Ontario/Quebec Electricity Trade Agreement

An Implications Assessment

Final Report

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STRATEGIC POLICY ECONOMICS

Executive Summary

In the fall of 2016, Ontario and Quebec entered into an electricity trade agreement with the purported goals of expanded interprovincial trade and collaboration and to generate savings for ratepayers. However, when the specifics of this agreement are examined, it becomes clear that the energy portion of this deal will increase costs to Ontarians, not decrease them. Ontario consumers will pay a premium over market prices when, alternatively, the province's electricity market and carbon pricing scheme, if left alone, would achieve the same results at a lower cost.

The agreement addresses two independent facets: Quebec's purchase of reserve electrical generation capacity from Ontario in the winter when Quebec is often very tight on supply; and, Ontario's electricity energy trade provisions with Quebec to reduce the use of natural gas electricity generation in Ontario during peak demand periods. When the deal was announced, the Ontario government bundled these two components together. Ontario claims that the capacity receipts net of the energy trading costs will save the province $10 million (M)/year and reduce CO_2 emissions by 1 megatonne (Mt)/year.

Beyond this, neither provincial government has provided the public with any further financial details or analysis associated with the arrangement. Ontario electricity consumers deserve transparent and evidence-based decision-making, given the significant electricity cost increases they have already experienced and come to expect due to the absence of such information. When the capacity and energy components of the arrangement are separated, it becomes apparent that the two components have little to do with each other from the perspective of the electricity market. All of the benefits appear to result from what may be a reasonable capacity agreement, while the costs reside in what can be characterized as an inappropriate energy arrangement.

Ontario is currently experiencing a significant surplus supply situation due to over-investments in capacity, largely renewables, with imports from Quebec already providing maximum benefit. Similarly, Quebec is awash in surplus energy and will remain so for the term of this deal. These respective situations suggest there is very little need at this time for incentivising additional imports from Quebec through premium pricing or out-of-market agreements.

Analysis shows that the energy arrangement likely entails an unnecessary premium for electricity, with an estimated electricity price of $45/megawatt hour (MWh) to $55/MWh. Energy trading between jurisdictions is done on a marginal cost basis because Ontario currently only operates an energy spot market. When natural gas generation is setting the market clearing price, all plants authorized to run will receive the same clearing price. In 2017, this average price was $25/MWh. This premium price will add $65M to $200M to the cost of electricity without delivering the promised benefit of additional Greenhouse Gas (GHG) emission reductions. The electricity market has already doubled the price of Quebec imports and natural gas-fired generation. Carbon pricing associated with Cap and Trade in both provinces is responsible for 60% of the increase. As the desired displacement of natural gas-fired generation is already being achieved, the price Ontarians pay for electricity does not need to be doubled again through a premium price in an out-of-market transaction. Going forward, carbon pricing will

continue to improve the attractiveness of displacing Ontario's natural gas-fired generation, particularly for export markets where most of Ontario's GHG emitting gas-fired generation is currently destined.

The premium pricing associated with this deal will result in Ontario electricity consumers paying more for what they are already getting. Ontarians should not be locked into a deal where they are subsidizing the cost of Quebec's surplus to its rate-payers at the expense of the province's own rate-payers.

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1.0. Introduction

In the fall of 2016, Ontario and Quebec entered into a seven-year electricity trade agreement to enhance interprovincial trade and economic collaboration. Such relationships are important and beneficial to Canadians in the long-term.

The agreement addresses two independent facets: Quebec is seeking to purchase 500 MW of reserve electrical generation capacity from Ontario in the winter; and Ontario is seeking electricity energy trade provisions with Quebec to reduce the use of natural gas electricity generation in Ontario. When the deal was announced, the Ontario government bundled these two facets together. Ontario claims that the capacity receipts net of the energy trading costs will save the province $10M/year and reduce CO_2 emission by 1 Mt/year. Beyond this, both governments have declined to provide the public with any further details about the deal's financial details or commitments.

The "Power" of Public Opinion

Ontario electricity ratepayers, businesses and industries concerns about the ever-growing cost of energy is evident in recent public opinion survey results, media coverage and political energy policy debates. Increasing public awareness of the Ontario/Quebec electricity agreement and the vacuum of significant details about it will only provide more "fuel for the fire".

Some environmental groups in Ontario welcomed the announcement of the deal, lauding the use of clean energy to replace electricity created from natural gas. Among these groups, staunch opponents of nuclear energy then called for the closure of Ontario's low carbon nuclear facilities in favour of more imports of Quebec hydro power. They assumed the latter to be much less expensive and better from an environmental perspective. The option of increasing imports from Quebec to displace baseload nuclear has been analysed by Ontario's Independent Electricity System Operator (IESO) and deemed to be not only more expensive, but also non-viable due to a lack of year-round capacity in Quebec. The need in this deal for Quebec to purchase Ontario capacity in the winter is an example of the latter.

Some media coverage has criticized the governments of Quebec and Ontario for overselling the cost savings the deal is promoted to deliver. Media reports have suggested Ontario will be paying $50/MWh for the electricity, a value described by the Quebec government as inaccurate[1] - yet no other figures have been offered. $50/MWh would be a premium price by Ontario standards, as established in this paper, but Quebec was criticized for the price being below its total cost of generation. Others have derided the figure of $10M in savings put forward by Premier Wynne as representing a minuscule sum relative to Ontario's total energy expenditures of $20 billion annually.

Several industry stakeholders believe the arrangements to be sub-optimal, costly, and, by virtue of the out-of-market nature of the arrangement, counter to the objectives of an efficient electricity market.

[1] National Post, Dec, 2016.

Over the last several years, independent reviews of Ontario's electricity policies have flagged past government policy missteps and the need for more comprehensive, transparent cost/benefit analyses going forward. For example, reports by the province's Auditor General and the Financial Accountability Office provided important background and more financial details about these missteps and the rising cost impacts on consumers. Ontario consumers would benefit from, and deserve having this kind of information about the electricity exchange with Quebec. Especially, since they will be paying for it.

