expand labour market analysis to be more inclusive and to ensure that reliable data is available to inform both private and public sector responses to the barriers impacting all underrepresented groups in engineering and other STEM professions. The federal government can facilitate this through funding departments to address data gaps.

d. Encouraging diverse and inclusive workplace practices.
Organizations must demonstrate a real commitment to diversity and inclusion through their workplace practices to access public funding. A revision of current funding frameworks to include specific measurable requirements from organizations seeking to access public funding should be included to ensure accountability. We encourage the government to look at workplace policies and practices, representation, commitment to inclusive design and/or diverse supply chains when determining eligibility.

Sustainability

6. Work with the provinces and municipalities to prioritize investment in sustainable infrastructure, including pre-design and design activities.

OSPE believes that proper, smart, and prioritized investment in sustainable infrastructure will help alleviate the economic burden the entire country is facing, while decreasing unemployment rates in several critical sectors of the economy.

The government should prioritize the delivery of federal funds to infrastructure projects that are **"shovel-worthy"** and which have already undergone regulated municipal asset management plans. By immediately utilizing these plans to select projects for investment, the federal government can work with the provinces to reduce application timelines and ensure a speedy and safe recovery. These projects will provide a positive return on investment. It is also imperative that infrastructure is built while still supporting a diverse, and inclusive workforce. Sustainable infrastructure must properly involve all Canadians, including women, Indigenous Peoples and other equity seeking groups.

The federal government should also invest in predesign and design activities. As a precursor to development and construction, design plays a critical role in preparing projects for permit and construction. These activities employ thousands of individuals, including engineers. Activities like these are essential for steady recovery, since they are needed to move projects forward, and can still be carried out respecting social distancing practices.

7. Work with provincial and territorial governments towards a sustainable transition, by encouraging the use of Distributed Energy Resources (DERs) and emissions free technology.

Restoring our economy in the wake of the COVID-19 pandemic should keep in mind our existing environmental and climate change concerns. DER technologies leverage economies of scale to produce economic, environmental and reliability benefits to the local economy. They also offer consumers the potential for lower-cost, higher-service reliability, high-power quality, increased energy efficiency, energy independence, and energy security to mitigate future effects of climate change.

Widespread use of local and regional district energy systems has been a fundamental and primary contributor to low-carbon communities in countries like Denmark and Finland. Toronto's *TOCore Downtown Energy Strategy* also concludes that district energy systems are fundamental to reducing greenhouse gas emissions from buildings at a lower cost compared to individual buildings.

The federal government should encourage the adoption of locally owned energy sources and storage systems that increase local jobs and energy costs throughout the entire province. Although this will require investment in distribution system upgrades, the upgrades will allow for a more optimal use of existing assets and, if designed correctly, can result in the elimination or deferral of other system costs. Furthermore, upgrading Canada's energy infrastructure represents an ideal opportunity to address the needs of current and future generations, while creating employment opportunities for engineers and energy innovators.

The government should also support technological innovation that reduces energy use, through grants and incentive programs for innovators. These incentives should reward technologies that are able to provide energy efficient solutions that will make Ontario's and Canada's infrastructure and energy sources more resilient to intensified weather patterns.

8. Invest in Ontario's Mining Industry to ensure proper clean-up of Ontario's orphaned and abandoned sites.

Mining is one of the economic backbones of the Canadian economy and is especially important to Northern Ontario. The materials and products delivered help Canadians stay safe, meet basic needs, and sustain northern communities. This industry produces around $10 billion in revenues for Ontario and Canada per year and employs over 75,000 Ontarians. Mining is also the largest private sector employer of Indigenous Ontarians.

Ontario is responsible for one-third of Canada's total mined metal production. It is the largest producer of gold, platinum group metals and nickel, and the second largest producer of copper in the country. The province is also a major producer of salt and structural materials. Mining produces key metals for the development of high-tech products and batteries, as well as medical devices, including ventilators and diagnostic COVID-19 test kits.

