ONTARIO SOCIETY OF PROFESSIONAL ENGINEERS

2020 ONTARIO PRE-BUDGET SUBMISSION

Ontario Pre-Budget Submission 2020

About the Ontario Society of Professional Engineers (OSPE)

The Ontario Society of Professional Engineers (OSPE) is the voice of the engineering profession. We represent Ontario's 85,000 professional engineers and 250,000 engineering graduates.

Ontario's economy is going through a fundamental technological and economic shift. This creates demand for a highly skilled, technical workforce that engineers can fulfill. Engineers are innovative problem solvers who develop solutions by considering costs, benefits, sustainability, public safety, and the complete lifecycle and integration of projects.

Engineers will lead Ontario's industries into the future. Engineers generate wealth for the province, through the development and commercialization of new technologies, with the capability of exporting to global markets and attracting foreign direct investment.

Introduction

OSPE appreciates the opportunity to define the priorities of Ontario's engineering community in advance of the next provincial budget. We understand the reality of Ontario's finances and fiscal position and the need to keep investing in sectors that provide returns on investment and contribute broadly to the wellbeing of Ontarians. OSPE strongly believes that evidence-based policy decisions can drive Ontario's economic growth and prosperity.

Summary of OSPE's Recommendations for 2020 Ontario Budget

Engineers Make Life More Affordable

1. Implement new regulations where surplus emission free electricity is priced separately from dependable electricity.

Engineers Preserve and Protect the Environment

2. Modernize the Building Code.
3. Develop a policy on plastic use, including a ban on single use plastics.
4. Increase electric vehicle adoption.
5. Invest in hydrogen technology.
6. Tackle flooding, stormwater and watershed management challenges.
7. Ensure safe drinking water is available for all Indigenous Communities.
8. Invest in Small Modular Reactors (SMRs).
9. Encourage the use of Distributed Energy Resources (DERs).

Engineers Connect People to Places

10. Transform and Improve the transit system governance and infrastructure investment process.
11. Become a leader in Connected and Automated Vehicles (CAVs).

Engineers Make Ontario More Competitive

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13. Create a data governance framework.
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15. Foster a diverse and skilled labour force.
16. Address the skills gap in STEM.
17. Address the underrepresentation of women and other equity seeking groups within engineering.

Engineers Make Life More Affordable

Implement new regulations where surplus emission free electricity is priced separately from dependable electricity

Ontario's electricity system has been transformed into a low emission system. All low emission electricity systems can produce significant amounts of emission-free electricity in surplus to domestic needs. Ontario currently exports most of this surplus to other Canadian provinces and the United States at low wholesale market energy prices and discards the amounts it cannot export.

Unfortunately, Ontario consumers cannot access this low-cost surplus electricity, as Ontario's retail price plans do not allow surplus electricity to be made available at its low wholesale market energy price. In 2017, this led to the waste of enough emission-free electricity to power 1.1 million households.

Ontario consumers should be able to purchase this surplus electricity at the same wholesale market energy price as other jurisdictions do.

The Government of Ontario should implement electricity price reform that will allow consumers to purchase our surplus. This will reduce annual energy bills and greenhouse gas (GHG) emissions, without imposing additional costs on the electricity system.

Recommendations:

1. The Ministry of Energy, Northern Development and Mines should revise current legislation and regulations which prevent consumers from purchasing surplus emission-free electricity at its wholesale market energy price.
    a. Make surplus emission-free electricity available to all Ontario ratepayers. This is economically and climate friendly, as it allows the reduction of fossil fuels, especially heating oil and propane used for thermal energy needs and allows industrial consumers to displace natural gas in favour of the production of hydrogen gas.
    b. Export the balance of the surplus electricity that cannot be used in Ontario.
    c. Dispose of any residual surplus amounts that cannot be used within Ontario or exported.
2. The Ministry of Energy, Northern Development and Mines, in collaboration with the Ontario Energy Board (OEB) and Local Distribution Companies (LDCs), should deploy voluntary smart price plans that will allow Ontario consumers to purchase surplus emission-free electrical energy at its low wholesale market energy price.
    a. Retail price components should align with the actual fixed and variable electricity system costs.
    b. Retail prices should encourage peak power demand reduction via load shifting/levelling, conservation and energy efficiency.
    c. Retail prices should encourage use of surplus emission-free electricity for fossil fuel displacement.
    d. The design of these voluntary smart price plans should take into account the state of technological capability of the LDCs' metering and communication infrastructure.