Document Objective and Structure

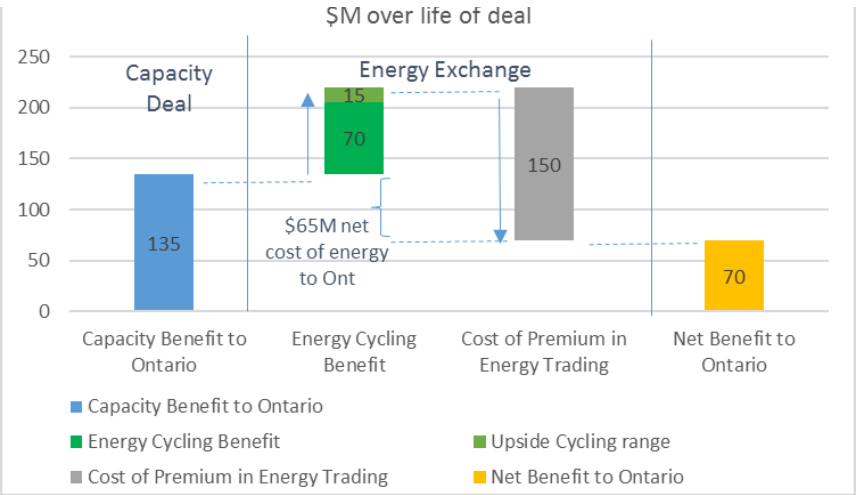
This document focuses on dispelling some of the myths surrounding the Ontario/Quebec deal. The methodology employs benchmarks and analyses of the electricity flows, market price, demand, and generation in Ontario in order to provide estimates of the cost and value of each component of the deal. The analysis weaves together the few publicly available facts in order to develop a cost of purchased energy under the deal to compare with the government's claims.

The followings sections of this document address the matters relevant to costing this deal:

- Section 2.0 – Interpreting the capacity agreement
- Section 3.0 – Interpreting the energy arrangement through a discussion of energy cycling and trading, including the associated risks
- Section 4.0 – Implications on other benefits
- Section 5.0 – Contribution of Ontario's wholesale energy market and carbon pricing

The baseline cost results developed in sections 2.0 and 3.0 of this report are summarized in Figure 1, which illustrates the two components of the deal: Capacity and Energy.

Figure 1 – Illustrative Assessment of Deal Component Benefits



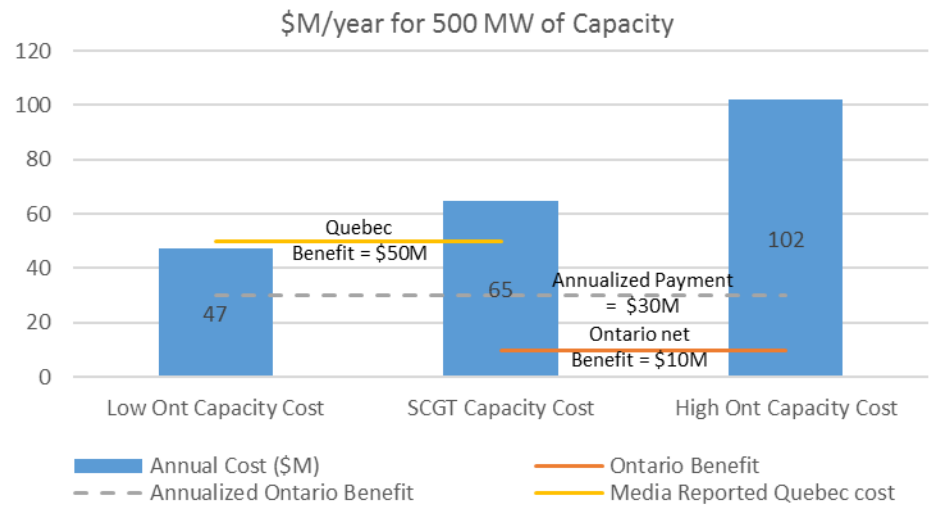
The sources consulted during the research are listed in Appendix A. A list of acronyms is contained in Appendix B.

2.0. Interpreting the Capacity Agreement

Purchasing "capacity" is paying a plant operator to have a facility on standby in case it is needed, technically for operational reserve. The expectation is that it won't be needed to operate often. Under the capacity agreement, Ontario is required to make 500 MW of "surplus" Ontario natural gas-fired generation capacity available to Quebec each year for the four winter months. Using Ontario's recently built excess spare capacity is smart business for both provinces. This 500 MW meets Quebec operational reserve capacity needs during the winter months and avoids the costs of adding reserve natural gas-fired capacity in Quebec.

Quebec media reports[2] indicate that the province would avoid $350M in capacity costs for the 7-year period of the deal or approximately $50M/year. Figure 2 shows a comparison of benchmarks for the annualized cost of 500 MW of capacity.[3]

Figure 2 – Capacity Cost Benchmarks



Cost benchmarks from existing Ontario capacity can be applied to a 500 MW capacity purchase. Estimates range from $47M/year, based on older facilities, to $100M/year, based on the newer plants such as the new natural gas combined cycle plants in Sarnia and Napanee[4]. The reported Quebec cost benchmark of $50M/year is near the low end of Ontario's benchmarks. The "Ontario net Benefit" benchmark illustrates, at $30M/year, the equivalent annualized cost of capacity if the $10M/year deal benefit was attributed only to capacity. A conservatively low estimate of the minimum reasonable benefit to Ontario would be to prorate Quebec's avoided $50M/year cost for the 4-months per year Quebec needs it. This approach

[2] LaPresse, Oct 2016.
[3] The IESO 2015 report on NUGs stated an SCGT capacity cost would be $130K/MW. 500 MW yields $65M/year.
[4] RPP, April 2017. The Sarnia and Napanee plants are the relocated facilities that were the subject of the Mississauga and Oakville scandals [ref also CBC News, October 21, 2016].

yields a $17M/year payment to Ontario. Over the life of the deal this amounts to a total value of $135M[5]. For the upper end, based on an assumption that the media's reported $50M/year savings was net of payments[6], a benchmark value would result in Quebec paying an Ontario benefit of $165M over the life of the deal.