Despite its tremendous benefits to the province and country, investment in this sector has lagged, causing serious concerns with existing legacy issues, that require attention immediately. To keep turning Canada's natural resource potential into jobs and sustainable wealth, it is essential to invest in activities that keep the mining cycle robust. These include but are not limited to encouraging more sustainable exploration, conducting appropriate project feasibility studies, design work, environmental and impact assessment studies, and ensuring mines are closed properly.

Unfortunately, the lack of proper closure of historical mines in Ontario has been a problem for decades. Ontario currently has over 5,000 known abandoned mines, containing over 15,000 hazards. These abandoned sites are an enormous environmental concern and pose health and safety risks to the surrounding communities.

It was only in 1991, under the *Mining Act,* that legislation established that all mining companies must prepare and submit for approval a Mine Closure Plan certified by a qualified professional engineer that the plan adheres to government's standards and is backed by a financial assurance bond. Therefore, there are thousands of abandoned sites that were closed prior to 1991 that have no current ownership. This means that the government, and ultimately the taxpayer is on the hook for cleaning up these sites. For example, Ontario has spent about $75 million to date to clean up the former Kam Kotia Mine near Timmins. As we strive towards a robust economy post-COVID-19, it should be noted that these costs will continue to increase for all governments, if these legacy issues are not dealt with appropriately and in a timely manner.

The Government of Canada should work with provincial and territorial governments to ensure that the Canadian Minerals and Metals Plan (CMMP) achieves all its goals under each of its six strategic directions.

- **a) Direct funding should support the re-imagination of the National Orphaned or Abandoned Mines Initiative (NOAMI)**
  - **i. NOAMI should develop a long-term plan that outlines key steps for the remediation of orphaned and abandoned mine sites.**
  - ii. **Federal funding to Ontario should mirror the type of funding that the government has already destined to help clean up orphaned and abandoned oil and gas wells in Alberta, Saskatchewan, and British Columbia ($1.7 billion).**

9. Invest in Ontario's Mining Infrastructure, including the Ring of Fire.

Mining is the backbone of the Canadian economy, especially due to the resources found in Ontario. The materials and products delivered help Ontarians and Canadians stay safe, meet basic needs, and sustain northern communities. This industry produces around $10 billion in revenues for Ontario per year and employs over 75,000 Ontarians. Mining is also the largest private sector employer of Indigenous Ontarians.

Ontario is the largest producer in Canada of gold, platinum group metals and nickel, and the second largest producer of copper. The province is also a major producer of salt and structural materials. Mining produces key metals for the development of high-tech products, batteries, as well as medical devices, including ventilators and diagnostic COVID-19 test kits.

The Ring of Fire region of Northern Ontario is an immense and untapped economic opportunity. Research done by the Ontario Chamber of Commerce suggests that in the first 30 years of its development, this region could generate more than $25 billion in economic activity across several different sectors in Ontario, including mining, financial services, retail trade, manufacturing, and utilities.

The development of this region will also provide enormous long-term benefits to northern communities through increased economic activity and job creation. To realize the full economic potential of the Ring of Fire, the government must prioritize key investments in core infrastructure, as well as ways to address the needs of the labour market and Indigenous communities.

The engineering community suggests that the Government of Canada:

a. **Work with the Provincial government to ensure that the Canadian Minerals and Metals Plan (CMMP) achieves all its goals under each of its six strategic directions.**
b. **Ensure resource development is sustainable, by establishing guidelines and frameworks that ensure corporations respect economic, environmental, and social needs of the communities.**
c. **Ensure Indigenous peoples are full partners in the development of the Ring of Fire, where consultations with Indigenous communities begin at the planning stage and continue throughout the mining exploration stages.**
d. **Develop a Youth Training Program, in partnership with OSPE, to teach Indigenous youth the engineering expertise and skills that will allow them to co-develop the different mining sites in ways that respect and integrate indigenous ways of knowing while serving the needs of the people of Canada.**

10. Invest in Small Modular Reactors (SMRs) to create jobs in the nuclear energy industry and provide additional sources of low carbon electricity and heat.