Access full report here: *Retail Electricity Price Reform: Path to Lower Energy Bills and Economy-Wide CO2 Emission Reductions*

Engineers Preserve and Protect the Environment

Modernize the Building Code

Environment and Climate Change Canada data reveals that GHG emissions from homes and buildings rose 23% from 1990 to 2016, making them the second fastest growing source of emissions in Ontario.

One solution is retrofitting existing buildings with energy-efficient and low-carbon options. This also helps stimulate the economy, as greener buildings have been proven to lead to lower utility bills, a higher resale price, and higher occupant comfort; all three are factors in economic growth.

A Natural Resources Canada study showed that sustained, mid-level investment in energy efficiency across the country led to the creation of 60,000 new jobs in 2019.

The Building Code ensures homes built after 2017 use 50% less energy to heat and cool than houses built before 2005. We believe Ontario is capable of doing more and being a global leader in this area.

Recommendations:

1. The Ontario Government should modernize its building code in order to significantly reduce building energy use and carbon emissions. The goal should be a “net zero” model building code by 2030.
    a. Targets should be differentiated between existing buildings and new construction.
        i. Existing buildings should reduce their current energy consumption levels at least 30% by 2030.
        ii. New constructions should seek to be net zero energy by 2030.
    b. An updated building code should make energy use data measurable and available. Progress on the established targets should be evaluated by independent third-party subject matter experts and made public.

Develop a policy on plastic use, including a ban on single use plastics

According to 2019 Environment and Climate Change Canada data, an estimated 95% of the material value of plastic packaging, between $100 and $150 billion dollars annually, is lost to the global economy after only a single use.

Plastics' durability, combined with inadequate incentives and infrastructure to recover and recycle this material, is at the root of an exponentially increasing global environmental problem. This pollution harms wildlife, damages habitats and fisheries, and transfers contaminants throughout the food chain. In Ontario, an estimated 10,000 tonnes of plastic debris enters the Great Lakes each year.

In 2016, 86% of Canada's plastic waste was landfilled. This represents a lost value of up to $7.8 billion per year. It is estimated that Canada's lost opportunities related to unrecovered plastics could rise to $11.1 billion by 2030.

Recommendations:

1. Continue to work with municipal and federal governments, through the Canadian Council of Ministers of the Environment to ensure single used plastics are banned throughout Ontario.
    a. This ban should, in its first stages, include unnecessary single-use plastics regularly found in the environment, such as straws, bags, cups, bottles, cutlery, cotton balls, take-out containers, and polystyrene.
2. Develop consistent standards to monitor progress and detection of plastics.
    a. Clear reporting procedures and standards should be implemented in order to better assess progress.
    b. Data should be transparent and easily available to the public.
3. Provide industry with financial incentives with the goal of developing smarter design techniques that aim to create products that replace plastic with recyclable materials or use bio-degradable plastics.
4. Launch an awareness campaign informing Ontarians of the harmful footprint plastics have on the environment.
    a. This campaign should highlight the need to use plastic alternatives and the important role citizens can play in protecting our environment by proper sorting and use of existing recycling programs.

Increase electric vehicle adoption

The transportation sector represents 35% of Ontario's GHG emissions. Electric vehicles (EVs) reduce greenhouse gas emissions and are more energy efficient. They are cheaper and easier to maintain and operate than combustion powered vehicles.

According to the Windfall Centre, if EVs were to reach a 10% share of the total vehicle population by 2025, Ontario would experience a GDP increase of over $3.6 billion. Ontario would benefit from a growing industry that would be modern, efficient, and create new employment opportunities across the province.

For consumers, EVs cost a quarter of the price to drive than gas vehicles. This means, the average Canadian driver, who travels 20,000km per year, would save as much as $2,000 per year on fuel alone.

Despite these benefits, the Ontario Government cancelled the EV incentive program, which resulted in a 53% decrease of EV purchases in the first half of 2019. Ontario is the only province in Canada not experiencing an increase in EV sales.

Some of the uptake barriers encountered with EVs, such as a shorter range, longer recharge times, and a higher upfront cost, can be reduced by smart government action.

A government EV sales mandate, such as in California, is legislation that requires automakers to sell a number of EVs per year, as percentage of sales. In Quebec, this resulted in a 131% percent increase in one year.