[5] The deal is for 7 years. As part of the agreement, Quebec will be returning to Ontario, at some point prior to 2030, the 500 MW Ontario had provided gratis under previous agreements. Modelling this as an extra payment at the same valuation rate yields the $135M total benefit to Ontario.

[6] Assuming $50M is net of payments, this represents 8 months of avoided costs, implying that four months would be worth half of the $50M. This results in a cost of capacity in Quebec of $75M/year. This would be high. If based on the SCGT $65M/year benchmark, prorated to 4 months would be $22M/year or $165M.

3.0. Interpreting the energy arrangement

According to the IESO[7], the purpose of the seven-year electricity trade agreement is to structure the delivery of electricity from Québec to Ontario to:

- Displace Ontario natural gas-fired generation;
- Enable Quebec to "continue" to provide at least 2 TWh per year; and
- Allow Ontario to cycle its surplus electrical energy by sending electrical energy to Québec, who will store it, and allow Ontario to withdraw the energy back in future periods.

The IESO refers to the intent of the agreement as developing a 'bundled' package using the existing wholesale energy market.

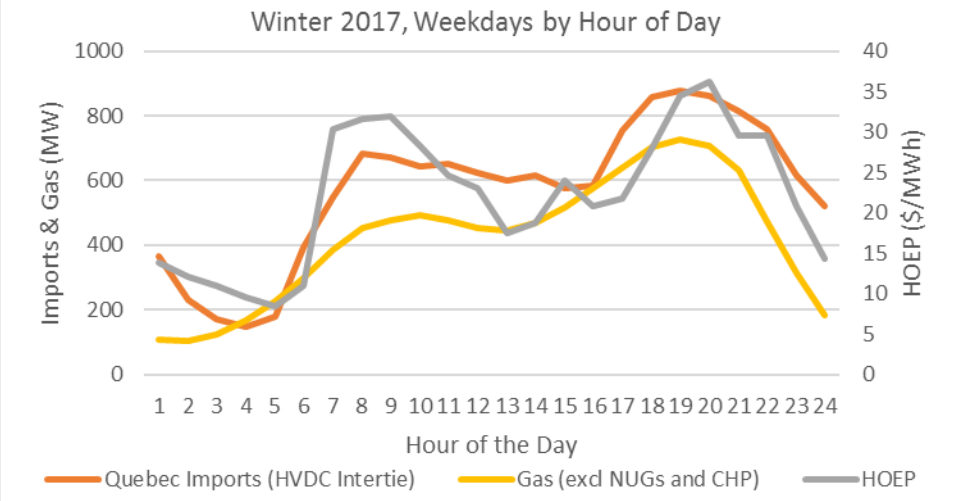
The wholesale energy market establishes the fair market price for electricity, including the price for imports from Quebec which are traded within it. Energy trading between jurisdictions is done on a marginal cost basis because Ontario currently only operates an energy spot market. The supply in on-peak times that sets the market price is chiefly made up of imports from Quebec, exports, and natural gas-fired generation. When natural gas-fired generation is setting the market clearing price, all plants authorized to run will receive the same clearing price. In 2017, this average price was $25/MWh. The market is particularly suited to the trading of Quebec's hydro and the natural gas-fired generation the deal seeks to displace. Both supplies have fast ramping capabilities that respond to market price and, as such, provide two important functions: (1) they can track the daily ramping of demand very closely; and (2) they can smooth out the gaps from intermittent renewable generation.

Figure 3 illustrates the average daily profile for the winter of 2017 and indicates the relationship between price (HOEP[8]), Quebec imports using the HVDC intertie[9], and natural gas-fired generation as a function of the hours in a day during the first three months of the deal.

Figure 3 shows how both of these supplies track well with market price. During on-peak hours, supply increases as the price signal indicates demand for this supply. In the winter of 2017, Quebec import volumes exceeded that of natural gas-fired generation in Ontario. Quebec supply appears to have a tighter coupling with the price signal, despite the fact imports and exports are currently scheduled on an hourly basis and cannot respond to 5-minute real time market changes.[10]

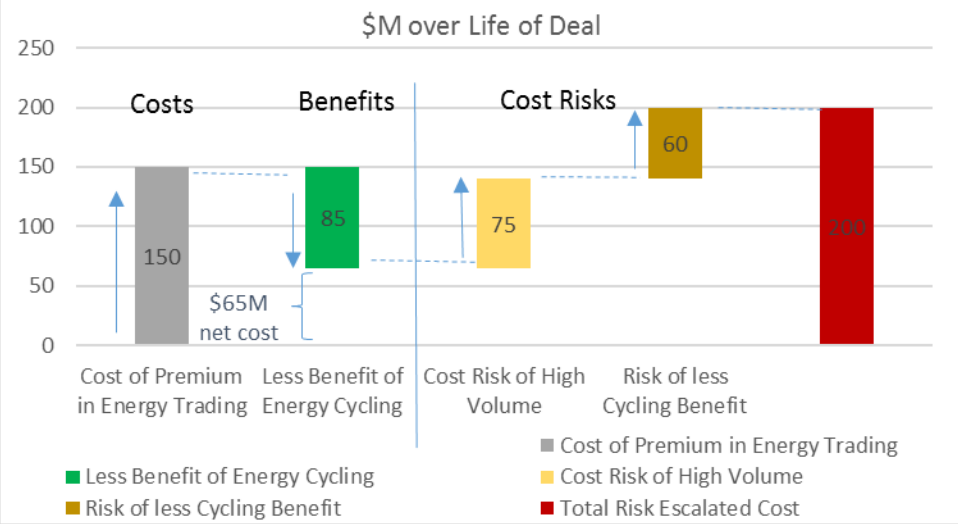
[7] IESO Overview of Electricity trade agreement between Quebec and Ontario, May 10, 2017.
[8] Hourly Ontario Electricity Price (HOEP)
[9] The 1250 MW High Voltage Direct Current (HVDC) intertie between Quebec and Ontario was commissioned in 2009 and is the only inytertie with Quebec that can track with price.
[10] The IESO is currently developing market reforms to improve this situation in the future and is also developing some near-term changes to improve real time market flexibility.

