Review of Ontario Interties

Prepared for the Minister of Energy by
the Independent Electricity System Operator
and the Ontario Power Authority

October 14, 2014

ONTARIO POWER AUTHORITY

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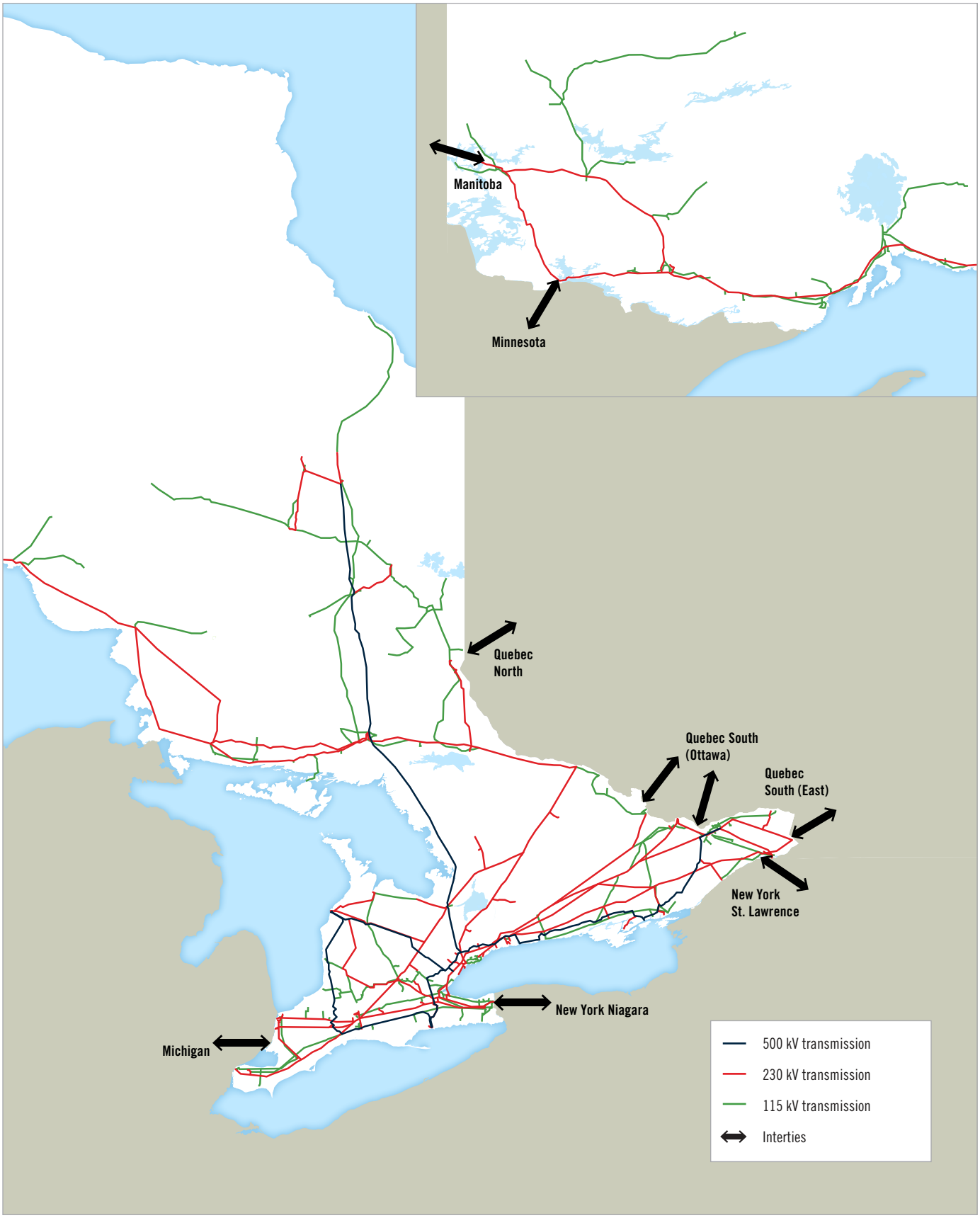
Contents

Interconnections with Other Jurisdictions



Executive Summary

Ontario has generally maintained sufficient resource capability within the province to be self-sufficient. The province has now transitioned to a new resource supply mix, including shutting down coal-fired facilities, building modern natural gas facilities and increasing its reliance on renewable energy, conservation, storage and demand response. Given Ontario's major restructuring to a low-carbon electricity system, the future role for the interties, and in particular the possibility of longer-term reliance on inter-jurisdictional clean-energy transactions, warrants consideration.

This report by the IESO and the OPA is in response to the request from the Minister of Energy for a review of the impacts and opportunities that may exist on Ontario's intertie connections to support demand and reliability requirements of the power system.

Ontario's interconnections with neighbouring jurisdictions have been of significant benefit to the province since the first connection between Ontario and New York was established more than 110 years ago. Currently, Ontario imports electricity on an hour-by-hour basis delivered across 26 interties with two provinces and three states. These non-firm arrangements have helped to enhance reliability for the province and reduce costs for Ontario consumers.

The interties provide operational and planning flexibility that enhance the reliability and the cost effectiveness of the Ontario electricity system. They also provide much needed support during emergency events, such as a sudden loss of a significant generating source or loss of transmission elements.

Flexibility is a key attribute of the existing interconnections, with the IESO utilizing that flexibility to meet changing supply-demand conditions in Ontario. Expanding the use of the existing interties for firm import arrangements – which would lock-in the availability of the interties on a real-time basis – could reduce that flexibility. Detailed analysis would be required to ensure that the reliable and efficient operation of the varied resource mix within Ontario's electricity system is maintained or enhanced under any proposed firm import scenario.

The firm import capacity is currently limited. There would need to be significant upgrades, including new transmission elements, to Ontario's transmission system and possibly new intertie capabilities to meet any marked increase in firm imports.

The cost of those enhancements would vary depending on the quantity of capacity being imported. There could also be the cost of new facilities that would likely be required in the exporting jurisdiction. The ability of suppliers to sell power at higher prices to markets other than Ontario could also push up the potential sale price to Ontario.

Transmission upgrades would also require regulatory and environmental assessment processes with long lead times, which brings into question the feasibility of firm import arrangements to meet the future baseload needs of the system identified in the 2013 Long Term Energy Plan (LTEP).

All of these factors could result in paying significantly more for firm imports than could be achieved through addressing supply needs with internal resources.

It is important to understand that the current interconnection system was not designed to be used to replace a significant amount of existing baseload facilities. In addition, such a fundamental reliance on significant firm import quantities would result in stranded costs for Ontario investments in existing generation and transmission assets. For example, the recently constructed new 500 kV Bruce transmission line was constructed in large part to deliver additional supply from the Bruce Nuclear Station. However, a smaller firm import agreement may be mutually beneficial given the complementary differences in the two jurisdictions. Quebec is a winter-peaking jurisdiction while Ontario's peaks generally occur in the summer. This provides opportunities for each jurisdiction to tap into the other's spare capacity when it is available.

This report focuses on the technical capabilities of Ontario's interties and transmission system as well as possible infrastructure investments, commercial arrangements and market factors that could influence decisions on potential firm import arrangements. It does not address the policy aspects or regulatory considerations of entering into long-term import arrangements. Nor does it assess the economic benefits of job creation and associated benefits of the construction and maintenance of generation situated in Ontario.

The Quebec intertie is quite restricted due to Ottawa area load/supply issues with up to 500 megawatts (MW) of import capability being available. This capacity value is expected to reduce to zero by 2020 as the load in the area increases. Scenarios for delivery from Quebec that would require additional transmission investment in Ontario are addressed in the report. In the northwest, up to 200 MW from Manitoba could be relied upon to meet local area needs.

With regard to firm import arrangement with the U.S., Ontario is a net exporter to markets in New York, Minnesota and Michigan. Due to the higher prices and the higher carbon footprint of the supply mix used in those jurisdictions as well as limitations on the interties and transmission systems, a firm import arrangement would be of little value for Ontario ratepayers.