By increasing the uptake of EVs in Ontario and encourage recharging during evenings, the EVs will in effect store Ontario's Surplus Energy Supply, which will significantly reduce the amount of surplus energy that is sold for a loss to external jurisdictions and/or curtailed, which is currently costing Ontario Energy ratepayers approximately $500,000 per year.

Recommendations:

1. Develop and implement an incentive program for electric and hydrogen powered vehicles.
    a. The retail price cut-off for eligible vehicles should ensure the program applies to the general public
    b. No subsidies should be given to cars over $75,000
2. Enact an EV sales mandate like the ones established in Quebec and California, requiring automakers to sell a minimum percentage of electric vehicles.
3. Permit free or discounted access for EVs to the 407 ETR.
4. Establish a robust network of electric vehicle charging stations.
5. Amend the Building Code to ensure that a minimum percentage of parking spaces in condo and apartment buildings enable EV charging.

Invest in hydrogen technology

Hydrogen technology displaces high GHG emitting fossil fuels like diesel fuel. The adoption of hydrogen technology can effectively reduce GHG emissions and generate economic growth.

Clean hydrogen is produced by the application of an electrolyzer process which splits water into its elemental hydrogen and oxygen gases. Ontario currently has surplus power which can be used with the equally plentiful supply of fresh water to generate large quantities of hydrogen gas. This also creates pure oxygen, which is an economically useful byproduct. Hydrogen can be stored indefinitely as a gas. The stored hydrogen can be used at the production site immediately, stored indefinitely for future use, or can be transported by a variety of means. Shipped hydrogen can then be efficiently used as a fuel for static hydrogen generators or by an ever-increasing array of hydrogen powered vehicles.

Transportation equipment manufacturing is one of the cornerstones of the economy. There are significant opportunities for Ontario designed and built hydrogen technologies to be incorporated into all types of vehicles manufactured or assembled, including mining equipment, trucks, buses, cars and railcars.

Recommendations:

1. Prioritize the creation of an industry forum that will bring engineers and business leaders together in order to develop a comprehensive strategy that will encourage the safe adoption and use of hydrogen.
2. Support the development of a hydrogen based industrial economy with near-term opportunities including mass transit vehicles, commuter trains and personal use vehicles.

Tackle flooding, stormwater and watershed management challenges

In the Spring of 2019 heavy rains, coupled with melting snow, led to emergency declarations being made by 23 municipalities and one First Nation.

Flooding is a natural event that will likely occur with higher frequency and lead to increased devastation due to climate change.

Flooding destroys homes, public infrastructure, farmer's crops and livelihoods. This impacts key industries and costs taxpayers money.

The Insurance Bureau of Canada reported that between 2009 and 2017, property and casualty insurance losses averaged $1.8 billion per year. This amount is more than four times the reported average losses between 1983 and 2008.

Recommendations:

1. Develop a provincial flooding strategy that focuses on all five components of emergency management: prevention, mitigation, preparedness, response and recovery.
2. Update the province's flood pain and flood risk mapping.
3. Create a provincial response mechanism, with the aid of local and municipal authorities, that has clear steps and standards addressing risk communication.
4. Implement policies, programs and financial mechanisms that promote adopting green infrastructure where possible.
5. Appoint a Professional Engineer on the Minister of Environment, Conservation and Park's Advisory Panel on Climate Change.
    a. A comprehensive assessment of the financial, environmental and social costs and benefits of both grey and green infrastructure is required to properly conduct a full cost-benefit analysis of both options.
    b. Green infrastructure and Low Impact Design (LID) considerations should be integrated into lifecycle asset planning and management.
    c. A project by project analysis is important to determine what type of infrastructure is required.

Ensure safe drinking water for all Indigenous Communities

Access to clean drinking water is a basic right. Despite this, there are more than 100 drinking water advisories in Indigenous communities across Canada. In October 2019, there were 43 long-term drinking water advisories impacting 23 First Nations communities in Ontario, giving Ontario the highest number of long-term drinking advisories in the country. In general, according to the United Nations Department of Economic and Social Affairs, homes in First Nations communities were 90 times more likely to be without running water than others in Canada.

