ONTARIO SOCIETY OF PROFESSIONAL ENGINEERS

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Submission to the Standing Committee on Finance and Economic Affairs

2017 PRE-BUDGET SUBMISSION

January 20, 2017

Honourable Charles Sousa
Minister of Finance
c/o Budget Secretariat
Frost Building North, 3rd Floor
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ONTARIO SOCIETY OF PROFESSIONAL ENGINEERS

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Dear Minister Sousa:

As the voice of 80,000 Professional Engineers and over 250,000 Engineering Graduates in the province of Ontario, the Ontario Society of Professional Engineers (OSPE) is pleased to make the following recommendations to the Minister of Finance and the Standing Committee on Finance and Economic Affairs with respect to the 2017 Ontario Budget:

1. Adopt the recommendations forwarded in OSPE's submission to Ontario's 2017 Long-Term Energy Plan to reduce energy prices for commercial and residential consumers by $5.5 - $6.3 billion per year;

2. Address the engineering skills gap by engaging with industry and universities to conduct needs analyses with the purpose of designing cooperative education, internship, and work integrated learning programs; and

3. Prioritize and commence the construction of key infrastructure projects, encourage the provincial and municipal adoption of Qualifications Based Selection (QBS), and enhance the engineering oversight of infrastructure projects.

These recommendations are essential for the continued economic prosperity of our province. We trust that you will give them full consideration for inclusion in the 2017 Ontario Budget.

Yours sincerely,

Sandro Perruzza
Chief Executive Officer
Ontario Society of Professional Engineers

Michael Monette, P.Eng., MBA
President and Chair
Ontario Society of Professional Engineers

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ABOUT THE ONTARIO SOCIETY OF PROFESSIONAL ENGINEERS

The Ontario Society of Professional Engineers (OSPE) is the voice of the engineering profession in Ontario. We represent 80,000 Professional Engineers and over 250,000 Engineering Graduates who contribute to the most strategic sectors of Ontario's economy.

OSPE elevates the profile of the profession by advocating with governments, offering career building services, and providing opportunities for ongoing learning, networking, and community building.

Engineers are key stakeholders in the budgetary process because they are trained, innovative problem solvers who develop solutions by considering costs and benefits, sustainability, public safety, and the complete lifecycle and integration of projects. Engineers are also on the frontlines of developing, safeguarding, and maximizing Ontario's investments.

OSPE was formed in 2000 after members of Professional Engineers Ontario (PEO) voted to separate regulatory and advocacy functions into two distinct organizations. PEO continues to conduct regulatory activities and OSPE focuses on advocating for issues that impact engineering.

ACKNOWLEDGEMENTS

OSPE would like to thank its members for contributing to the development of the recommendations in this submission, which will assist government in creating thoughtful, evidence-based policies as part of the 2017 budgetary process—for the benefit of all Ontarians.

Adopt the recommendations forwarded in OSPE's submission to Ontario's 2017 Long-Term Energy Plan to reduce energy prices for commercial and residential consumers by $5.5 - $6.3 billion per year

For Ontario to achieve a brighter energy future, the importance of proper planning cannot be overstated. The management of our energy sector is arguably one of the most complex and integral responsibilities of the provincial government. In order to plan this sector effectively, the insight of engineers is of paramount importance.

In 2015 the cost of operating Ontario's power system was about $20.5 billion and consumers paid an additional $1.3 billion in HST (after including a business input tax credit estimated at $1.3 billion per year). Policy changes can reduce the price of energy in Ontario to levels that are similar to competing jurisdictions in the NAFTA trading zone.

In December 2016, OSPE delivered fully costed recommendations to the Ministry of Energy that equate to total savings between $5.5 and $6.3 billion per year, representing a more than 25% reduction in costs to ratepayers per year. See Appendix A for further details and itemized costing.

At a high-level, these recommendations are guided by the belief that the government should return to its prior role of establishing high-level goals for Ontario's energy systems and leave the detailed planning and design to the agencies and organizations that have the required engineering expertise to develop those systems in a cost-effective manner. Determining the supply mix and where that supply should be located are an integral part of the detailed planning and design process, which should be controlled by engineering professionals.

Engineers have the technical knowledge that is required to develop an optimal power system plan and an integrated energy system plan for the economy as a whole. It is imperative that the Government of Ontario grant its professional engineers more independence in planning and designing the provincial energy systems in accordance with the outcomes-based objectives determined by government through public consultation.