If economic, the interties could provide alternatives to fill some supply needs as they evolve over the period outlined in the 2013 LTEP. Firm imports could be relied upon to meet the province's adequacy requirements if they can be achieved without compromising the reliability benefits of the current interties, and at a cost-effective price that takes into account the investment for any needed transmission enhancements.

Firm imports can be acquired either through contracts or through a market mechanism such as a capacity auction. Structured properly, both types of arrangements could play a role in utilizing Ontario interconnections in the interest of Ontario ratepayers, and both have been used in other jurisdictions. In addition to imports, the interties could be utilized to allow Ontario generators to sell capacity that is surplus to the province's needs to an external jurisdiction. This would provide revenues to facility owners, helping them to remain viable and provide energy in Ontario when economic, with potential savings for the Ontario ratepayer. The IESO is actively considering a capacity auction for Ontario, and as part of its mandate, the OPA periodically explores opportunities for medium- to long-term import arrangements with other jurisdictions.

The IESO and the OPA offer this recommended course of action for consideration by the Ministry:

1. The OPA and the IESO should work with Hydro-Quebec and Manitoba Hydro to explore opportunities for clean imports when such imports would have system benefits and are cost effective for Ontario ratepayers.
2. The OPA should continue to evaluate and regularly update the Minister of Energy on the specific parameters for clean-energy import arrangements that would best meet Ontario's needs and circumstances.
3. The IESO should allow for capacity imports and exports in developing the design for a potential capacity market for Ontario.
4. In providing for capacity imports and exports, the current ability of the interconnections to support reliability and operating flexibility should be maintained. This will mean that only a portion of intertie capacity could be allocated for capacity imports.
5. Opportunities to enhance the benefits of the interties should be pursued by the IESO, including more frequent intertie scheduling, and expanded provision of ancillary services through intertie transactions.

Introduction

As indicated in the 2013 LTEP, opportunities for clean imports should be considered. This report by the IESO and the OPA is in response to the request from the Minister of Energy for a review of the impacts and opportunities that may exist on Ontario's intertie connections to support demand and reliability requirements of the power system (See Appendix A – Letter to IESO, Appendix B – Directive to OPA). In conducting this review, the IESO and the OPA were asked to engage and involve stakeholders (see Appendix C) to identify considerations and provide recommendations.

The report focuses on the technical capabilities of the interties and the Ontario transmission system as it relates to the need for additional resources in Ontario over the planning period outlined in the 2013 LTEP. The 2013 LTEP states that opportunities for clean imports will be considered when they would have system benefits and are cost effective for Ontario ratepayers.

The report also outlines possible infrastructure investments and market factors that could influence decisions on a potential firm import arrangement. As well as potential commercial arrangements for evolving Ontario's use of the interties, the report outlines the corresponding planning and scheduling requirements that would need to be considered.

Finally, it considers Ontario's future needs, various import scenarios, including increasing the firm import capability, and assesses the technical capability of the existing Ontario facilities to accommodate increased reliance on firm imports.

It does not address the policy or regulatory considerations. The transmission enhancements considered in this report are for illustrative purposes only and specific detailed design, analysis and assessment would be required before reaching conclusions on any firm import option being considered.

The Current Landscape in Ontario

The 2013 LTEP identifies the province's long-term intentions for meeting Ontario's adequacy needs. As noted in the 2013 LTEP, although planned resources are expected to be able to meet the energy needs over the plan, there is a potential emerging requirement for new capacity starting around 2019/2020, including:

- An overall system need averaging about 2,200 MW, with up to 3,500 MW in summer peaking capacity mainly to be delivered to the Greater Toronto Area (GTA). The amount and duration is highly dependent on the nuclear refurbishment schedule.
- A smaller localized need evolving in the Northwest that is highly dependent on load growth tied to natural resource development in the area north of Dryden.

The overall system need arises as load grows, Pickering nuclear generation station retires and Bruce and Darlington units are refurbished. The 2013 LTEP stated that Ontario plans to refurbish units at Darlington and Bruce nuclear generating stations. The facilities that will be refurbished currently deliver approximately 8,300 MW of capacity and, operating virtually around the clock, provide about 65 terawatt-hours (TWh) of energy each year, which will be over 40 per cent of the energy needs for the province.

Most of the increased need for energy can be delivered by increasing the use of existing resources from existing combined-cycle gas facilities that are not fully utilized in the off-peak hours. However, during the peak hours when both the nuclear units and these existing gas plants will typically be in service, additional facilities will be required to make up the difference.

The 2013 LTEP's "Planned Flexibility" approach outlines several alternative resources available to meet these needs within the province including:

- further conservation and renewable supply
- non-utility generator (NUG) re-contracting
- conversion of Lambton/Nanticoke to gas
- new generation facilities in Ontario

These alternative sources would have job creation and economic development opportunities for Ontario in addition to their electricity system contributions. Some have the potential to provide relatively low-cost solutions for the peaking capacity requirements.

The 2013 LTEP also identifies the potential use of firm, clean imports when such imports have a system benefit and are cost effective for Ontario ratepayers to meet Ontario energy needs. At present there are no firm arrangements in place with neighbouring jurisdictions to supplement Ontario's adequacy requirements.

As with all alternatives the cost consideration will include not only the cost of the commodity, but also any other incremental costs to transmit the commodity to the load centre. This report explores these considerations for imports.

Although each decision will be evaluated on specific cost/price and conditions of delivery, the benchmark comparison is the all-in price for new generation in Ontario. Currently the benchmark would be priced as a newly built simple-cycle facility to provide the capacity (~$130,000/MW/year) with the energy at the average expected system marginal cost (~$35 to $40 / per MWh). The price paid at the border needs to be on average lower than $50 to $60/MWh when considering the all-in cost of even modest transmission investments.

As described above, although there is a need for both capacity and energy, the majority of the additional energy can be supplied from existing resources but on-peak new capacity is required.

Role of the Interties in Ontario

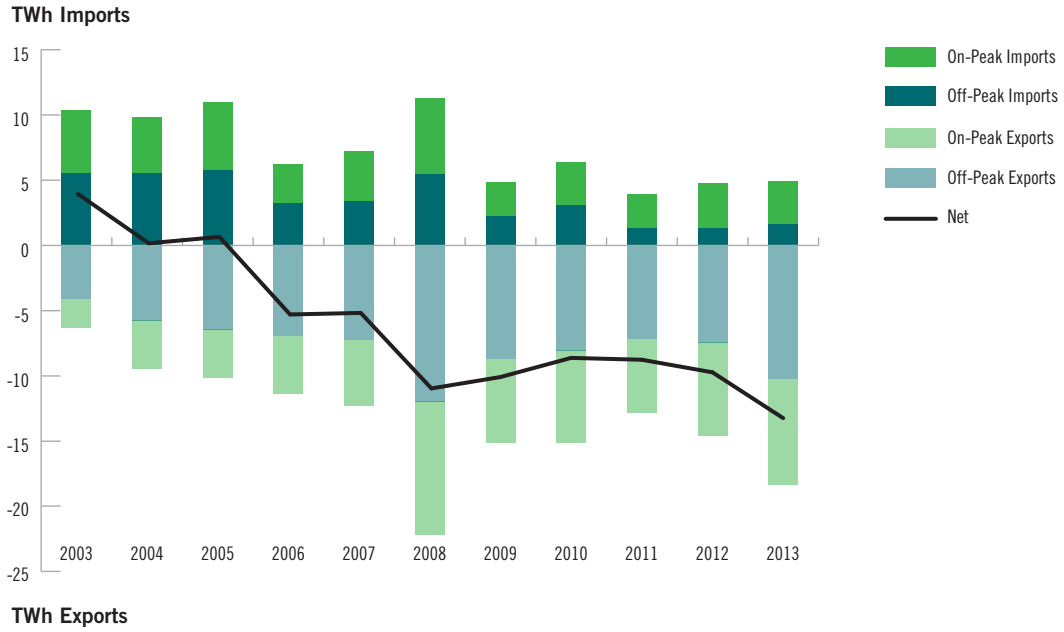
Ontario's interconnections with neighbouring jurisdictions have been of significant benefit to the province since the first connection between Ontario and New York was established more than 110 years ago. Non-firm imports averaging about 850 MW per hour since market opening, reaching as high as 4,500 MW being delivered across 26 interties with two provinces and three states, have helped to enhance reliability for the province and reduce costs for Ontario consumers.