Figure 3 – Average Daily Profile of Imports, Gas and Price



The wholesale energy market price is used by this analysis as the reference for identifying any additional cost implications that an out-of-market transaction may represent. Figure 4 summarizes the estimated net cost to Ontario's energy system of the energy trading portions of the deal. These costs range from $65M to $200M.

Figure 4 – Cost of Energy Trading



The following discusses the cost components of cycling, energy trading, and risk.

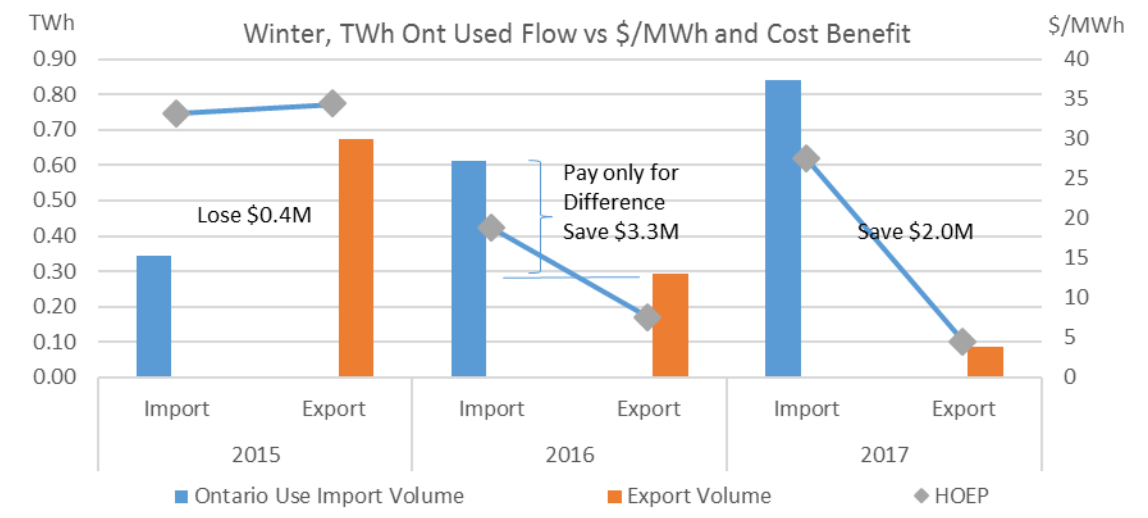
3.1. Cycling Energy

The assumed benefit of cycling electricity flows is that it gives Ontario the ability to store its surplus electrical energy in Quebec's reservoirs and withdraw it later *at no charge* during higher demand times. Under normal market operations, Quebec would buy Ontario's surplus at the prevailing market spot price,

which would be typically low when Ontario is in surplus. Ontario would then buy back energy during high demand times, again at the prevailing spot price, which is typically higher when natural gas is on the margin. In 2015, Quebec earned a premium of $22/MWh from this exchange[11]. Under the "no charge" assumption, the value to Ontario of the energy cycling provisions is assumed to be the market price difference between the swapped export and import volumes.

Analysis of intertie trading between Ontario and Quebec during the first six months of each of the last three years is shown in Figure 5. Flows from Quebec into Ontario have grown significantly, displacing exports of surplus energy to Quebec. In addition to the shift in direction of the flows, value is affected by the market price. Since 2016, the price of Ontario exports to Quebec has dropped, while the price of imports from Quebec has risen.

Figure 5 – Comparison of Potential Cycling Impact



Were Ontario to have had a free exchange of surplus energy, the average cycling benefit for the first half of 2015 and 2016 would have been about $5M for those six-month periods. This average benefit matches that calculated for the first half of 2017. To estimate the annual cycling benefit, this 6-month value is doubled to yield $10M/year, or $70M over the life of the agreement. If 2015 trade flows are relied upon as an estimate of future behavior, this benefit could be $12M/year or $85M over the course of the deal. This sensitivity analysis suggests an uncertainty range of $70M to $80M for the benefit to Ontario of cycling energy.