Looking to the future, Ontario must achieve balance between its environmental commitments and its economic welfare. Reducing carbon emissions in non-electrical sectors of the economy will be more difficult to achieve and potentially far more costly than Ontario's experience with the electrical sector if it is not done in an optimal way. Close attention must be paid to the engineering that is required to efficiently achieve these complex transitions.

It is with attention to these objectives that OSPE forwards the following recommendations.

To put downward pressure on the cost of energy for ratepayers, the Government of Ontario should:

1. Reduce operating costs or increase revenue from the sale of surplus electricity;
2. Move existing costs not directly associated with producing electricity into tax-supported accounts;
3. Transfer market risks from electricity consumers to investors; and
4. Remove government sales and water use taxes on electricity.

Address the engineering skills gap by engaging with industry and universities to conduct needs analyses with the purpose of designing cooperative education, internship, and work integrated learning programs

In a knowledge economy, skills, creativity, innovation, and technology are key to growth and prosperity. Engineering graduates therefore represent an important segment of Ontario's skilled workforce.

Unfortunately, while the number of undergraduates enrolled in an accredited engineering program in Ontario has increased,[1] this has not necessarily translated into employment in engineering. Based on data from the 2011 National Household Survey, OSPE's 2015 report entitled *Crisis in Ontario's Engineering Labour Market* found that 33% of engineering-degree holders worked in jobs that did *not* require a university degree.[2] OSPE calls this "underemployment" because individuals are working in jobs that do not fully utilize their knowledge and skills and, hence, represent an unrealized economic benefit for the individual and the province of Ontario.

The report also found that only 31% of individuals with a bachelor's degree or higher in engineering actually worked as engineers or engineering managers. Meanwhile, we continue to hear of an engineering skills shortage and a lack of qualified engineers. When compared with fifteen other regulated professions, engineering had the lowest employment match rate.[3] Left unaddressed, this situation will continue to negatively impact and limit Ontario's economy[4] and the future growth of a broad range of industries that employ engineering graduates.

In 2013, the Conference Board of Canada estimated that Ontario's skills gap cost $24.3 billion in forgone GDP and $3.7 billion in provincial tax revenues each year.[5] Since then the gap has continued to grow, presenting a clear threat to future economic growth in Ontario.

Engineering graduates represent a key segment of Ontario's skills gap—meaning that unlocking the potential of these graduates will lead to economic development and employment across other disciplines.

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[1] Engineers Canada, *Canadian Engineers for Tomorrow: Trends in Engineering Enrolment and Degrees Awarded 2010-2014* (Engineers Canada, 2014), 23.

[2] Ontario Society of Professional Engineers (OSPE), *Crisis in Ontario's Engineering Labour Market: Underemployment Among Ontario's Engineering-Degree Holders* (Prism Economics and Analysis, 2015), 11.

[3] Ibid, 8.

[4] The Conference Board of Canada estimated that engineering and applied science technicians and technologists contributed $54.7 billion to Canada's economy in 2011 or 3.3% of Canadian GDP.

[5] The Conference Board of Canada, "A Looming Skills Gap Threatens Ontario's Future", 2013.

Ontario must address the engineering skills gap by making it easier for employers to provide work integrated learning (WIL) opportunities for engineering students and recent graduates in cooperation with post-secondary institutions and employers.

It is with attention to these objectives that OSPE forwards the following recommendations.

To address the engineering skills gap, the Government of Ontario should:

1. Convene a roundtable comprised of industry, employers, and post-secondary institutions[6] to identify the barriers employers face in developing WIL opportunities, as well as the mechanisms (i.e. funding and wage subsidies) that can help employers overcome these challenges and invest in the next generation of engineers;

2. Facilitate greater university-industry partnerships and collaboration to address Ontario's skills gap, provide engineering employers with qualified candidates to fill engineering positions, and help students successfully transition to the workforce;[7]

3. Ensure that new and existing post-secondary programs provide engineering students with the skills that industry needs and expects, specifically communications skills and hands-on experience;

4. Create year-round funding opportunities for companies of all sizes that are looking to hire interns, engineering students and recent engineering graduates. Funding that is offered from January 1st to April 1st does not mirror the ongoing labour needs of employers. Instead, funding that is accessible and predictable can help Ontario develop and retain its engineering talent;