Their overall import and export capability varies depending on internal constraints in the Ontario and neighbouring transmission systems.

Ontario has been a net exporter of energy for a number of years, primarily to U.S. jurisdictions, but was a net importer throughout the early 2000s.

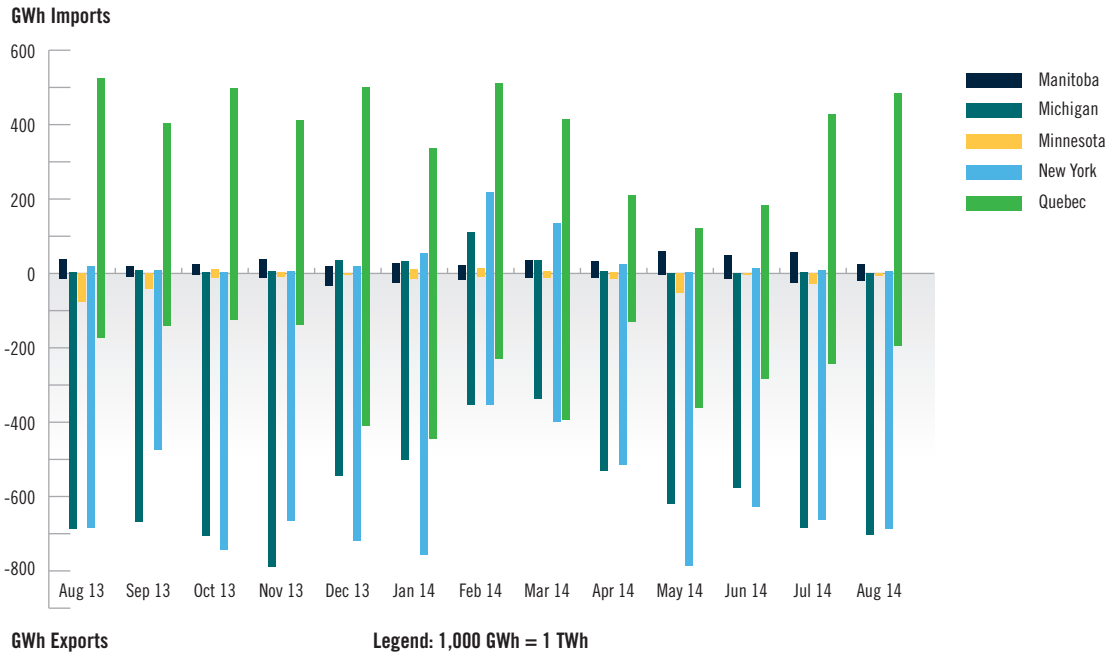
The figure below illustrates Ontario's export and import activity since 2003.

Annual Ontario Exports and Imports



And while Ontario is electrically interconnected with Manitoba, Minnesota, Michigan, New York and Quebec, the interties allow for the trade of electricity beyond those jurisdictions. Transactions can reach across eastern North America, contributing to a more diversified and competitive pool of supply.

Imports/Exports per Jurisdiction (Monthly Total)



The current interties have been developed mainly to enable inter-regional reliability support, thereby providing flexibility and helping to support reliable operation.

The use of the interties has historically helped system operators address near-term power needs, as those needs varied over time. A decade ago, given the shortage of Ontario-based supply, the province was heavily reliant on the interconnections to help meet Ontario's summer peak demands. Ontario now has sufficient domestic supply to meet its own needs, and over the past five years has relied on the interconnections with neighbouring jurisdictions to more efficiently manage periods of surplus baseload generation.

The interties help stabilize normal minute-to-minute fluctuations by providing a large pool of generation and load that helps absorb normal fluctuations and keeps the system running smoothly. The interconnections also provide much needed support immediately following emergency events, such as a sudden loss of a significant generating source or loss of transmission elements. The July 2013 flooding in the west end of Toronto is an example of an event where the interties help maintain reliability during unforeseen contingency events.

On July 8, 2013, a severe storm passed over the Greater Toronto Area (GTA), resulting in record rainfalls that caused localized flooding and subsequent damage to telecommunications, protections, and station service equipment at the Richview and Manby transformer stations. The damaged equipment resulted in the interruption of 3,800 MW of load within the GTA over a 25-minute period – with the result that Ontario was "over-generated" by that amount.

As a consequence, intertie flows increased into neighbouring jurisdictions – with New York and Michigan increasing intertie flows by approximately 800 MW and 900 MW respectively. Having the interties available helped to absorb the excess generation created by the event, with no adverse impact on those jurisdictions.

This ongoing exchange of electricity enhances reliability in Ontario and neighbouring systems while offering consumers potentially lower-cost sources of supply. Some of this exchange occurs as part of the design of the system to respond to increases or decreases in demand with the closest generators responding according to the physics of the electricity system. This provides the buffer to maintain flexibility, power quality and reliability throughout the interconnected system.

The interties also provide operational and planning flexibility that enhance the reliability and the cost effectiveness of the Ontario electricity system.

When there is spare generating capability on one system and market prices are favourable, power can be exchanged from one jurisdiction to the other if there is room on the intertie and both transmission systems. These types of exchanges result in better utilization of existing assets and more efficient use of variable cost components (like fuel) for both jurisdictions. These types of exchanges are called interruptible transactions and require the receiving jurisdiction to have additional capacity on hand to ensure system demand can be met in the event the transaction is curtailed.

Firm transactions that can be counted on to meet Ontario's adequacy needs must have assurance of dedicated generation capacity from the sending jurisdiction and a reliable transmission path through to the receiving jurisdiction's load centre.

Current transactions on the interties are non-firm and consequently rely on the real-time power system conditions on an hourly basis.

Energy, Capacity and Operating Reserves

There are several products and services required to operate the Ontario electricity system including energy, capacity and ancillary services such as operating reserve.

Energy and operating reserve are currently transacted over the interties on an hourly basis. Where out-of-province energy or operating reserve are more economic than domestic sources, out-of-province transactions are committed in the real-time energy and operating reserve markets, thus lowering costs for Ontario consumers.

Currently, Ontario does not use the interties for capacity transactions, relying instead on internal resources to meet its long-term planning requirements.

Economic Benefits of the Interties

Through Ontario's wholesale electricity market, interties allow energy providers from outside Ontario to compete with domestic suppliers every hour to meet the province's electricity needs at the lowest cost. This is achieved through transparent price signals that help ensure the least-cost energy resources in the region are used.

The exchanges made through Ontario's wholesale market also provide opportunities to better utilize Ontario facilities. Significant investments have been made on behalf of Ontario consumers to add generation capacity to meet the province's needs. At times of lower demand, when that generation is not required to meet provincial needs, it can be used to generate electricity for export, which brings in revenue to help cover fixed costs that otherwise would have to be paid for by Ontario consumers.

Exporters are charged an export transmission tariff of $2/MWh, which is paid to Ontario transmitters for using Ontario's transmission system. The transmission revenue recovered from exporters reduces the costs that Ontario consumers would otherwise have to pay.

Over the 12-month period between April 2013 and March 2014, consumer costs were reduced by approximately $300 million on volumes of 5.21 TWh of imports and 18.9 TWh of exports, as a result of trade with neighbouring states and provinces.