3.2. Energy Trading

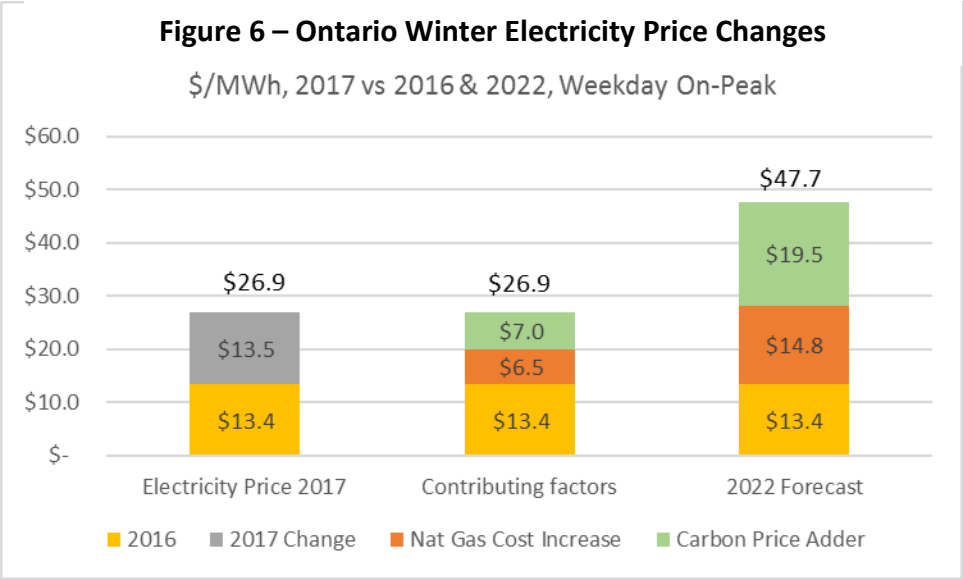
The Ontario government has claimed the net benefit of the deal to be $70M after considering the costs of trading. The combined benefits to Ontario shown above for capacity exchange and energy cycling, are estimated to approach $205M. This means that balancing the net benefit statement would require the

[11] Strapolec, 2016

expected cost of energy trading to exceed $135M over the term of the deal in order to yield a net benefit of $70M. This $135M implies that a price premium must be inherent in the deal terms, such as the $50/MWh suggested in the Quebec media.

The wholesale energy market establishes the market price for electricity. Any premium in the price paid by Ontario for Quebec imports would represent an additional unnecessary cost. The market price when natural gas-fired generation is setting the price can be forecast out to 2023 based on key drivers of the price: the cost of natural gas; and, the imposition of carbon pricing from Ontario's and Quebec's joint Cap and Trade Program. Figure 6 illustrates the comparison of the prices between 2016 and 2017 and the implications for 2022.

In 2017, the average winter electricity price was $27/MWh, when importing transactions from Quebec were occurring.[12] During the same time period in 2016 the average price was $13.4/MWh. Most of the difference in price between 2016 ad 2017 can be attributed to higher fuel costs and the addition of the carbon price in 2017 as shown in Figure 6[13]. The U.S. Energy Information Administration (EIA) forecast to 2022, projects higher natural gas prices. Canada's federal government has also set a carbon price target of $50/tonne. This suggests an Ontario electricity market price of $48/MWh. These values represent an estimate of the market value of electricity even though they are higher than seen in 2016. They do not represent a premium over market price.



The premium price that may be inherent in the deal would be that amount above the market price that could be calculated to yields the $135M cost of the energy trading provisions. The $50/MWh price reported in the media, provides a simple proxy to illustrate this effect. Modelling this reported $50/MWh

[12] Weekday on-peak market price as reflected by the HOEP.

[13] Natural gas price changes between 2017 and 2016 obtained from the OEB website. Carbon price assumed was $18/tonne with emissions assumed to be .39 tonnes per MWh from Ontario's gas fired fleet.

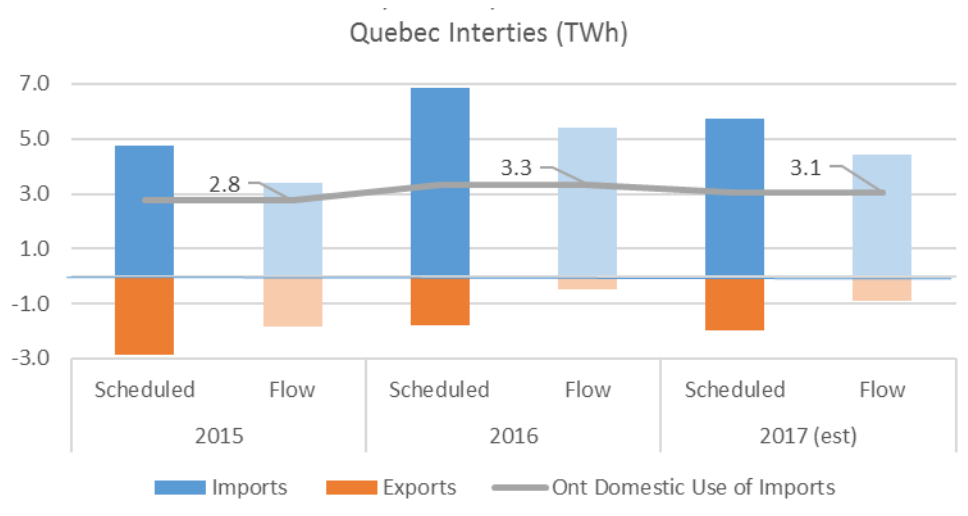
price against the 2 TWh/year of Quebec imports contemplated in the deal and contrasting it against the forecast market prices yields an estimated premium of $150M over the term of the agreement. This is within the range of estimates noted earlier and strongly implies an agreed purchase price in the vicinity of $50/MWh could be embedded in the deal, almost double the market price of $27.6 that was set in the first part of 2017. A sensitivity analysis suggests an uncertainty range of between $45/MWh to $55/MWh.

3.3. Cost Risks

The previous analysis suggests that the energy deal will cost Ontario rate payers at least $65M. There are two factors that suggest Ontario's cost exposure may be higher, up to as much as $200M over the course of the deal. This is illustrated in Figure 4.

Past trend data indicates that Ontario's electricity trading with Quebec is shifting towards higher imports and lower exports as Quebec seeks to export as much of its surplus as possible. These macro trends are illustrated in Figure 7 which shows three things: Scheduled imports and exports, which are a function of trading that may have imports and exports scheduled at the same time; Flows, which are the actual physical transfers that occur over the interties; and, Domestic Use Imports which is the share of the flows that are for Ontario's domestic use. The IESO estimated that about 60% of flows into Ontario were used for domestic purposes in 2016. Analysis of 2017 data suggests this level could be repeated this year. The remaining imports from Quebec serve exports to the U.S.. Domestically used imports from Quebec have averaged 3 TWh/year, not 2 TWh. For 3 TWh/year, the costs of the premium in the energy trade portion of the deal could increase by 50% to $225M over the course of the agreement, increasing the cost by $75M.