5. Provide funding for OSPE to conduct a labour market study. The study would examine the engineering skills gap, which programs better position students for employment, and whether post-secondary programs are anticipating the future labour market needs of the province;

6. Require businesses that receive funding through Ontario's Jobs and Prosperity Fund[8] to provide WIL opportunities for science, technology, engineering, and mathematics (STEM) students and recent graduates. Ranging from advanced manufacturing to enabling technologies to the pulp and paper industry, individuals with a STEM background will be integral to the success of these projects; and

7. Work with the federal government to address constraints facing international students when it comes to participating in WIL opportunities that are required for their academic program.[9]

[6] One of the recommendations from the Premier's Highly Skilled Workforce Expert Panel report was the creation of a Planning and Partnership Table that would develop actionable solutions with respect to skills, talent development, and experiential learning in priority growth sectors.
[7] Data from the 2013 National Graduate Survey confirms there are benefits for students who participate in a co-op program, specifically higher employment rates and earnings.
[8] This fund provides $2.5 billion over 10 years to enhance productivity, bolster innovation, and grow Ontario's exports.
[9] Foreign students who wish to participate in a co-op or internship program must apply for a work permit *as well as* a study permit.

Prioritize and commence the construction of key infrastructure projects, encourage the provincial and municipal adoption of Qualifications Based Selection (QBS), and enhance the engineering oversight of projects

Well-designed, efficient infrastructure is critical to public safety and a competitive economy.

Much of Ontario's core public infrastructure – roads, bridges, highways, water systems, buildings, electrical grid, and private infrastructure – requires significant investment now and in the future to replace obsolete or failing components and ensure the complete life cycle sustainability of serviceable assets. According to the Federation of Canadian Municipalities' 2016 Canadian Infrastructure Report Card (CIRC), one third of Canada's municipal infrastructure is in fair, poor, or very poor condition, with the majority of liabilities existing in Ontario. Aging and failing municipal infrastructure increases the risk of service disruption and directly impedes Ontario's competitiveness, economic development, and business investment, while also decreasing our quality of life.

Engineers know that infrastructure investments are vital to strengthening the economy, creating jobs, and building strong communities in which residents enjoy a high quality of life—and there are positive signs that governments understand this reality as well.

In 2015 and 2016 respectively, Ontario and the federal government announced unprecedented levels of investment in infrastructure totalling more than $255 billion over the next 10 years. While OSPE continues to applaud the size of these commitments, it is imperative that the provincial and federal governments expedite the deployment of these funds and that projects are strategically prioritized. Through the Construction and Design Alliance of Ontario (CDAO), OSPE has been involved with both levels of government to develop a coordinated infrastructure investment strategy that prioritizes investment in transit and trade-enabling infrastructure.

Reflecting on 2016, OSPE is concerned that Ontario has enjoyed limited progress in transitioning from the assessment phase to the construction phase for key, shovel-ready projects.

Ontario's infrastructure, the backbone of our provincial economy, has long been suffering. The reasons are systemic. They include funding deficits, non-informed infrastructure policy, and uncoordinated systems planning. Extreme events due to climate change compound these issues. Meanwhile, public expectation on infrastructure has also evolved from being safe and mobile to being intelligent and sustainable.

Thorough assessments, although important, should not be a cause for delay to funded (or earmarked) shovel-ready transit and infrastructure projects. In Ontario, the streamlined environmental assessment process for transit sets a six-month deadline for the purpose of expediting critical projects.

Qualifications Based Selection (QBS)

Engineering services that are procured solely on the lowest bid can lead to initial cost savings, but often carry greater long-term costs and lower user and community benefits.

The long-term costs for lowest bid procurement are linked to higher construction, operation, and maintenance costs by encouraging the replication of older, cheaper technologies that will not be resilient to changes in climate, for example. A selection method that attaches an overriding significance to infrastructure costs, such as the cost of engineering fees, can result in a situation where design-time limitations restrict the engineer's professional autonomy to find the best solution to improve infrastructure resilience and protect public safety.

It is well understood that procurement policies that pressure firms to focus solely on achieving the lowest possible price creates a market function known as a 'race to the bottom', where firms are incentivised to make decisions that have risk implications for public safety.

Procurement policies need to ensure they provide a level of service and security that citizens deserve.

Qualifications-based selection (QBS) is a transparent procurement process used for the selection of architectural and engineering services for public infrastructure and construction projects. Under this system, the infrastructure owner considers a variety of competing engineering firms and selects a qualified firm, and then negotiates the project scope of work, schedule, budget, and fees.