Not only do the interties support a more reliable interconnected system under a range of operating conditions, they also factor into near-term power system planning decisions.

This ability to rely on imports in the near term provides more opportunities for planned outages to support the maintenance of Ontario's generation and transmission facilities. From a near-term planning perspective, up to 700 MW of imports are explicitly factored into assessing whether a specific outage can proceed.

The availability of the interconnections was one of many factors considered when Ontario embarked on the construction of large multi-unit generation facilities, often remotely located from the larger load centres. In the absence of the interties, Ontario costs would be significantly higher to achieve the same quality of service it currently receives.

While the current Ontario wholesale market is effective at leveraging the interties to provide reliability and economic benefits to Ontario, there may be opportunities for additional utilization of the interties that could further enhance those benefits.

Reliability Benefits of the Interties

Interties help system operators address power system needs and adapt to changes in system conditions, both anticipated and unanticipated.

The interties have been essential to allow for the relatively seamless evolution of Ontario's supply mix over the past 10 years, facilitating the elimination of coal and the introduction of variable renewable generation.

In the normal course of operations, the interties:

- Provide a reliable and cost-effective means to manage surplus baseload generation, at least during short periods of over-supply through exports.
- Maintain stability to the system through frequency and voltage regulation.
- Facilitate economic power transfers and enhance the interconnected system's ability to withstand disturbances. In the event of a significant loss of Ontario generation, the interties act like a large shock absorber, instantly spreading the impact of the loss across multiple interconnection points until replacement resources in Ontario can restore Ontario's supply-demand balance.
- Allow Ontario to provide assistance to other jurisdictions during contingencies external to the province.

The ability to draw on the interties during peak demand periods provides an added reliability benefit. In the event of extreme situations that fall outside of normal planning assumptions (for example, a combination of a drought-limited hydro output combined with a large number of unplanned generation outages), imports from other jurisdictions may assist in avoiding reliability issues in Ontario.

Although the system is planned, built and operated to high levels of reliability based on Ontario resources, the interties provide additional buffering and reliability to keep disturbances to customers to a minimum. Each jurisdiction plans to be self-supporting based on statistical standards for reliability with no assistance from the interties other than committed firm imports. The interties provide reliability over and above those planning criteria. In real-time operations, the benefits of the interties can be seen almost every day in maintaining system frequency and voltages, for operating reserve and on many occasions to deal with extreme situations.

Furthermore, the distribution of the interties around the province ensures that all regions of the province have access to this capability. If the interties were not available, more resources would be required to maintain today's level of reliability in the system. Therefore, in considering potential import arrangements, a certain level of the intertie capability needs to remain available to maintain this operational flexibility. Currently, commercial transactions use the interties with the understanding that they can be cut at any time to deal with operational concerns.

It is essential that any long-term firm transaction recognise the need to maintain this buffer for operational reliability. Therefore in considering quantities of firm imports that would utilize significant portions of interties, it should be recognized that the results of studies to assess the needed buffer are required before firm commitments can be made.

Opportunities for Additional Intertie Benefits

While the current arrangements with respect to intertie transactions and operating reserve are working well, opportunities are available to enhance the benefits, through more frequent scheduling of transactions, expanding the provision of ancillary services, and using the interties for the purchase or sale of capacity.

More Frequent Scheduling

Intertie transactions are currently scheduled on an hourly basis in Ontario as they have been since the market opened in 2002. This results in intertie transactions being committed approximately 45 minutes before they are scheduled to flow and are locked in for the entire hour regardless of any operational changes, including generation or transmission contingencies that may occur subsequent to the commitment decision.

Over the last several years, neighbouring jurisdictions have implemented 15-minute intertie scheduling, which has now become a regulatory standard in the U.S.[1]

In observing the trend in the U.S., the IESO undertook a review of more frequent intertie scheduling.[2] In 2013, the IESO released a study paper concluding that more frequent intertie scheduling would provide system benefits and increase market efficiency by lowering the overall system costs of meeting demand.[3]

Stakeholders who participated in the consultation were generally supportive of more frequent intertie scheduling. The IESO will be including more frequent intertie scheduling in its broader market development plan to improve the efficiency and the effectiveness of Ontario's electricity market.

Expanding the Provision of Ancillary Services

Stakeholders have also expressed an interest in Ontario investigating new opportunities to provide ancillary services through intertie transactions. This could include, for example, optimizing the allowable quantities of 10-minute operating reserve provided through the interties.

In late 2013, the IESO and Hydro-Québec TransÉnergie began testing the scheduling of 10-minute non-synchronized and 30-minute operating reserve markets over the Ontario-Quebec interties. The intent of the test is to determine if operating reserve activations in the 10-minute non-synchronized operating reserve market can be successful between the two balancing authorities, and to identify any technical issues either with the IESO or Hydro-Québec TransÉnergie. Testing of this product started at 10 MW and has since been increased to 50 MW.

[1] See 139 FERC ¶ 61,246, United States of America, Federal Energy Regulatory Commission, 18 CFR Part 35, [Docket No. RM10-11-000; Order No. 764], Integration of Variable Energy Resources, (Issued June 22, 2012) and 141 FERC ¶ 61,232 United States of America, Federal Energy Regulatory Commission, Order No. 764-A, Order on Rehearing and Clarification and Granting Motion for Extension of Time, (Issued December 20, 2012)

[2] IESO stakeholder engagement SE-115 More Frequent Intertie Scheduling

[3] http://www.ieso.ca/Documents/consult/se115/se115_20130926_Study.pdf

The IESO expects to further increase this to 100 MW in the near future.

In addition to scheduling operating reserve on the interties, the IESO also participates in the Northeast Power Coordinating Council (NPCC) Simultaneous Activation of 10-Minute Reserve ("SAR")[4] program which supports reliable interconnected operation.

Depending on the findings, there may be other opportunities for intertie transactions to further support Ontario's reliability requirements.

Capacity Exports and Imports

As noted earlier, energy is already imported and exported over the interties through the Ontario wholesale market every hour of every day. While adding to overall market efficiency, these transactions do not contribute to the province's long-term adequacy requirements, as there is no firm commitment beyond one hour to deliver the energy.

The interties could, however, also be used to obtain capacity resources. Unlike hourly energy transactions, capacity obtained on the interties would be available to meet Ontario's resource adequacy requirements.

Currently, Ontario only uses domestic resources to meet its resource adequacy requirements, securing these resources either through a contract with the OPA or, in the case of OPG, through regulation. Like energy transactions, the introduction of competition for capacity from resources outside of Ontario should help to drive lower costs.

Ontario could also allow the export of excess domestic capacity resources should they not be required or contracted to meet Ontario's resource adequacy requirements. This could provide the owners of existing assets with additional revenues, turning potentially unprofitable assets that otherwise might cease to operate in Ontario into profitable assets that can continue to operate in Ontario, and compete to provide energy to meet Ontario's demands in most hours.

More importantly, by keeping these assets operating they would be available should they be needed to meet a future Ontario capacity need at a lower cost than having to build additional new generation. Allowing these plants to remain profitable and stay in Ontario also means that the jobs, corporate tax revenues and other spin-off economic benefits would remain in the province.

Participating stakeholder feedback supported expanding the use of the interties for capacity-backed transactions and identified areas of concern that should be addressed as part of future market development work. Some of the highlighted areas include the need for changes to transmission rights, an appropriate price signal and potential Market Rule amendments.

In short, there are a wide range of possible proposals that could be explored to use the interconnections to meet Ontario's demand and reliability requirements in a cost-effective way.

[4] SAR is a program in which two or more Balancing Authorities agree to individually maintain but jointly activate 10-minute reserve to facilitate a more rapid recovery from a generation loss of 500 MW or more, or for stressed system conditions.

Commercial Considerations

Options

Purchasing capacity over the interties could be achieved either through a capacity auction mechanism or some form of provincial contract with external sellers. Some U.S. jurisdictions already employ capacity auctions and the IESO, with the support of the OPA, is currently exploring a capacity auction mechanism for Ontario. Consideration for including imported capacity is included in the IESO's ongoing Capacity Auction public stakeholder consultations.