Figure 7 – Scheduled, Flow, & Domestic Use of Imports



There are two factors that could reduce the benefit that Ontario may otherwise gain from energy cycling. First, the nuclear refurbishment project is expected to reduce Ontario's surplus baseload generation over the term of this deal. Second, Quebec has a surplus that has been further impacted by the mild winters of

2016[14] and 2017 and higher precipitation this year. Quebec's electricity exports provide significant economic benefits to the province and Quebec has included increased exports in its long-term economic strategy.

Figure 5 illustrates the effect these two factors had on intertie traffic in the winter of 2017. Ontario's exports to Quebec were down 90% from 2015 as Quebec was maximizing the use of the intertie for its exports[15]. Figure 8 shows Ontario's surplus remained high over the same period.

Increased Quebec electricity export wheeling through Ontario restricts this province's ability to cycle its own surplus electricity. The previously noted $70M benefit from cycling energy could be eroded by as much as $60M, or 90% as reflected by the change from 2015 to 2017 previously shown by Figure 5.

[14] Hydro Quebec: Hydro-Québec Anticipates Moderate Growth in Electricity Demand Over Next 10 Years.

[15] Quebec use of the intertie dropped to 2015 levels in the spring of 2017. Constraints at the Michigan intertie contributed to this challenge and also affected gas-fired generation exports. Additionally, nuclear generation in the spring of 2017 was higher than 2016. Both of these conditions are expected to be resolved over the next few years.

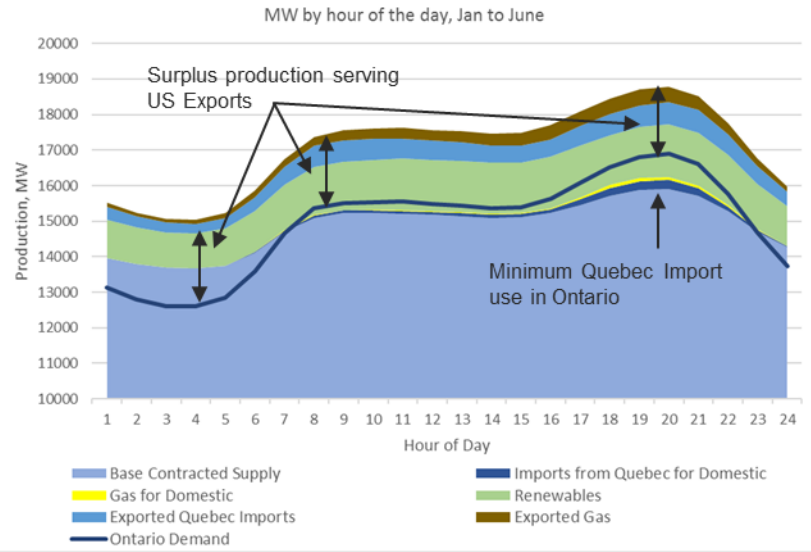
4.0. Implications on Other Benefits

The daily profile of this province's energy supply and consumption in Figure 8 shows that Ontario is currently experiencing a significant surplus supply situation and that imports from Quebec are already delivering maximum utility.

Given Ontario's surplus supply situation and recognizing that Quebec also has a surplus, there is little need for incentivising additional imports from Quebec. There does, however, remain a need to offset natural gas-fired generation during on-peak demand hours. It would thus be fiscally prudent to restrict import exchanges to on-peak demand hours, which, unfortunately typically have the interties capacity maxed out in those times due to the demand that is already in the system.

A simplified calculation can be used to estimate Ontario's minimum import needs from Quebec – by subtracting on an hourly basis the output of Ontario's base generation[16] and renewables from Ontario demand. The result for 2017 is that Ontario would have only needed 0.4 TWh of Quebec imports in the first six months to ensure total supply met Ontario demand. The average impact of this calculation is shown in Figure 8 as the thin dark blue line above the base contracted supply.

Figure 8 – 2017 Average Daily Supply & Demand Profile



However, market trading, regional transmission constraints, and wind intermittency prevents some base and wind supply from being used domestically, requiring their output to be exported as surplus[17]. This creates additional domestic demand for Quebec imports and production from Ontario's natural gas-fired

[16] Ontario operates its natural gas fired plants in two distinctly different operating regimes. Some natural gas capacity is designated "must run" to provide quick responding operating reserve. This "must-run" capacity operates most of the time throughout the year and its cost is settled outside the real-time energy market. This must run gas is included in the base contracted supply. The remaining natural gas capacity illustrated in Figure 8 is used to supply peak load demand.

[17] CCRE, Ontario's High Cost Wind Millstone, June 2017.

generation. The IESO statement that the domestic use of Quebec imports could be 60% of the imported volume reflects a more fulsome approach than discussed here. Figure 8 nevertheless underscores the significant amount of Ontario based natural gas-fired generation and Quebec imports that are destined to U.S. markets.

The interties neared their import capacity in the winter of 2017 as shown by Figure 9. Quebec was able to export such significant amounts due to the mild winter, when typically, the province is otherwise facing high consumer demand and winter condition constraints on generation output. The interties effectively reached their limits during times when Ontario's natural gas-fired generation was on the margin.