The engineering services available for public infrastructure and construction projects directly impact the safety and welfare of the Ontarians. It is imperative that the most qualified firm is chosen.

Adopting a QBS process significantly enhances the prospects for innovative approaches that include climate adaptation. This will benefit taxpayers through improved reliability, climate resiliency, safety, and long-term savings through the life cycle of the infrastructure. QBS maximizes the value of the engineering contributions to a project while reducing the life cycle costs of the project. Design engineering typically accounts for only about two per cent of the life cycle cost of infrastructure, but dramatically impacts the cost, its resilience to extreme weather and changing climate, and the quality of the remaining 98 per cent represented by construction, operation, and maintenance.

Across North America and Europe, other jurisdictions have realized the value of QBS.

QBS has been used in the United States for over 40 years. The Brooks Act is a United States federal law passed in 1972 that requires that the U.S. Federal Government selects engineering and architecture firms based on their competency, qualifications and experience rather than price. Forward-thinking jurisdictions in Canada have acted accordingly; other provincial ministries already use this selection process. Moreover,

the system is strongly endorsed by the International Federation of Consulting Engineers and by the Association of Consulting Engineering Companies – Canada.

To support the adoption of QBS, the Government of Ontario should:

1. Ensure that only qualified and experienced engineering firms across Canada are selected for public infrastructure and construction projects;
2. Make it easier for infrastructure owners to understand the importance of selecting qualified and experienced engineering firms for public infrastructure and construction projects; and
3. Ensure that any legislation or regulations that refer to engineering work require that QBS is used for the procurement of all provincial or municipal engineering services.

A provincial framework must include the implementation of policies that require QBS is used for the procurement of all infrastructure related projects and services (i.e. engineering design) and include climate resilience as a requirement in order to protect and maintain public safety and provide reliable levels of service to Ontarians.

To ensure that Ontario's infrastructure investments deliver service, value, resiliency, and prioritize public safety, enhanced engineering oversight will play a vital role.

In consultations with the Ministry of Infrastructure and the Ministry of Environment and Climate Change, OSPE has observed a growing focus on project management and less on technical oversite (i.e. engineering). In line with the value proposition of QBS, the safety of key infrastructure projects is enhanced when project management and technical oversite are equally valued.

The lack of engineering oversight has led to significant project delays, cost over-runs, and failure of infrastructure projects, costing Ontario's tax payers and economy billions of dollars.

Recent examples include the Herb Gray Parkway, Nipigon Bridge, the pedestrian bridge that goes over Highway 401 in Pickering, and Hazeldean Bridge over the Carp River, to name a few.

How OSPE Can Help

OSPE is comprised of dedicated Committees, Task Forces, and Working Groups that analyze engineering-related policy areas such as those highlighted in this document. OSPE is also fortunate to have Subject Matter Experts with knowledge in highly specialized and key strategic areas.

These Professional Engineers provide OSPE with the analysis and input needed to develop reports, submissions, and advisory services to government. As evidenced in this presentation, OSPE also provides policymakers with tangible solutions to many of the challenges Ontario is facing or will face in the future.

For further discussion, please contact Patrick Sackville, Lead, Policy and Government Relations at (416) 223-9961 ext. 225 or patrick@ospe.on.ca.

Appendix A: Policy Changes That Could Lower Electricity Bills for Consumers

IESO has reported that in 2015 the power system had a total cost of $20.5 billion. About $13.1 billion was for generation costs and $7.4 billion was for transmission, distribution and other costs. In addition, consumers paid about $1.3 billion dollars in HST after business input tax credits.

Residential consumers in urban areas pay about 19.8 cents/kWh on average over the whole month (17.5 for electricity and 2.3 for HST). Residential consumers in low-density rural areas pay about 27.5 cents/kWh on average over the whole month (24.4 for electricity and 3.2 for HST). Average residential customers use about 750 kWh per month so urban consumers pay about $150/month, low-density rural consumers pay about $200/month.

Medium sized (Class B) and very large (Class A) businesses can pay additional charges for peak demand capacity and poor power factor. Class A customers can join the Industrial Conservation Incentive (ICI) program and earn discounts by lowering their demand on the highest 5 demand days. On average in 2015 Class A customers achieved a reduction of about 3.6 cents/kWh over the whole year (businesses receive input tax credits for HST payments so they effectively pay the same HST whether or not HST is charged on their electricity costs).