Exporters of electricity regularly seek opportunities to sell electricity into Ontario and have from time to time expressed interest in signing longer-term arrangements with Ontario. As part of its mandate to plan for a reliable, cost-effective and clean electricity system in Ontario, the OPA periodically explores opportunities for medium- to long-term import arrangements with other jurisdictions, including Manitoba, Newfoundland and Labrador and most recently with Quebec.

There are a number of different ways in which a firm import deal could be structured. To understand these, it is important to define the terms Capacity and Energy.

Capacity: Measured in units of MW, this is an amount of power that must be delivered "on demand." A capacity purchase can defer or eliminate a new build peaking generator.

Energy: Measured in units of MWh, this is a quantity of energy that is available for delivery over a specified period of time. There is no commitment to "on demand" delivery or for a certain capacity at a given time. An energy purchase cannot usually defer the need for a new build but is used to reduce the "fuel" costs.

A firm import deal could be structured as only capacity or energy or a combination of the two.

Capacity Imports

A capacity-only agreement is designed to address peaking requirements and can be used to avoid or usually defer a new build or to address a short-term adequacy shortfall – for example to accommodate a nuclear refurbishment.

A capacity-only arrangement involves reserving the rights to a certain megawatt quantity to be delivered on demand. These capacity arrangements usually have a relatively low fixed cost that reserves the megawatt quantity but have a variable energy cost, so they may not be economical if the megawatts are needed over long periods of time. This is based on the fact that they are often linked to resources with the same characteristics (lower fixed costs and higher variable) like simple-cycle turbines.

It is important to note that a capacity import would be considered in long-term capacity adequacy planning as it is equivalent to internal generation capacity. Capacity is usually the critical driver in the economics of this type of contract. The energy component is a small element and can often be simply tied to the system marginal price.

Energy Imports

An energy-only deal could be structured such that Ontario is purchasing a number of megawatt-hours over a specific time frame. For example, if the deal was for 8,760 MWh of firm energy over one year, the energy could be delivered over the year at the rate of 1 MW per hour every hour of the year or 500 MW over 17.5 hours. Usually in these types of contracts, the schedule for delivery is based on mutual agreement which would take into account supply limitations such as the ability to deliver megawatts during the peak times. Firm energy imports would not be considered in long-term adequacy planning as they cannot be relied upon for delivery at all times.

Risks

Whether through a capacity market or procurement contract, these transactions would need to ensure that Ontario's electricity needs are met even in tight supply situations, while striking the right balance between short-term flexibility and medium- to long-term certainty.

In the case of purchases made through a capacity auction, the obligation would be on the IESO to assure these criteria are laid out as obligations to the seller through the IESO's Market Rules. In the case of a procurement contract, it would be the responsibility of the purchasing party (such as the OPA) in Ontario to ensure that these criteria and requirements are included in the contract. To ensure availability and delivery of capacity, the arrangements would have to satisfy a set of planning, scheduling, and curtailment requirements such as those outlined in Appendix D.

It would be important to structure an arrangement on terms that reflect Ontario's needs and mitigate financial risk. One significant risk is that the price paid over the life of any arrangement, longer-term contract or otherwise, could be higher than the price that would have been paid had the energy been secured hourly through the Ontario wholesale markets.

The seller could require a material premium above future expected market prices reflecting the seller's risk for providing the firmness of sale. In addition, both the buyer and seller are exposed to risk that future market conditions change in an unfavourable way from the conditions that were expected at the time of the arrangement. Locking into a firm arrangement through a long-term contract with one seller reduces the flexibility to choose from several sellers in the future who may then be willing to sell their energy for less than the earlier contracted price.

A second financial risk is that the amount of energy purchased through a firm import arrangement could be in excess of Ontario's future need. Ontario's energy demand varies hourly and seasonally. There may be periods over the life of the import arrangement when Ontario does not require the energy – so even if Ontario was able to negotiate a reasonable price up front, the energy is locked in on a take-or-pay basis.

The firmness of delivery during times when the energy is surplus to Ontario's needs could also contribute to surplus baseload generation conditions, necessitating the reduction of electricity produced from Ontario baseload generation assets.

A firm energy arrangement could also create operational risk to the Ontario system. As discussed above, the interties provide operational and planning flexibility that could be compromised by locking up the interties to accommodate a firm import arrangement.

Finally, it is also important to recognize that the capability of the transmission system within Ontario is as significant as the intertie capability itself. Prior to any agreement being made, it would be important to ensure that a firm energy import would not adversely impact the functioning of the internal transmission system and can be delivered from the intertie through the internal transmission system to Ontario load centres.

These risks that will need to be addressed and mitigated as interconnection opportunities are explored, including in the areas of term, structures (e.g., daily, monthly, seasonal versus longer term) and risk sharing.

It should also be recognized there are potential commercial benefits to firm arrangements, which will need to be balanced against these risks.

Pricing the Firm Imports at the Ontario Border

In Ontario and indeed for most of northeastern North America, the benchmark for import prices tends to be the capacity cost of a simple-cycle gas turbine (SCGT) and the marginal cost for energy from a combined-cycle gas turbine (CCGT).

The price Ontario could expect to pay for firm imports would depend on several factors:

- type of contract (capacity and/or energy)
- product delivered (e.g., baseload, shaped or scheduled)
- length of the agreement
- cost of transmission enhancements needed to deliver the product to the Ontario border

Also any substantial firm import deal with Ontario would likely involve capacity and energy delivery that would require construction of new generation and transmission facilities by the selling jurisdiction. In that case, prices would likely be driven higher than current prices for energy.

Another consideration is the ability of suppliers to sell power at higher prices to markets other than Ontario. This factor has often explained why past discussions have not resulted in a firm contract price acceptable to Ontario. For example, Hydro-Québec exports hydroelectricity to jurisdictions at a premium, which is above the benchmark gas plant cost in Ontario.

With Ontario and most of the northeast being summer peaking systems, the availability of spare generating capacity for delivery to Ontario during summer peak periods is limited. It should also be noted that new environmental standard regulations in the U. S. are causing the marginal units to be decommissioned due to an inability to meet the new emissions standards. This has the effect of further reducing the spare capacity available in the Eastern Interconnect. These factors lead to upward pressure on the price that could be charged for any spare generation capacity, which could impact the cost to import power during summer peak periods.

Technical Considerations

Planning considerations are also key in evaluating the role of interties in Ontario's power system. As a rule, long-term planning takes a more conservative approach than near-term planning. Long-term planners need to design a system capable of adapting to a broad range of variables that can impact the power system's ability to reliably deliver power to consumers. These variables include:

- shifting economic conditions
- technological change that drives changes to energy consumption behaviours or introduces new forms of supply with different operating characteristics
- extreme weather patterns
- generator and transmission outages
- availability of fuel supplies – water to run hydroelectric resources, wind and sun for renewable resources and natural gas for the new natural gas fleet

As a result, planning for resource and transmission adequacy needs to incorporate many different scenarios – including those with a low probability of occurring. Resource adequacy criteria established by the North American Electric Reliability Corporation (NERC) and the Northeast Power Coordinating Council (NPCC) are applied by all power system planners in the northeastern part of North America. The critical driver in these criteria is the need to plan for a loss of load due to a resource deficiency that occurs no more than once in 10 years.

These prudent planning assumptions and resulting requirements for both resources and transmission will ensure that there is enough margin to allow for long-term uncertainty and unplanned events while still satisfying peak system demand and required reserves.

The scenarios below consider the expected capability of the existing assets on the power system to rely on firm imports to complement the provincial resource supply mix, and options for providing incremental import capability from Manitoba, Quebec, Michigan, Minnesota and New York.