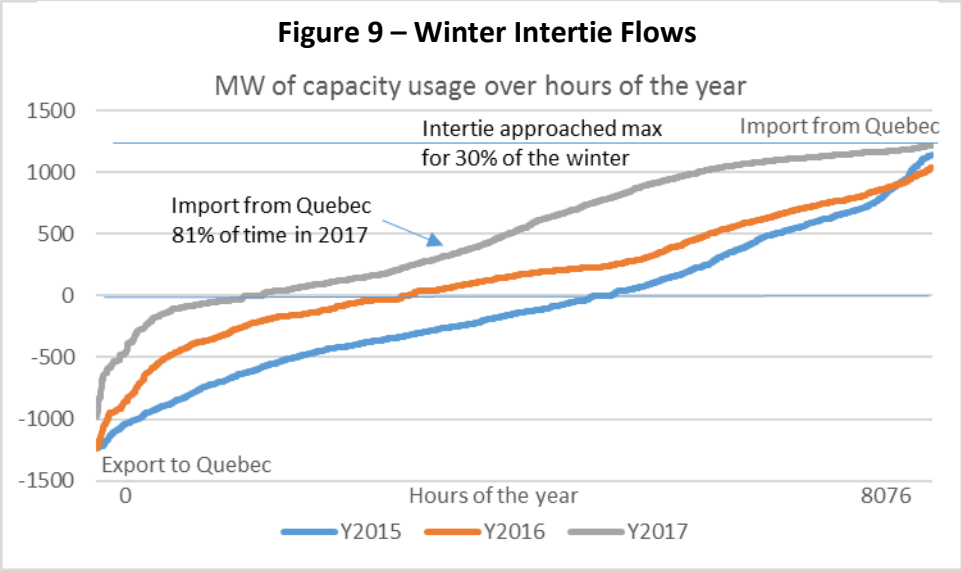


Figure 10 compares the changes in average hourly winter and spring generation between 2016 and 2017 for imports from Quebec, natural gas-fired generation and exports to the U.S.. While imports from Quebec went up in the winter of 2017, even while exports declined, there was no change to Ontario's natural gas-fired generation. In the spring, soft demand was reflected in reduced imports from Quebec, reduced exports to the U.S. and reduced natural gas-fired-generation in Ontario. Compared to 2016, imports from Quebec in the spring of 2017 were reduced proportionately more than that of natural gas-fired generation. Further reductions of natural gas-fired generation would appear to be constrained by other factors that extend beyond Quebec's own exporting practices. There is no basis to assume additional imports from Quebec could further reduce natural gas-fired generation from the reductions achieved in 2017. From a practical perspective, it appears that there is no GHG emitting supply left in Ontario for Quebec imports to replace.

Figure 10 – Quebec Imports, U.S. Export, & Gas-fired Generation Output

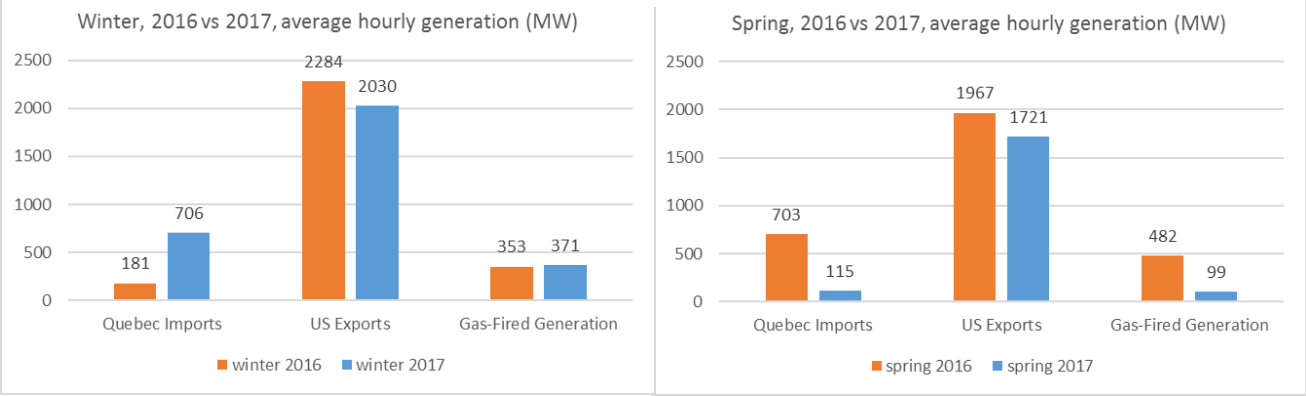
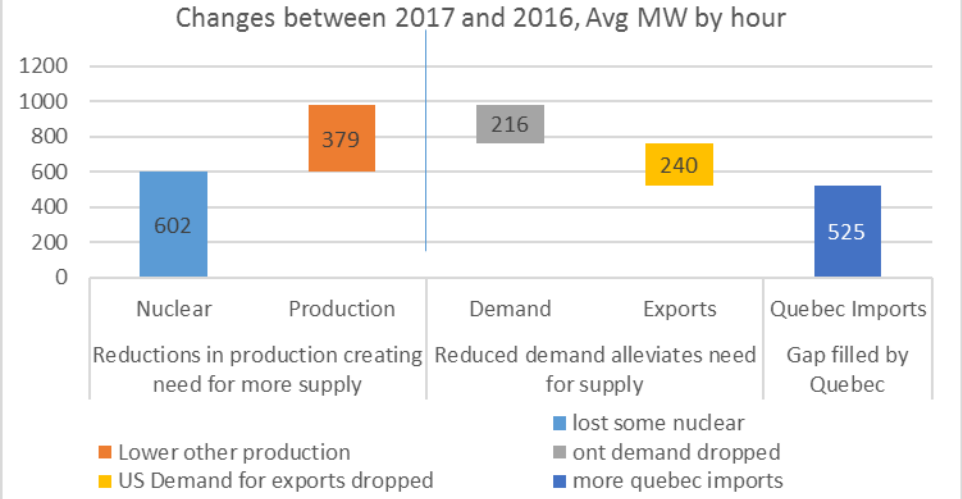


Figure 11 shows the change in the demand and supply mix in Ontario between 2016 and 2017. There was a loss of production due to the province's nuclear generation refurbishment program, but also a reduction in other supply. The mild winter reduced both demand in Ontario and exports from Ontario to the U.S. The remaining gap in supply required to meet demand was filled by increased imports from Quebec. However, under normal winter conditions, like those of 2014 or 2015, increased demand across the region will reduce the availability of imports from Quebec to fill the nuclear gap. Natural gas-fired generation would increase as a result.