Independent studies and consultation processes with Indigenous Peoples have revealed some of the root causes of the slow progress towards lifting drinking water advisories:

a. A complicated governance structure with shared jurisdiction between different orders of government.
b. A highly complex and cumbersome capital and operational expenditures funding process.
c. Insufficient infrastructure funding and resources for operation and maintenance.
d. Limited consultation and involvement of Indigenous Peoples regarding water legislation and regulation.
e. Lack of technical capacity and knowledge in small and remote communities.

While the provision of drinking water on reserves is a shared responsibility between the federal government, and the respective First Nations community, the province of Ontario has also made the access to safe, sustainable drinking water in First Nation communities a priority.

Recommendations:

1. The Government of Ontario should continue collaborating with the federal government and Indigenous communities through the Trilateral Steering Committee to:
    a. Ensure funding formulas provide sufficient funds for capital upgrades, operation and maintenance of water facilities.
    b. Ensure that water issues are addressed in conjunction with other wider issues such as housing and infrastructure.
    c. Establish a proper regulatory and accountability framework requiring the government to report on the progress of lifting drinking water advisories.
2. The Government of Ontario should also:
    a. Continue funding the Indigenous Drinking Water Projects Office, which helps ensure long-term drinking water sustainability.
    b. Continue funding and supporting the Walkerton Clean Water Centre, to ensure the availability of high-quality training programs that support operators, managers and community leaders.

Invest in Small Modular Reactors (SMRs)

Nuclear energy in Canada is a strategic asset that provides 60% of Ontario's electricity supply. Markets in Canada and around the world are signaling an increased 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, could fulfill this demand.

The Canadian Small Modular Reactor Roadmap Steering Committee's research outlines that SMR technology has the potential to provide emission free and affordable energy opportunities for a low-carbon future. SMRs require lower capital investment and so, can compete with other low-cost forms of electricity generation.

Ontario has already taken a leading role by investing $26 billion to refurbish the province's nuclear reactors. As a result, Ontario will unlock regional growth opportunities and become a world leader in this developing technology. Additionally, SMR's have the potential to create well-paying jobs. 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 in this developing industry. The World Nuclear Association has identified licensing costs and waste management concerns as potential barriers to adoption. The Canadian Nuclear Safety Commission has also noted that more research still must be conducted in order to show that this technology is reliable and safe.

Recommendations:

1. Develop a long-term comprehensive energy strategy in partnership with other provinces and the federal government, that includes the development of SMRs. This strategy should address:
    a. The limited supply of economically recoverable Uranium 235, the fissile isotope needed to power SMRs.
    b. Security concerns which include the fear of nuclear accidents.
    c. Concerns regarding the burying of long-life used fuel isotopes, such as transuranic isotopes.
    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.

Encourage the use of Distributed Energy Resources (DERs)

DERs are electricity producing resources or controllable loads that are connected to a local distribution system or a host facility within the local distribution system.

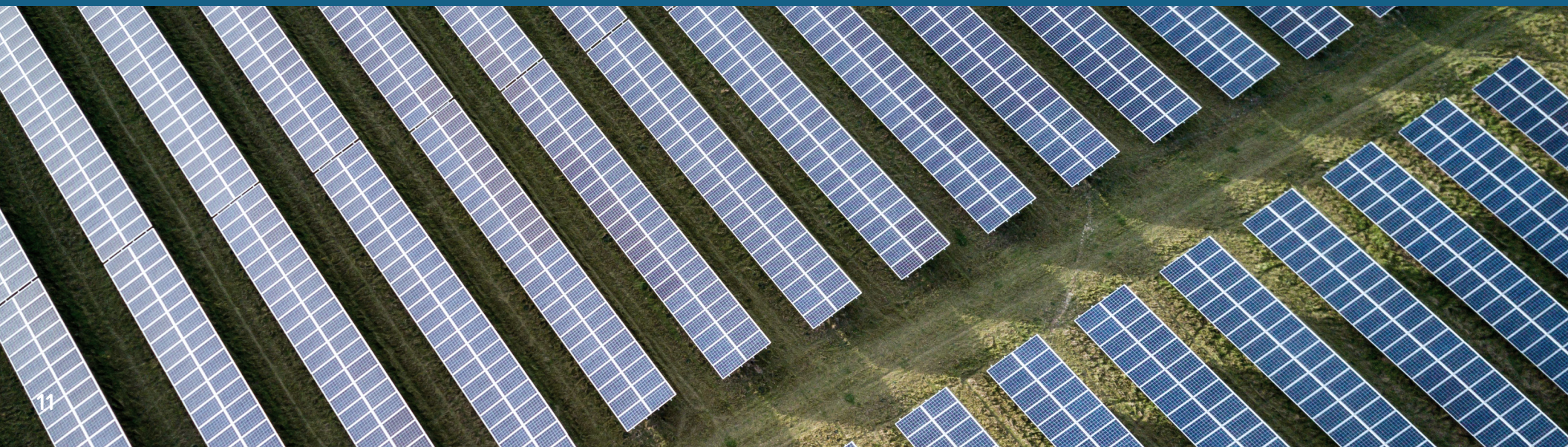
DERs can include solar panels, combined heat and power plants, electricity storage, small natural gas-fueled generators, and electric vehicles.