As most of the province's interties are located at a considerable distance from major load centres, in particular the Greater Toronto/Hamilton Area that accounts for about 40 per cent of provincial demand, transmission capability was an important consideration when examining the various scenarios to ensure the considered import level could be delivered to the load centre. Most of the scenarios examined would require investment in new transmission.

The assessment of the options is based on three key forecast criteria for the 2020-2030 timeframe:

- Peak demands: These are the expected peak electricity demands in the 2020 – 2030 timeframe.
- Assumed generation available on peak: This is the expected generation available to supply the peak demands in the 2020 – 2030 timeframe. It considers what generating units are expected to be in service in this timeframe, forced outage rates to those generating units and the historical contribution from the different generation types during peak-loading conditions.
- Anticipated transfer capability: This is the maximum power that can flow across the transmission lines in Ontario and is based on potential limitations created by, among other things, extreme weather conditions and the in-service status of power system equipment.

If there isn't sufficient capability along the existing transmission lines, imports could create congestion and restrict the availability of other domestic resources that are needed to meet provincial adequacy requirements. In effect, this would mean that import supply from outside the province would at times only serve to replace another source within the province, providing little net benefit to the system but instead potentially adding considerable costs.

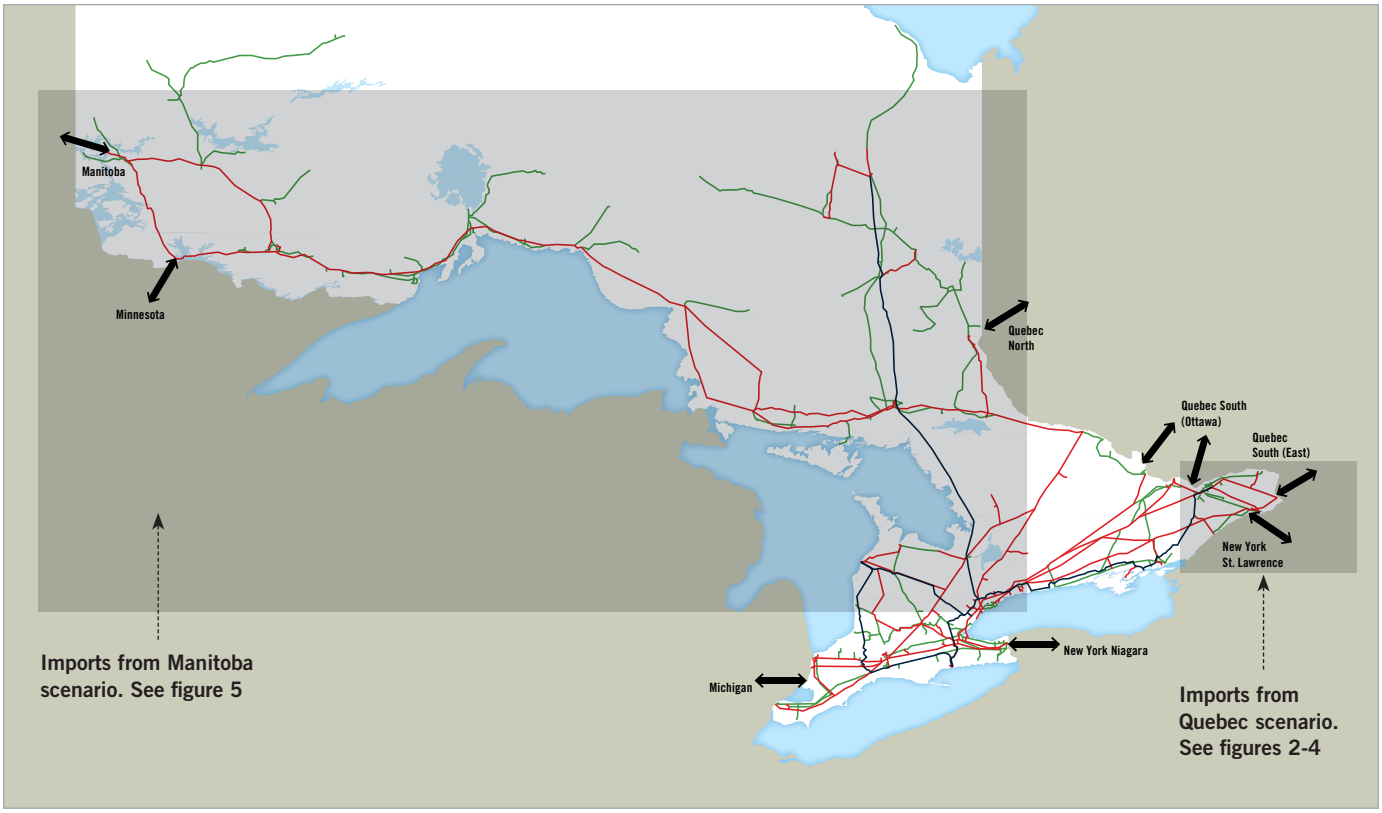
Evaluation of Import Scenarios

In looking at ways to use Ontario's interties to secure clean, firm capacity between 2020 and 2030, import arrangements for all of the province's interconnections were explored from a variety of perspectives.

The selected examples are representative of the range of possible options in terms of location and capability. The analysis that follows identifies the extent to which existing interties can deliver firm imports, the potential transmission enhancements within Ontario that would be required to accommodate the additional import levels, as well as the potential supplier constraints associated with selling firm capacity and energy to Ontario.

It should be noted the scenarios are only intended to demonstrate potential enhancements that would be required to achieve certain levels of transfer.

Figure 1: Ontario's Interties with Neighbouring Jurisdictions



Imports from Quebec

Ontario and Quebec have had a long and successful trading relationship over many decades – building on both previous contractual relationships and the growing ongoing regular transactions between the two provinces.

Quebec has substantial hydroelectric generation that provides considerable flexibility. Already significant energy transactions between Ontario and Quebec take place through the wholesale electricity market. Often, Ontario provides energy to Quebec at night, allowing the Quebec system to store hydro capability for use later in the day.

Over the last decade, new synergies have emerged.

Quebec has a winter peaking system and is currently capacity limited in the winter – but has spare capacity in the summer, as evidenced by Quebec's recently issued RFP for 500 MW of capacity for the winter months from 2014 to 2018 with an expected capacity factor of about five per cent.

Ontario, by comparison, is a summer-peaking province, which means the province has spare capacity in the winter, which could be exported. An agreement could be made to optimize day-night, weekly or seasonal operations potentially including some storage options.

Given these synergies, a firm import arrangement could potentially be developed. However, there are significant considerations that would need to be worked through, including intertie and transmission capacity and competition for Quebec's surplus energy, which could significantly affect the all-in cost for any long-term firm contracting situation. Any arrangement would need to include a delivery schedule that optimizes the attributes of both systems.

The current interties between Quebec and Ontario have a combined capacity of 2,775 MW; however transmission constraints in Ontario regularly limit available transfer capability between the two areas. Real-time transactions with Quebec have reached maximums of about 1,800 MW either way under ideal conditions over the last few years.

Just east of Ottawa, two 230 KV lines use a High Voltage Direct Current (HVDC) converter to transfer up to 1,250 MW of supply into or out of Ontario. This interconnection is relatively new and came into service in 2009. At other points along the Ottawa River, east of Cornwall, and in the Abitibi region, generation resources from either province are connected, or segregated, onto one system or the other depending on system and market conditions. The total import transfer capability of these segregated interties is 1,525 MW.

The following scenarios illustrate the import capability assuming the current and the additional transmission investments identified. It should be noted the scenarios are only intended to demonstrate potential enhancements that would be required to achieve certain levels of transfer.

Scenario 1: Status Quo – Imports up to 500 MW (to 2020):

At present the firm import capability that could be relied on for all hours on the Quebec–Ontario interties is quite restricted due to transmission issues in the Ottawa area, with the ability to accommodate only about 500 MW of firm capability on a regular basis; but even this could be limited during some extreme local conditions.