Figure 11 – Role of Imports from Quebec in 2017 Winter Supply Mix



The lack of correlation between the volume of natural gas-fired generation and Quebec imports shown in Figure 10, coupled with the risk of increased natural gas-fired generation mentioned above, suggests the government's claimed benefit of 1 Mt/year of incremental emissions reduction is overstated. Such an

emission reduction would entail replacing 2.4 TWh of natural gas-fired generation. There is no evident basis to assume that by providing Quebec a premium for all existing imports actually achieves any of the substantive emission reduction objectives of this deal. Ontarians will most likely be paying more for what they are already receiving.

5.0 Contribution of Ontario's Wholesale Energy Market and Carbon Pricing

The Ontario/Quebec agreement is premised on using the wholesale energy market to affect the energy transactions. At present, indications are that the wholesale electricity market is functioning perfectly. Prices have been set and the IESO has dispatched supply accordingly. Furthermore, in 2017, Quebec imports garnered material market price increases to the benefit of that province. Ontario's net payments to Quebec went up $8M in the first six months of 2017, just based on the market price.

Ontario's Cap and Trade Program may also be achieving some of its desired environmental effect. The Program has increased the electricity market price, and hence cost to Ontarians, of Ontario's variable generation by 30%, providing the basis for Quebec imports to capture that increased value and displace Ontario natural gas-fired generation. With the additional margin created by the carbon price, Quebec appears to be adept at undercutting Ontario's gas-fired generation and securing the aforementioned growth in market share in the winter of 2017.

The analysis indicates that Ontario's wholesale market mechanism and the carbon price is already pushing electricity prices up. The market has set a price to achieve the flows desired and that price will continue to grow over the next 5 years. There should be little need to pay additional off-market premiums for Quebec imports.

One alternative would be to let the market price drift up with the cost of carbon. Once the price is sufficiently higher than the U.S. markets, exports to the U.S. may begin to drop, particularly for natural gas-fired generation. The market pricing implications due to Ontario's carbon price can be expected to erode the exports of natural gas-fired generation over time and achieve Ontario's emission reduction objective.

6.0. Conclusion

While public details on the Ontario-Quebec electricity trade agreement are slim, when the economics of this agreement are examined, the energy portion of this deal will increase costs to Ontarians, not decrease them.

The capacity agreement is a good one and should be treated in isolation so as not to mask the excessive costs associated with the energy trading arrangement. It is unlikely that Ontario will realize the anticipated benefits of the deal as the risks in energy trading costs are likely to offset the benefit of the capacity exchange agreement. There is clear evidence that a premium price in the range of $45/MWh to $55/MWh will be paid to Quebec under this agreement. This premium price is almost double what the 2017 market prices showed were necessary to attract electricity from Quebec.

The deal involves many inherent risks. The arrangement suggests strong incentives for Quebec to export more to Ontario and import less, further eroding the energy cycling benefit by occupying the interties and increasing the volume of imports over which the premium will be paid by Ontario. The identified risks could see this energy arrangement costing Ontario consumers $200M more over its full term.

There is no evidence to suggest the Ontario/Quebec agreement will further reduce GHGs in Ontario's electricity system. Both provinces will have surplus low carbon energy for the foreseeable future due to their respective over-investments in capacity, largely for intermittent wind and solar generation. The deal is specific to Ontario's domestic use of Quebec imports and the data shows that Ontario has already maxed out its ability to offset GHGs with imports. Most of the remaining GHG emissions in the electricity system are associated with exports to the U.S..

The wholesale market, not political intervention, offers a perfect mechanism for managing increased imports from Quebec as the carbon price works its way through the system. The market clearing price is already becoming attractive to Quebec and will continue to be as fuel costs and carbon prices rise. Through the wholesale market mechanism, the U.S. will eventually wean itself from Ontario's higher carbon-priced natural gas-fired generation exports. This is also the purpose of Ontario and Quebec Cap and Trade Programs.

With this deal, Ontarians should expect to be paying more for what they already get because of the premium pricing provisions contained within it. There is no evidence supporting that a price premium for Quebec's imports would reduce GHGs in Ontario. It's bad economics to lock Ontarians into a deal where they are subsidizing the cost of Quebec's surplus to its rate-payers at the expense of Ontario's own rate-payers.

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Appendix B - List of Abbreviations

CO_2 – Carbon Dioxide
DNGS – Darlington Nuclear Generating Station
GHG – Greenhouse Gas
GW – Gigawatt
GWh – Gigawatt Hour (one billion watts being produced for 1 hour)
HOEP – Hourly Ontario Energy Price (wholesale market)
HQ – Hydro Quebec
HQD – Hydro Quebec Distribution
HQP – Hydro Quebec Production
IESO – Independent Electricity System Operator
LTEP – Long Term Energy Plan
Mt – Million Tonnes – also referred to as megatonnes
MW – Megawatt
MWh – Megawatt Hour (one million watts being produced for 1 hour, enough to power ten thousand 100W light bulbs for one hour)
NERC – North American Electricity Reliability Corporation
NHR – Non-Hydro Renewables
NPCC – Northeast Power Coordinating Council
NUG – Non-Utility Generator
OEA – Ontario Energy Association
OEB – Ontario Energy Board
OPG – Ontario Power Generation Inc.
PNGS – Pickering Nuclear Generating Station
RPP – Regulated Price Plan
SBG – Surplus Baseload Generation
SCGT – Simple Cycle Gas Turbine
TWh – Terawatt hour (one trillion watts being produced for 1 hour)
Tx – Transmission
U.S. – United States of America

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