The Ontario government plans to remove the PST portion of the HST beginning in January 2017. The PST portion is 8%, the GST portion is 5%. Currently (Nov 2016) the combined PST+GST or HST rate is 13%.

Electricity rates are set in such a way as to recover total costs from the total demand in the system. Different rates apply to different consumer classes. In general regulators try not to transfer costs unfairly between rate classes. North American rules for trading electricity between power systems can affect rates in Ontario. Trading of interruptible electricity is done in the wholesale market at the marginal production cost not the full production cost. Ontario consumers must pay for the difference through what is called the global adjustment in retail rates.

Electricity is currently about 6 times more expensive than the cost of natural gas on an energy content basis in urban areas. Low-density rural areas do not have easy access to natural gas and typically use other carbon-based fuels such as propane. Achieving low emissions across the entire economy will require some migration from higher emission natural gas to lower emission electricity. Unfortunately, electricity will not displace natural gas at current retail prices for electricity and natural gas. The difference in price can be reduced by either lowering the price of electricity or by increasing the price of natural gas or a combination of the two.

There are four ways to reduce the price of electricity for Ontario consumers:

A. Reduce operating costs or increase revenue from the sale of surplus electricity.
B. Move existing costs not directly associated with producing electricity into tax-supported accounts.
C. Transfer market risks from electricity consumers to investors.
D. Remove government sales and water use taxes on electricity.

There is one way to increase the price of natural gas without imposing costs on the economy:

E. Introduce a tax or price on carbon dioxide emissions but rebate the revenue back to consumers.

A - Options that reduce electricity bills by reducing costs or increasing revenue:

Actions to Reduce Rates	Approx. Savings	Remarks	Background Notes
A1. Stop adding planned (directed) capacity to an over supplied system.	100 M$/yr in 2017 up to 500 M$/yr in 2025	Excess capacity drives rates up. The savings accumulate yearly until 2025 when planned capacity increases stop. Estimate is based on 2,500 MW of excess directed capacity by 2025.	The 2008-09 recession, rising electricity rates and conservation programs have permanently changed the demand growth rate. This has not been adequately reflected in planned capacity additions. The recent LRP-II deferral by the government only impacts about 1/3 of the excess planned (directed) capacity.
A2. Cancel committed capacity contracts that have not been built that have cancellation benefits or that are not in compliance with contractual in-service requirements.	200 M$/yr	Excess capacity drives rates up. Estimate assumes about 1,000 MW of higher cost committed capacity can be cancelled.	Currently we have 8% excess overall capacity. However, what nameplate capacity is cancelled will affect carbon dioxide emissions differently because each technology has a different capacity factor. Nuclear operates at about 85% capacity factor and displaces the most carbon dioxide per kW installed, hydroelectric operates at about 50%, wind operates at about 30% and solar operates at about 15% and displaces the least carbon dioxide per installed kW.
A3. Enter into firm delivery contracts for surplus clean energy supply to adjoining power grids instead of using the wholesale (spot) market for interruptible electricity.	0 up to 350 M$/yr	Upper estimate is based on 50% of the 17.3 TWh of surplus clean supply can be sold on a firm basis at $40/MWh more than the wholesale price for interruptible power.	Interruptible power is priced at the marginal cost of production (essentially the fuel cost), uninterruptible power is charged at the full cost of production (includes capacity and labour costs) by agreement in North American. Providing firm clean electricity to adjoining jurisdictions means some of Ontario's domestic demand will have to be supplied by natural gas generation instead of clean electricity.
A4. Allow Ontario consumers to buy interruptible surplus clean electricity at 1 cent/kWh like adjoining power grids do on the wholesale (spot) market.	0 up to 200 M$/y	Reduces consumers' fossil fuel costs (not their electrical costs). Also reduces CO2 emissions by up to 3 million tonnes/yr. Estimate based on a 1.2 cent/kWh price differential between surplus electricity and natural gas at the home.	Choosing option A4 exclusively over option A3 indicates that reducing Ontario's CO2 emissions is a higher priority than reducing electricity rates. Note that item A3 and A4 are mutually exclusive because they use the same energy.
A5. Allow Ontario consumers to buy interruptible surplus natural gas-fired electricity at its marginal fuel cost	0 M$/yr up to 300 M$/yr	Would reduce self-generation by consumers with less efficient fossil fueled equipment. Savings	Option A5 should only be available to consumers who can demonstrate that they will use the grid supplied gas-fired electricity to achieve lower CO2 emissions