Nuclear energy in Canada provides 60% of Ontario's electricity supply. The nuclear industry employs thousands of highly educated and skilled people. As new large, centralized nuclear projects are not being built, there is a growing acknowledgement of the need for smarter, simpler, and cheaper nuclear energy. SMRs, defined by the International Atomic Energy Agency (IAEA) as nuclear reactors that generate under 300 megawatts of electricity, are being developed around the world for that purpose.

The Canadian government, together with several provincial governments (Ontario, Alberta, Saskatchewan, New Brunswick) has formed a Small Modular Reactor Roadmap Steering Committee. Canada has long been a leader in developing new nuclear technology and SMR technology has the

potential to provide emission free and affordable energy for a low-carbon future. SMRs require lower capital investment and so can potentially compete with other low-cost forms of electricity generation. Due to their efficient, safe, and modular design, SMRs present a real solution for remote energy needs which are currently provided by combustion of oil and gas.

SMR development in Ontario and Canada will create well-paying jobs. Design, manufacturing, servicing, and management of SMRs (along with the associated supply chain) represents a huge potential future industry that Ontario's scientific, manufacturing and engineering communities are ideally positioned to create, as well as export to other markets. The estimated total global export potential of SMRs is approximately $150 billion per year for 2030 to 2040.

There are still some challenges to address with SMRs. The World Nuclear Association has identified licensing costs and waste management concerns as issues to overcome for favourable economics of this technology. The Canadian Nuclear Safety Commission has also noted that more research is required before licensing this technology as reliable and safe.

The Government of Canada should continue developing a long-term comprehensive energy strategy in partnership with other provinces, that includes the development of SMRs.

This strategy should address:

a. **The limited supply of economically recoverable Uranium 235 needed to power SMRs.**
b. **Security and safety concerns.**
c. **Concerns regarding the disposal of long-lived used fuel and other nuclear waste.**
d. **Lack of public knowledge regarding SMRs.**
e. **The need for Indigenous engagement in advance of specific project proposals.**
f. **The unique challenges faced by northern communities due to access and remoteness.**

Research and Innovation

11. Support local manufacturing innovation and production

Manufacturing is a cornerstone of our modern economy. Accounting for approximately $174 billion of our GDP, manufacturing represents more than 10% of Canada's total GDP. As Canada's manufacturing engine, it is imperative that both provincial and federal orders of government work together to support this sector. To date, the Government of Ontario has launched a procurement tool that will remove barriers and leverage Ontario's manufacturing capacity in the fight against COVID-19.

The federal and provincial governments should refocus investment in "Made-In Canada-" solutions and products. This could be achieved by working across orders of government to identify nationally strategic products and services and establish a minimum level of domestic production of these. Items such as medical supplies, personal protective equipment (PPE), food, energy, and other essentials should be included.

The uptake of technology and digitization will improve the sectors ability to be able to switch production to respond to consumer demand more quickly, not only in times of crisis but also in response to market shifts. For economic recovery it is critical that engineering expertise be deployed to ensure the safety and optimization of innovative solutions within industrial spaces. The Federal Government should work with the Ontario Government to provide additional advanced manufacturing (AM) focused programs with

potential financial incentives for Canadian companies to enhance their competitiveness both domestically and internationally. Supporting businesses in improving current manufacturing processes and methods, developing, and implementing digital technologies and focusing on developing more sustainable and energy-efficient products, will help create resiliency in this sector and improve Canada's export potential.

12. Create a dedicated fund to support Ontario businesses in Research and Development (R&D) activities with a strong focus on local commercialization, including development and protection of Intellectual Property (IP) for Ontario and Canada's benefit.

The federal government must support the Ontario Government to create a dedicated fund that continues to spur innovation within the province. Canada should encourage research and development (R&D) that will accelerate technology transfer and commercialization of innovative products, processes, and services based on immediate demand.

As a result of COVID-19, many businesses are having to shift their operations, processes, products, and services, and the need to invest in research and development has become crucial to their ability to remain competitive. Another significant element to the economic success of these businesses and the Canadian economy are investments in IP. As outlined in Ontario's IP Report titled *Intellectual Property in Ontario's Innovation Ecosystem*, "product enhancements and services based on IP have low or even zero marginal production costs, and result in 'winner take all' economies". To address this, government must incentivize businesses to invest in developing and protecting IP.