Innovation in new DER technologies that compliments existing investments in our energy systems, while providing a path for comprehensive renewal of our energy infrastructure can increase cost savings and reduce GHG emissions.

Recommendations:

The Government of Ontario, in coordination with the Ontario Energy Board should:

1. Create pricing mechanisms that encourage the adoption of locally owned energy generation and storage systems with a focus on community or cooperative energy developments.
2. Align rates to the actual cost of electricity service and value to the grid, while concurrently preserving a competitive market-based supply pricing mechanism.
3. Remove inefficiencies in the application processes needed to connect DERs. The analysis of such inefficiencies should be undertaken by a Professional Engineer experienced in DER integration studies.
4. Industry participants should be able to compete without any participants being seen to have preferential access.



Engineers Connect People to Places

Transform and Improve the transit system governance and infrastructure investment process

Governments invest in public infrastructure with the goal of driving economic growth and prosperity. In Ontario, we have not seen projects deliver enough benefits to the taxpayer.

OSPE believes that infrastructure projects should be selected based on tangible benefits to taxpayers.

The Greater Toronto Hamilton Area (GTHA) is home to half of the province's economic activity. To develop this economic engine, Ontario requires a regional transit agency with the ability to properly integrate the millions of people that live in this area.

This is essential to making the region competitive at the world stage. Transit projects face enormous challenges due to the confusing and shared responsibility of planning and funding among municipal, provincial and federal governments.

A region with more than 6.5 million people, which transcends different municipal and regional governments, requires a system of transit with a governance structure able to deliver regional projects appropriately, consistently, transparently and predictably.

Recommendations:

1. Reform the process for prioritizing investments in major transit infrastructure by:
    a. Emphasizing evidence-based technical analyses and business cases, developed without political intervention, as the primary basis for making investment decision-making.
    b. Requiring technical studies and business cases prepared by project proponents to be peer-reviewed by a panel of independent experts. The reports must be made public and include assessments of quality, comprehensiveness, and reason ableness of the conclusions reached.
    c. Providing transparent online reports, available to the public, including the technical studies and business case documentation relied upon. This should be accompanied by plain language summaries and a detailed description of the rationale behind the decision to commit funding.
    d. Making amendments or alterations to transit plans initiated by the Minister of Transportation as permitted by current Bill 57, completely public.
2. Ensure transit planning is integrated with land use planning and regional economic strategies.
3. Improve region wide integration of transit modes, systems, services, and fares through an empowered regional governance body/structure.
4. Adequately support transit system operation and maintenance of existing and future transit infrastructure assets through stable, predictable, long-term funding.

Become a leader in Connected and Automated Vehicles (CAVs)

With an educated workforce, robust automotive and manufacturing industry, and a leading technological and research ecosystem, Ontario is well positioned to be a global leader in the development, testing and deployment of CAVs.

In January 2016, Ontario put forward a pilot project allowing the testing of Automated Vehicles (AVs) on public roads under certain conditions. This 10-year pilot project is restricted to testing purposes only.

CAVs address transportation challenges, while leading to the cleaner, safer, and efficient use of roads. CAVs help human drivers make better decisions on the road, provide drivers with early hazard warnings, and increase accessibility to transportation services, while reducing fuel consumption and greenhouse gas emissions. As technological changes transform the way cities function, Ontario must stay economically competitive by ensuring the conditions for success are in place.

A report by KPMG showed that Canada has fallen back in the Automated Vehicles (AV) readiness index; from the 7th place in 2018 to 12th place in 2019. The AV readiness index is based on four pillars:

- policy & legislation
- technology & innovation
- infrastructure
- consumer acceptance

Ontario must achieve greater policy and institutional guidance through clear and concrete legislation. It is imperative that the government create policy and a regulatory framework that promotes economic growth, new jobs and innovation, and protects public safety.