(approx. 3 cents/kWh).		depend on amount of self-generation present in Ontario.	compared to their current production practices.
A6. Do not mandate technology choices on the power system. Allow the cap-and-trade program to determine technology choices.	$200/tonne CO2 savings (annual savings are included in other items in this table)	Will lower future costs of reducing carbon emissions from the present $250/tonne to $50/tonne by 2025. The $250/tonne cost is from the Ontario Auditor General 2015 report on the cost of reducing emissions in the electricity sector using renewable energy generating capacity.	Trading allowances in a cap-and-trade program effectively allows lower cost carbon reduction technologies to satisfy the emission reduction targets regardless of the sector in which they are installed.

Note: Items A4 and A5 would require a special electricity price plan and smart controllers to correctly enable the energy flow and billing. The special plan should be voluntary for those consumers who have or will purchase the required automation and other equipment to use surplus electricity effectively. The special plan should remain in effect until the equipment capital costs are recovered – 10 years is suggested.

B - Options that reduce electricity bills by moving costs to more appropriate accounts:

Actions to Reduce Rates	**Approx. Savings**	**Remarks**	**Background Notes**
B1. Adopt the USA approach to subsidizing higher cost clean energy technologies (eg: use tax rebates not global adjustment to pay for extra costs for renewables).	1,700 M$/yr	Estimate is based on 14% additional total costs for renewables in 2017 compared to conventional generation.	Using different rules than our NAFTA trade partner USA to subsidize renewable energy development increases electricity costs in Ontario and makes Ontario businesses less competitive. Move those excess costs from the electricity account to a tax supported account.
B2. Write off poor investment decisions in a tax account rather than the electricity account.	100 M$/yr	Estimate is based on non-productive costs like gas plant relocation, etc. that are not covered in the other items in this list.	Consumers should not be expected to pay for planning errors. In private power systems investors pay for those errors. In a public power system the taxpayer should pay for those errors so that electricity rates remain competitive for businesses that compete in the NAFTA trading zone.
B3. Write off surplus capacity costs in a tax supported account rather than the electricity account.	1,000 M$/yr (850 M$/yr if option B1 is adopted)	Current system has 8% excess installed generating capacity at peak demand. Estimate is based on generation costs only.	Consumers should not be expected to pay for planning errors. In private power systems investors pay for those errors. In a public power system the taxpayer should pay for those errors so that electricity rates remain competitive for businesses that compete in the NAFTA trading zone.
B4. Remove stranded debt charge from larger electricity consumers.	500 M$/yr	Estimate is based on 70 TWh/yr that is subject to	Consumers should not be expected to pay for planning errors. In private power

		the stranded debt charge of 0.7 cents/kWh.	systems investors pay for those errors. In a public power system the taxpayer should pay for those errors so that electricity rates remain competitive for businesses that compete in the NAFTA trading zone.
B5. Transfer the conservation costs to a tax supported account rather than the electricity account.	400 M$/yr	Estimate based on IESO annual budget for conservation.	Conservation costs are not part of electricity production costs and with surplus capacity this charge in not helping to reduce electricity costs. In fact conservation costs in the presence of excess capacity actually raises electricity rates.

Note: Ensuring that Ontario businesses are competitive in a free trade zone like NAFTA, CETA or TTP is important so that Ontario does not lose the sales, jobs, employment income and government income tax revenue.

C - Options that reduce electricity bills by transferring risks from consumers to investors:

Actions to Reduce Rates	Approx. Savings	Remarks	Background Notes
C1. Pay full production costs only for delivered energy to Ontario consumers.	0 to 850 M$/yr	The maximum savings are estimated assuming the excess costs due to take-or-pay provisions in the contracts is 50% of the total production costs on 17.3 TWh of surplus energy.	Stop signing take-or-pay contracts at full production costs. Build anticipated curtailment into the contract price so that investors assume the risk of future market demand changes or technology changes. Options C1 and B3 are mutually exclusive. Only the savings for one of the options applies even if both options are adopted.