A focus on dollars for systems/products/services most impacted by the COVID-19 crisis such as development of large-scale oxygen delivery therapies for emergency and long-term care, and more robust HVAC systems to minimize circulation of viruses, should be of primary importance. What has emerged already and during previous crises provides lessons for our near-term, but also highlights the underlying and more critical to better resource research and innovation efforts.

It is critical that the R&D and innovation dollars provided contribute to the Canadian economy long-term. Although this will benefit all businesses, it will have an amplified benefit to small and medium sized enterprises (SMEs), as they do not have the resources to invest in product and process development at the same rate. Through this fund, the government will minimize the risk of investing in local commercialization and will support the retention of key engineering talent throughout Ontario's diverse R&D ecosystem, while promoting competitiveness and innovation.

13. Invest in 5G deployment through an efficient, flexible, and sustainable approach to spectrum management and network coverage, in consultation with the engineering community.

COVID-19 has placed an unprecedented demand on communication networks. With more individuals working from home, network bandwidth and reliability have become key issues of concern for all levels of government. The demands on the network are only expected to increase as Canada progresses through its digital evolution in its effort to remain competitive.

The development and deployment of 5G-networks is expected to fuel Canadian innovation. The potential benefits will diffuse across various sectors including but not limited to manufacturing, transportation, agriculture, and healthcare. The features of 5G such as ultra-low latency, high bandwidth and improved machine-to-machine communication will enable a wide range of applications. According to the Canadian Wireless Telecommunications Association, 5G is expected to generate $40 billion of annual GDP by 2026 and create 250,000 new jobs. Disruptive technologies such as

autonomous vehicles, artificial intelligence, smart city applications, and quantum computing will be maximized when combined with 5G networks.

In addition, 5G deployment has the potential to significantly improve the digital divide between rural and urban Canadians. The Canadian Government has committed to achieving 95% broadband coverage across the country by 2026. According to a report by Accenture 5G fixed wireless access technology is one way to improve rural connectivity, addressing the challenges related to last-mile network infrastructure, at a lower cost than Fibre-to-the-Premise (FTTP) deployment.

We commend the government for investments and collaboration through initiatives such as ENCQOR 5G and CENGEN to support SMEs to collaborate with the MNEs and 5G tech providers (Thales, Ericsson, etc.) to develop innovative solutions that leverage 5G. However, to materialize those benefits there are challenges regarding spectrum availability and cost, infrastructure, and regulation that must be addressed.

Here we focus on spectrum cost and availability as this is a major governing factor affecting capacity, coverage, and network rollout in most deployments. Deploying a 5G network, like all previous wireless network evolutions, is not just enhancing the existing system, but requires building out an entire new network from the core elements right out to every cell tower and radio. Besides core elements to provide 5G, there will be requirements for greater density of cell sites with backhaul capability and advanced antennas transmitting in specific frequency bands. While the service providers will have to invest massively to build the 5G network, they will also require the bandwidth to communicate with the end-use devices (spectrum) which is in very short supply and must be managed in the most optimal manner.

The Canadian Government has auctioned off spectrum to the highest bidders generating significant revenue. However, as equipment and expertise costs for newer technology grow, while revenues get squeezed due to competition and regulation, providers globally are increasingly challenged to finance the upgrade to 5G. Government spectrum auctions should be structured with these costs in mind.

Some countries have had auctions with time sensitive targets designed to provide opportunities for new and innovative entrants and guidelines on cooperation between providers to stimulate innovation and provide the best possible service. Best practices that balance the different requirements with fact and science-based technology justification rather than pure commercial considerations must be utilized. A deep understanding of the underlying technology, such as how to slice spectrum across areas and providers, does indeed play a crucial role in how best to structure the regulatory requirement to stimulate 5G availability.

To make 5G a reality, the federal government must:

a. **Consult with the engineering community, who are the technical experts in the field. Without this expertise, 5G deployment will continue to hit various roadblocks and could impact Canada's ability to innovate and compete with other nations.**
b. **Support mobile operators in the deployment of 5G technology by generating cost effective options.**

c. **Work with provincial and municipal governments to facilitate critical infrastructure build as efficiently as possible.**

14. Support the generation, protection, and commercialization of intellectual property (IP) in small to medium enterprises (SMEs).