Recommendations:

1. The government of Ontario should establish a provincial policy, governance strategy and framework for the development and adoption of AV technology.
    a. This strategy should set clear objectives, goals, timeframes and performance targets to measure tangible success.
    b. Rules and regulations need to be developed to update traffic manuals and define cyber security protocols, data privacy and ownership.
    c. This framework should seek to reduce traffic congestion, increase safety levels, reduce GHG and sustain economic vitality.
    d. The role and scope of government should be clearly defined and communicated.
2. Continue strengthening and providing long-term sustainable funding for the Autonomous Vehicle Innovation Network (AVIN).
3. Allocate investment in order to upgrade the current infrastructure for the deployment of automated and connected vehicles.
4. Ensure the work force is well-equipped to be part of these new labour market opportunities through new training and re-training grants and opportunities.
5. Raise public awareness of the benefits of automated and connected vehicles.

Engineers Make Ontario more competitive

Develop the Ring of Fire

The Ring of Fire region of Northern Ontario, with its deposits of chromite, nickel, copper and platinum, 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, the Ring of Fire 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 Indigenous 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.

Recommendations:

1. Develop a long-term infrastructure plan for Northern Ontario, based on direct input and consultations from northern and Indigenous communities and the mining sector.
2. Ensure resource development is sustainable.
    a. Government should establish guidelines and frameworks that ensure corporations respect economic, environmental and social needs of the communities.
3. Ensure Indigenous peoples are full partners in the development of the Ring of Fire.
    a. Consultations with Indigenous communities should begin at the planning stage and continue throughout the mining exploration stages.
4. 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.
5. Work with engineering programs based in Northern Ontario (Lakehead and Laurentian) to promote work opportunities to engineering students to secure a trained labour force.

Create a data governance framework

Advances in technology have paved the way for a data economy where intangible assets drive unprecedented growth, innovation, and prosperity. To effectively leverage the power of data for both public and private sector efficiencies, it is imperative to address transparency and privacy. It is also important that the government make investments in training to secure a workforce that is ready for a data economy.

The public has expressed concerns regarding the use of data, specifically the risk of data breaches for personal, privileged or high value data, as well as the misuse of public/open data. This public is concerned about misuse from corporations, political parties and foreign states, who may use private data to gain an unfair economic or political advantage or exploit Ontarians in an unethical manner.

There are concerns about the lack of commitment and continuity in reporting data consistently and over a long period of time. Guidelines should be adopted that require an agreement to publish data information in a standard format. This must be tied to a commitment to share the information over five years. By committing to a standard format and term, this will establish continuity and transparency in reporting.

This has the added benefit of supporting business and government, as longitudinal data makes it possible to establish trends and extract insights that observers will be capable of drawing conclusions from.

Recommendations:

1. Commit to providing data at regular intervals, with consistent quality and over a period of time that allows for trends to be established.
    a. Allow citizens to access government services through a single channel (particularly for authentication).
    b. Adhere to the European Union (EU) “Once Only Principle” of data collection so that data is collected only once. Allow citizens to update/manage their data and determine which Ministry (or, in future, external validated partners) can access it through one central point or one single channel.
    c. Allow communication and sharing of data between Ministries through the creation of an independent government entity under the Chief Digital Officer that manages a distributed, secure and standard based data repository for all Ministries.
    d. Standardize datasets as much as possible (e.g. if looking at labour data, use the same formatting across years and different government departments). Giving power to the Chief Digital Officer to define and enforce data standards, as well as the power to audit ministries (and, in future, trusted external partners) for adherence to data security, standards and ethical use of the data.
    e. Include context and data collection methodology with each dataset (e.g. if looking at financial data, accrual vs cash basis accounting).
    f. Partner with agencies such as Ontario Centres of Excellence (OCE), MaRS, or Communitech, to provide data concierge services, where companies can approach these agencies to obtain help with finding the right data.

Invest in growing the Advanced Manufacturing (AM) sector

Manufacturing is a key driver of the Ontario economy. With enormous growth and export potential, the manufacturing sector is transforming through the incorporation of advanced robotics, automation, and additive manufacturing. It is imperative that the government focus on highly qualified personnel training and advanced technology adoption to ensure the ongoing success of this industry.