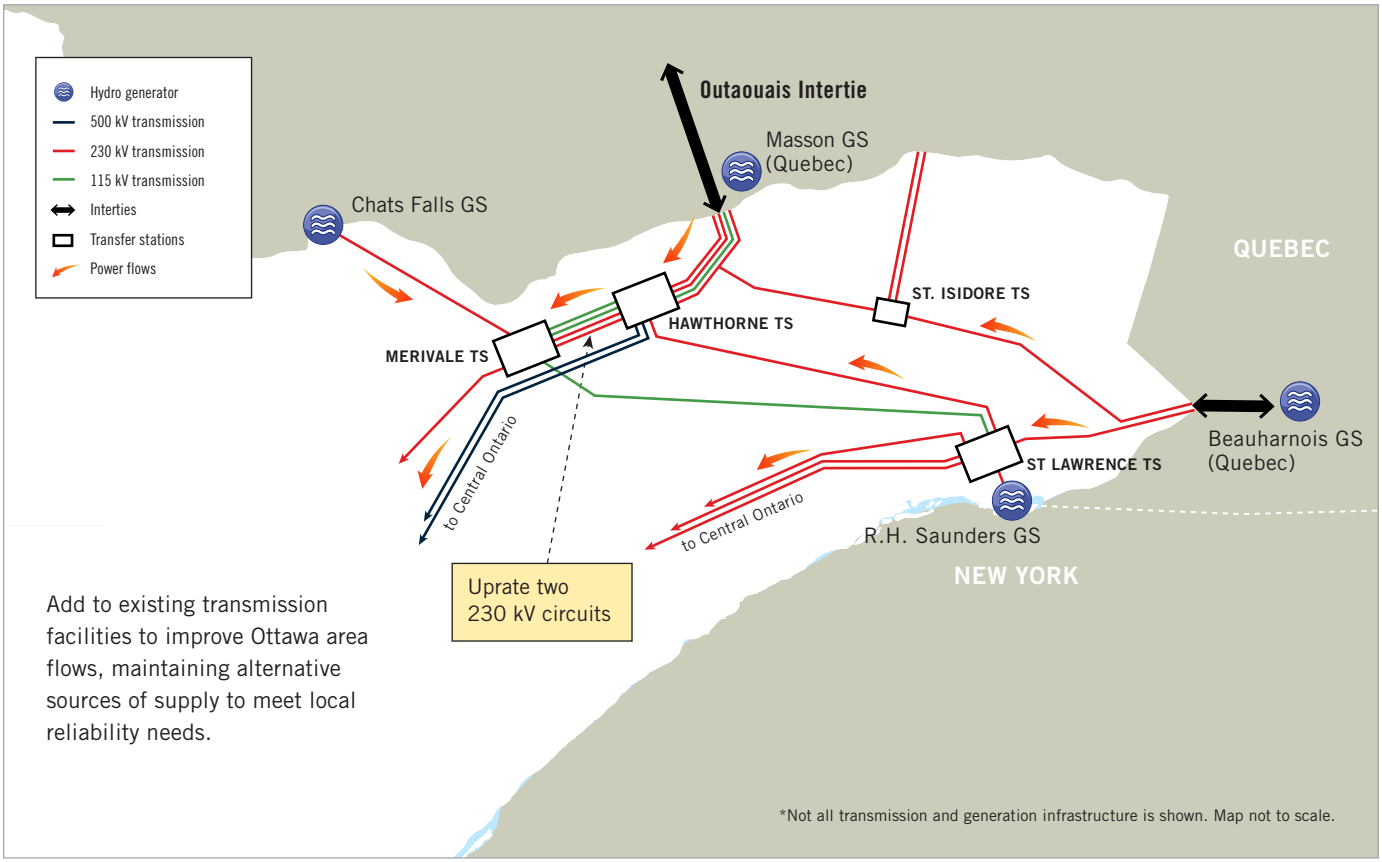
As Ottawa-area load increases in the period up to 2020, it is expected that no firm imports can be counted to flow through the Ottawa area from Quebec to meet Ontario peak load without significant transmission investments in that area.

The following lays out some of the possible transmission upgrades that could be needed to accommodate firm long-term arrangements between Ontario and Quebec.

Scenario 2: Imports up to 1,000 MW:

Load growth around the Ottawa area is fully utilizing local transmission capability, leaving little capacity if any to allow for a firm import during peak periods. A transmission upgrade in Ottawa is expected to be required in the future to meet local reliability needs. Upgrading the 230 kV circuits in Ottawa will meet local reliability needs and also allow firm imports of up to 1,000 MW on the high-voltage direct connection. The upgrades to meet local needs are required around 2020. The cost associated with these upgrades will be as high as $325 million and is estimated to take three to five years to complete.

Figure 2



Scenario 3: Imports up to 1,800 MW:

To support firm imports of up to 1,800 MW further transmission enhancements in Ontario would be required, beyond what is laid out in Scenario 2, around Ottawa and west of Cornwall.

A preliminary estimate of the enhancements includes:

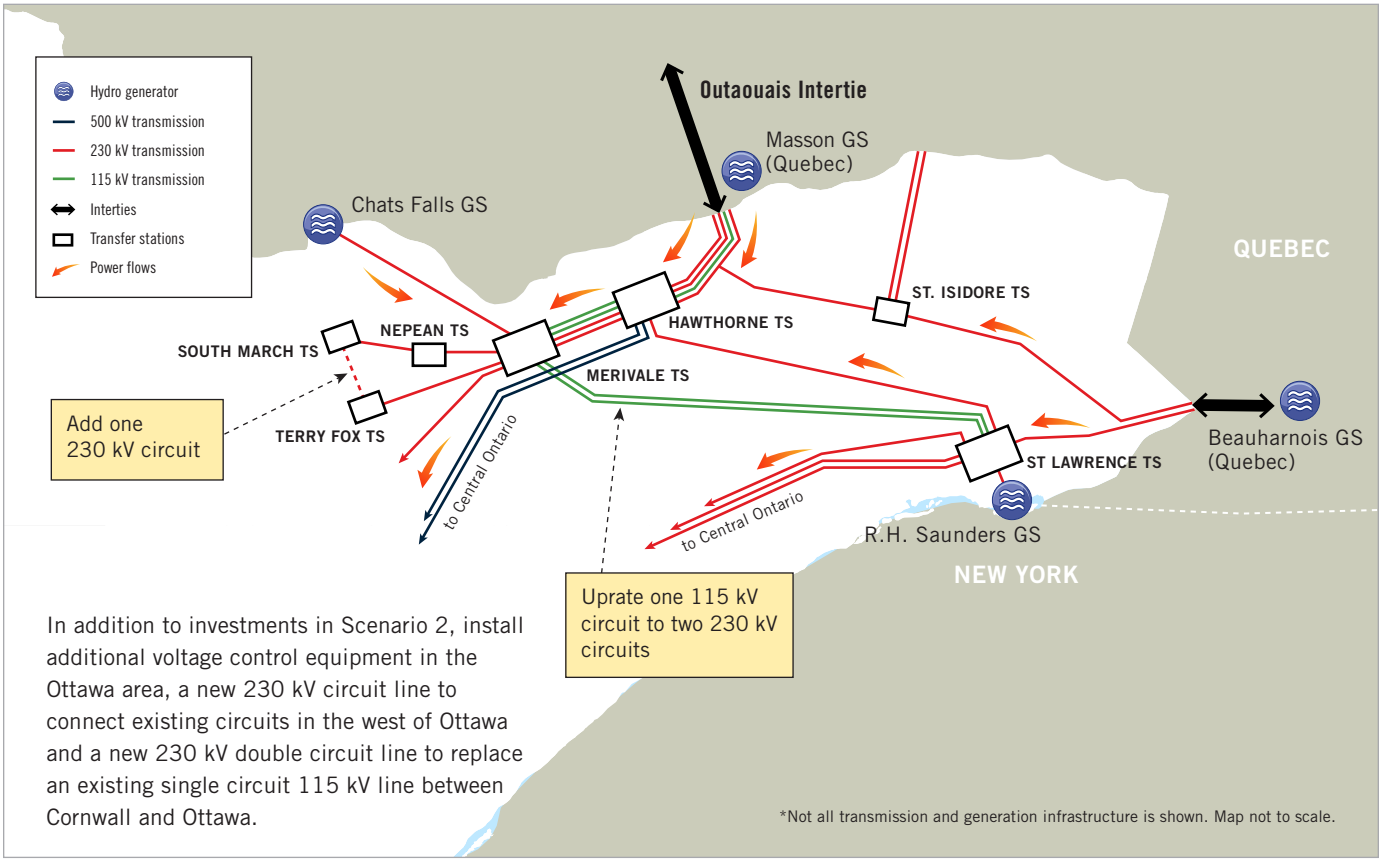
i. A new 230 kV double-circuit line between Cornwall and Ottawa to replace the existing single-circuit 115 kV line along the right of way.