Small to medium-sized enterprises are integral to the economic recovery and long-term prosperity of Ontario and Canada. According to a recent report by the Ontario Chamber of Commerce titled *Small Business, Big Impact,* Canada is home to 1.2 million SMEs (426,490 are in Ontario). SMEs are responsible for employing 90% of Canada's private sector workforce.

As outlined in our short-term letter, due to COVID-19, SMEs are being forced to pivot their operations to adapt to new realities and remain competitive. These enterprises play an important role in fueling innovation through the creation and commercialization of new products, services, and processes. As a result, it has become increasingly important for these companies to invest in research and innovation. These investments are not only critical to the long-term sustainability of organizations but to the overall economic health of the province and its workforce.

A key driver of this innovation potential is the generation, protection, and commercialization of associated intellectual property (IP). As noted in Ontario's IP Report titled Intellectual Property in Ontario's Innovation Ecosystem, Ontario has fallen significantly behind other jurisdictions in its economic growth and prosperity. The report outlines the potential to recover Ontario's economic position through research and innovation with a specific focus on increasing intellectual property assets. As a significant contributor to Canada's GDP, Ontario is well positioned as a major force to drive the country towards economic prosperity through innovation potential.

We commend the federal government's commitment to help Canadian businesses to understand, protect and access intellectual property (IP) through a comprehensive IP strategy. Many engineers and engineering school graduates are either entrepreneurs involved in launching SMEs or otherwise associated with SMEs.

As such we recommend that the government address three key barriers currently preventing all types of SMEs from pursuing the generation, protection, and commercialization of IP:

- Limited access to IP professionals with practical expertise (patent agents or patent lawyers);
- Lack of transparency and uniformity in the process to engage research institutions in IP development and commercialization;
- Cumbersome administrative requirements that impact the access for funding.

Recommendations:

a. **Provide a dedicated fund for small to medium enterprises (SMEs) to access IP expertise alongside their R&D efforts. SMEs require practical IP advice at every stage of the R&D process. This includes providing a foundational understanding of the types of IP protections available for R&D, guidance on IP strategy, and how to capture and leverage IP protections to achieve business goals. The patent filing fee and legal fees associated with this are costly and a deterrent for companies to file. Current government funding programs either do not consider IP a fillable expense or do not encourage the expense as it may be a significant portion of the grant. If the government wants to increase the number of patents filed,**

especially in Ontario, it must reduce this cost.

b. **Create a resource that effectively explains the process by which industry can engage with universities and other research institutions to access IP assets for commercialization. Currently, who owns the IP depends on the funding program used to engage with the institution. This means that working with one research institution will not be the same as working with another and there is no transparency regarding who will own the IP until the company is engaged in the process. The negotiation can take time and resources that SMEs do not have the capacity to provide. This resource/tool should provide distinctions between research institutions that enable companies to make informed decisions in the selection of their research partner and navigate the negotiation process once it begins.**

c. **Reduce cumbersome red tape that impedes access to public funding to support R&D**

   i. **Public disclosure of funds available to disperse for that year and an up-to-date version available regularly. This should avoid the filling of applications to programs where funding may no longer be available or become highly competitive as funding is closed to being fully committed. Submitting a funding application requires a time investment that organizations can spend on other activities with higher ROI if funding is no longer available.**
   ii. **Companies undertake strategic relationship building, with members from funding agencies, located within regional innovation hubs. This relationship building process is onerous creating an added burden on SMEs. At times, these relationships may not be well established by the end of the funding cycle, and companies miss the opportunity to access funding for the year. The government must examine this process and determine how best to streamline these activities considering the potential economic burden these place on SMEs.**

OSPE believes that these recommendations are essential for the economic recovery of Canada. We look forward to working with you to further develop these recommendations. If you have any additional questions please contact Stuart Atkinson, OSPE Policy and Government Relations Lead at satkinson@ospe.on.ca or 416-223-9961 ext. 225.

Sincerely,

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