Growth in the advance manufacturing sector will lead to 3.5 million positions filled between 2015 and 2025. Yet 2 million positions will go unfilled because of the lack of AM trained employees in the job market. Further complicating the position, these employees will need to be trained in the exact machines used, while being proficient in design for additive manufacturing (DfAM) technologies.
As conventional subtractive manufacturing skills and AM skills are not necessarily interchangeable, the market will have a huge reliance on these highly skilled employees.

Data suggests that more than half of all manufacturers do not allocate funds for employee development, and one-third agree their company provides only minimal job-related training opportunities. Until manufacturers can attract and retain both engineering and production talent they'll fail to achieve projected returns or establish the competitive advantage envisioned.

Both the federal and provincial governments have tax programs in place to encourage the adoption of AM technologies for Ontario businesses, and the establishment of the AM supercluster is accelerating the development of AM technologies. As this technological shift approaches, manufacturers utilizing AM technologies will need a fully trained work force to reap the benefits.

Recommendations:

1. The Government of Ontario should work with all levels of government to provide additional AM-focused programs with potential tax rebates and upfront grants for Ontario companies to enhance their competitiveness both domestically and internationally.
2. Establish and fund a program for manufacturers to hire/contract engineers for a period of six to twelve months to redesign their systems. This program would allow small and medium-sized enterprises to bridge some of the expenses and technical needs to optimize their systems to run more efficiently, while increasing production, streamlining processes, and developing new products.
3. Work with universities and the regulator to ensure that curriculum is adapted to produce engineering talent with AM specific skills.
4. The Government of Ontario should work with Ontario's post-secondary institutions to fund and support disruptive AM start-ups led by students and recent graduates with subject matter expertise.

Foster a diverse and skilled labour force

The profound social, economic, and technological shift the Ontario economy is experiencing creates new demands and expectations from the labour force. Ontario's engineers are uniquely positioned across several industries – from mobile internet, automation, cloud technology, advanced manufacturing, energy storage, advanced oil and gas exploration, mineral extraction, and renewable energy, amongst others – to make significant contributions to the future wealth and health of the province.

The Ontario government must demonstrate leadership by ensuring that the future workforce is equipped with the skills required by the changing labor market. It is equally important that the labour force is reflective of the Ontario population and possesses the intercultural competence to participate in a globalized economy. This requires bridging the current skills gap, ensuring that graduates are work ready, and addressing inequities that negatively impact underrepresented groups.

Address the skills gap

According to OSPE's analysis of the 2016 Census, amongst all Ontarians between 25 and 64 years old with engineering degrees, only 32% of men and 22% of women work in engineering, and 31% of men and 38% of women work in jobs classified as 'underemployment' (jobs not necessarily requiring a degree). Reflecting this, OSPE's industry partners continuously present concerns with the lack of job ready skills engineering graduates possess. There are also clear concerns with the ability of graduates to adapt to new and disruptive technologies.

To understand the experiences of post-secondary students and their transition to the labour market, OSPE undertook a joint research project with the Engineering Student Societies Council of Ontario (ESSCO). The study revealed that 95% of students surveyed expect to find a job in engineering, with the same proportion of engineering graduates indicating they expect to find a job in engineering after graduating. Further, an overwhelming majority of respondents, 92% of students and 81% of graduates, believe that co-ops/internships are highly valuable.

Two key conclusions can be drawn from the data presented. The first is that there is a stark contrast between the expectations of engineering students and graduates and the realities of the labour market. The second is that it is imperative necessary to support engineering talent by aiding their transition into the workforce so that they can create wealth and jobs in communities across the province.

Recommendations:

1. Allow more flexibility for university engineering programs to adapt curriculum to the current needs of the labour market. This will require a change to the accreditation model. The Ontario government should work to ensure that representatives from the provincial regulator are directly connected to and understand the demands of the engineering industry.
2. Government must ensure that post-secondary engineering programs are adapting to the new knowledge economy by providing work-integrated learning (WIL) opportunities to enhance graduates' skills as they enter the workforce.
    a. Conduct an in-depth analysis of various incentive mechanisms to determine the most effective and efficient methods for increasing the number of employers willing to engage in WIL opportunities. The analysis should review the effectiveness of current programs such as the Co-operative Education Tax Credit.
3. Create accessible and predictable funding opportunities for companies that are looking to hire interns, recent engineering graduates and students, and highlight successful Ontario WIL programs that are helping develop and retain engineering talent in this province as best-in-class examples.
    a. Facilitate greater university-industry partnerships to ensure that post-secondary institutions are informed of industry trends and are equipping students with the skills to succeed in the labour market.