D - Options that reduce electricity bills by eliminating government sales taxes and water use taxes on electrical energy:

Actions to Reduce Rates	Approx. Benefit	Remarks	Background Notes
D1. Eliminate hydroelectric production tax for water use.	400 M$/yr	Estimate based on hydroelectric production of 36.3 TWh and average tax of 1.1 cents/kWh.	Lower tax revenue will impact negatively on Ontario deficits and debt and funding for municipalities near hydroelectric facilities.
D2. Eliminate PST on electricity consumption.	1,600 M$/yr and -800 M$/yr input tax credit	Affects provincial tax revenues.	Ontario has already announced the elimination of the PST on Jan 1, 2017. This will impact negatively on Ontario's deficit and debt.
D3. Eliminate GST on electricity consumption.	1,000 M$/yr and -500 M$/yr input tax credit	Affects federal tax revenues.	This will impact negatively on federal deficit and debt.

E - Options that increase the price of natural gas (and gas-fired electricity) to effect reductions in carbon dioxide emissions:

Actions to Reduce Rates	Approx. Savings	Remarks	Background Notes
E1. Introduce a price on carbon dioxide emissions but rebate the cap-and-trade program revenue on a per capita basis to those families with less than $100,000/yr family income	-100 M$/yr in 2017 to -350 M$/yr in 2025	Higher gas costs will raise the price of electricity for the 10% of electricity produced by natural gas plants. The estimate assumes a carbon price of $15/tonne in 2017 to $50/tonne by 2025. The estimated $2 billion/yr in cap-and-trade revenues in the early years will be cost neutral to the economy if the funds are rebated to consumers.	Consumers can choose to spend the money on emission reduction technologies to reduce their future carbon emission costs or on general consumer expenditures. Both will result in additional economic activity that will offset reduced economic activity and income tax revenue losses due to the carbon price. Mid and low income consumers are likely to spend most of the refund amounts on consumption rather than saving it. Consequently refunding the cap-and-trade revenue to consumers is likely to produce similar economic benefits as compared to the government purchasing carbon reduction technologies. Refunding the cap-and-trade revenue will likely give consumers more satisfaction because they can allocate the funds to the highest family needs. Emission reductions could be greater if the government spends the cap-and-trade revenues on the most cost effective carbon reduction technologies.

Electricity Price Impact of CCAP Plan to Deploy Electrical Space Heating

The government's Climate Change Action Plan (CCAP) proposes to deploy electric heat pumps for winter space heating. Heat pumps are more efficient than electric resistance heaters but at a higher capital cost. However, installing low-emission electrical capacity to meet the additional demand of space heating in the winter will result in a significant upward pressure on electricity rates. The reason is that electrical capacity dedicated for space heating will operate at approximately 30 to 35% capacity factor rather than the present 65 to 70% capacity factor for the grid overall. During the spring, summer and fall that dedicated capacity will be idle unless we find other uses for the surplus electricity. At half the operating capacity factor the levelized cost of that dedicated capacity will be double the current production costs. That will drive electricity rates higher. Carbon prices will have to be very high, in excess of $600/tonne at current gas commodity prices to make natural gas retail prices comparable to electricity retail prices in order to displace natural gas in the industrial sector. We can price surplus low emission electricity at its marginal cost of production of about 1 cents/kWh to encourage displacement of natural gas in various industrial sectors. However, this means most of the production cost of that surplus electricity must still be borne by the electricity consumer. A comprehensive cost study should be undertaken before deploying dedicated electrical capacity to meet the needs of space heating loads. That study should include an hour-by-hour supply and demand simulation analysis of the power system to correctly quantify the amount of surplus low emission electricity that will be created.

Summary

In 2015 the cost of operating the power system was about $20.5 billion and consumers paid an additional $1.3 billion in HST (after including a business input tax credit estimated at $1.3 billion/yr). Policy changes can reduce the price of electricity in Ontario to levels that are similar to competing jurisdictions in the NAFTA trading zone. Adjusting for mutually exclusive items the financial implications of adopting all of the proposed policy changes are:

Consumer electricity bill reductions = $5.5 to 6.3 billion/yr

Impact on provincial government tax revenue = -$1.2 billion/yr

Impact on federal government tax revenue = -$0.5 billion/yr

Impact on provincial government revenue due to write-offs and transfers = -$3.6 billion/yr

Total impact on provincial government revenues = -$4.8 billion/yr

Total impact on federal government revenues = -$0.5 billion/yr

Cap-and-trade discretionary new funding = $2 billion/yr (based on 2017 carbon price and emissions)

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