Address the barriers facing women and other equity seeking groups within engineering

As noted above, a skilled labour force is imperative for economic growth and prosperity. OSPE's analysis of 2016 census data shows that only 14% of engineers in Ontario are women. This analysis also reveals that a higher proportion of engineering graduates working in professional occupations, not defined as engineering work, are women. Research conducted through the Let's Break Barriers project demonstrates that women in STEM continue to face significant barriers to success. This is also the experience of other equity seeking groups, particularly Indigenous peoples and internationally trained engineers. The implications of losing this talent to other sectors of the economy, in a time of high demand for technical skills, is detrimental for Ontario's competitiveness and productivity.

Recommendations:

1. Address the gender wage gap.

OSPE's 2016 census analysis revealed that the wage gap between men and women working in engineering was 12% or $11,000 annually.

a. Ontario has robust legislation intended to tackle the wage gap through the *Pay Equity Act*, however, there is an insufficient accountability mechanism built into this legislative tool. The government must create accountable and enforceable tools to truly address this issue.

2. Reduce the burden of unpaid care.

Research shows that women continue to face the brunt of caregiving responsibilities in Canadian homes.
This impacts professionals – including engineering graduates and engineers – limiting career progression.

a. Invest in access to affordable and quality childcare. This is an important factor in determining the participation, attachment, and retention of women to the labour market.
b. With the population of senior citizens expected to double to 4.5 million in Canada by 2041, it is important that the government support caregivers through tax credits and programs that facilitate the outsourcing of care.

3. Invest in robust labour market analysis.

a. In a data driven economy it is imperative that the provincial government continue to make investments in data collection, analysis, and evaluation.
b. 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. It is important to expand this to ensure reliable data that can be used to inform both private and public sector responses to the barriers impacting underrepresented groups in engineering and other STEM professions.

4. Address the underrepresentation of Indigenous peoples in the engineering profession.

According to Engineers Canada, only 1.2% of undergraduate engineering students in Canada are Indigenous. Government must work with Indigenous communities, industry and academia to address this underrepresentation.

a. This should include a thoughtful process by which the government works with industry and Indigenous communities to understand the barriers facing Indigenous peoples looking to pursue engineering.
b. Encourage and provide support to Colleges and Universities to decolonize their programs and integrate Indigenous perspectives into the engineering curriculum.

5. Facilitate the integration of International Engineering Graduates (IEGs) into the labour market.

Since 2008, OSPE has received government funding to run bridging programs that address barriers for International Engineering Graduates (IEGs). These programs provide a guiding light to new Canadians looking to enter the profession.

According to OSPE's analysis of 2016 Canada Census data, IEG's are not faring well in Ontario's labour market. Both women and men with engineering degrees outside of Canada are highly underemployed at 50% and 47% respectively.

In 2016, OSPE received funding for an additional bridging program focused on equipping IEGs with the skills to succeed within Ontario's Environment Sector. Since 2018, 58% of those who participated and completed this course are now employed in engineering or a related field.

a. Renew funding for bridging programs designed specifically to support international engineering graduates who are preparing to write PEO's Professional Practice Exam and those who require additional skills to succeed within Ontario's labour market.

Assess all new and existing policies using an intersectional lens

Intersectionality refers to the oppression experienced at the crossroad of multiple forms of discrimination (i.e. the overlapping discrimination experienced by women of colour, or people with disabilities living in poverty, etc.). The government should not put diverse peoples into silos that negate the unique nature of their experiences. Applying this intersectional lens when determining policy changes and applications will help to ensure those most vulnerable are not left behind.

a. Develop an analytical tool to assess how members of equity seeking groups will be impacted and will respond to new policies. The government can model this against the Federal Government's Gender Based Analysis Plus (GBA+) tool which enables the government to ensure that the barriers and needs of equity seeking groups are both addressed and considered when implementing new programs, initiatives, and policies.

OSPE believes that these recommendations are essential for the continued economic prosperity of our province. We look forward to working with the government to further develop these recommendations.

Sincerely,

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2020 ONTARIO PRE-BUDGET SUBMISSION