ii. A new 230 kV circuit, approximately 8 km in length to connect existing circuits west of Ottawa (Kanata).

iii. Additional voltage control equipment in the Ottawa area.

The cost to complete these transmission enhancements is up to $500 million. Including the needed time for regulatory and environmental approvals, the time needed to complete these enhancements is five to seven years.

Figure 3



Scenario 4: Imports up to 3,300 MW:

In order to add 1,500 MW of intertie capability for a total of 3,300 MW, a new interconnection with Quebec would be required, in addition to the enhancements noted in Scenarios 2 and 3.

A preliminary estimate of the enhancements includes:

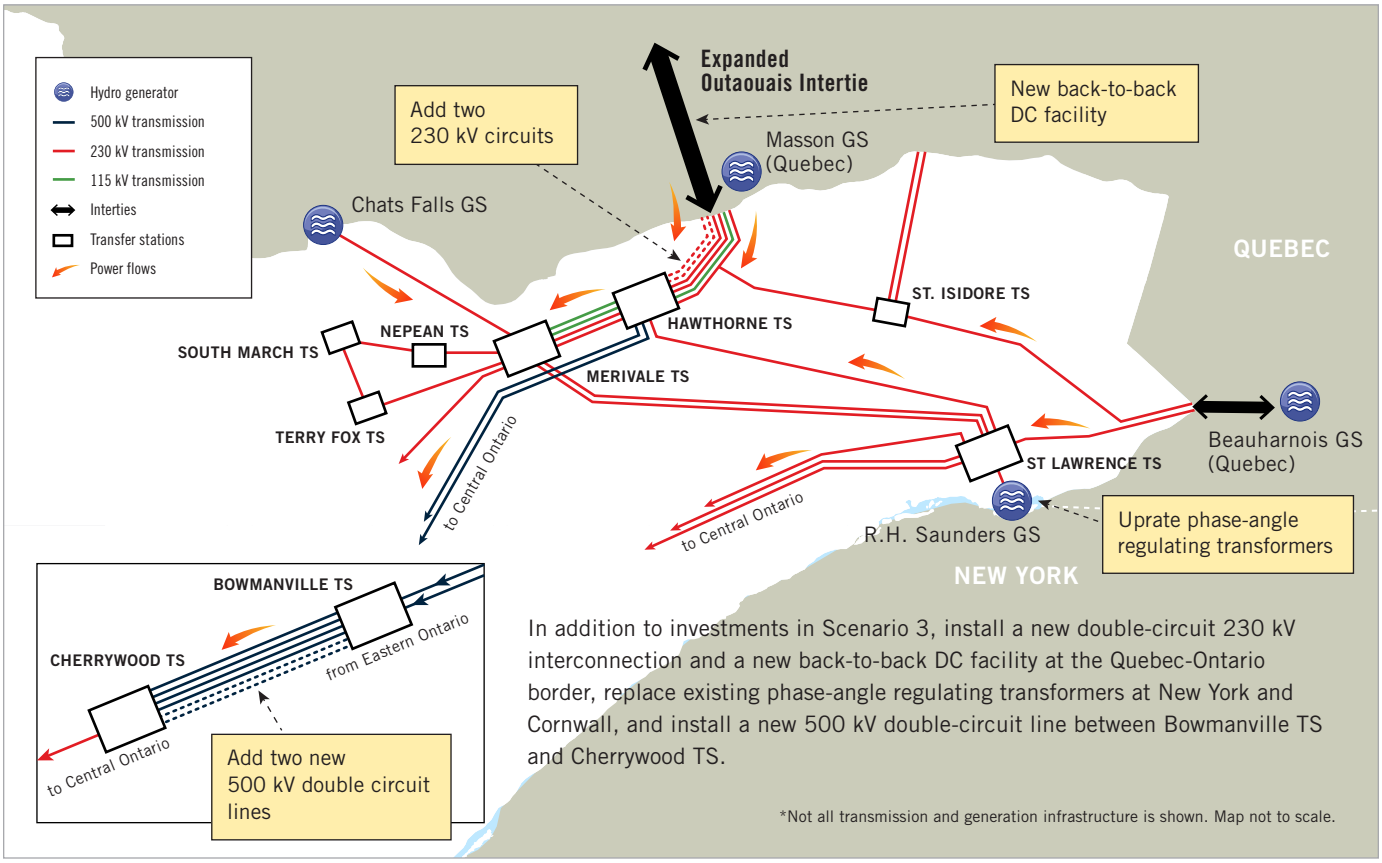
i. A new double-circuit 230 kV interconnection.

ii. A new back-to-back DC facility at the Quebec-Ontario border.

iii. Replacement of the existing phase-angle regulating transformers on the interties to New York at Cornwall, with units having a greater regulating range to control flows into and out of New York.

iv. A new 46 km 500 kV double-circuit line between the Bowmanville and Cherrywood transformer stations.

Figure 4



The estimated cost for the Ontario enhancements could be as high as $1.4 billion. Including the needed time for regulatory and environmental approvals, the time needed to complete these enhancements is estimated to be seven to 10 years. There would also be additional transmission build required in Quebec to supply the additional 1,500 MW along with the appropriate Quebec regulatory and environmental assessments.

These transmission enhancements are conceptual designs only and would require detailed design work. Scenarios 2 and 3 reflect the need to preserve operational flexibility. However, the needed flexibility margin could be higher depending on the size, duration and other terms of any proposed agreement. The estimated cost for the enhancements needed to import 3,300 MW is in excess of $2 billion.

Another consideration when looking at a firm import arrangement is that any agreement for a large amount of capacity would have implications both for the Ontario and Quebec power systems, beyond the interconnections and transmission systems. Public documents indicate that Quebec currently has limited quantities of power available to export in the summer, and plans to add capacity in the coming years. Consequently, any deal to supply baseload energy year round, similar to Ontario's nuclear plants, would require the construction of new generation in Quebec. This new generation would be more expensive than existing power because it would factor in the cost associated with new generation and transmission build, resulting in higher import prices for Ontario.

Also, Ontario is not the only jurisdiction currently looking to purchase Quebec power. While there have been recent discussions around obtaining a firm contract, they have not resulted in a price that would provide value to Ontario, largely due to the fact that power from Quebec is currently being sold in other markets at higher prices. This competition for Quebec's power could have upward pressure on the potential price at which Quebec would be willing to sell power to Ontario.

It is also important to note that for the Quebec import scenarios above, the conclusions apply equally to capacity sourced internally from Quebec and also external sources of supply from, for example, Labrador or New Brunswick that travel through Quebec. Any external supply would need to secure appropriate transmission access rights within Quebec or enter Ontario via the U.S. markets.

Imports from Manitoba

Manitoba has an abundance of hydro power and is a winter-peaking system, creating potential for Manitoba to provide summer capacity to Ontario. With a total installed capacity of about 5,500 MW, Manitoba can serve its own needs and has some ability to export.

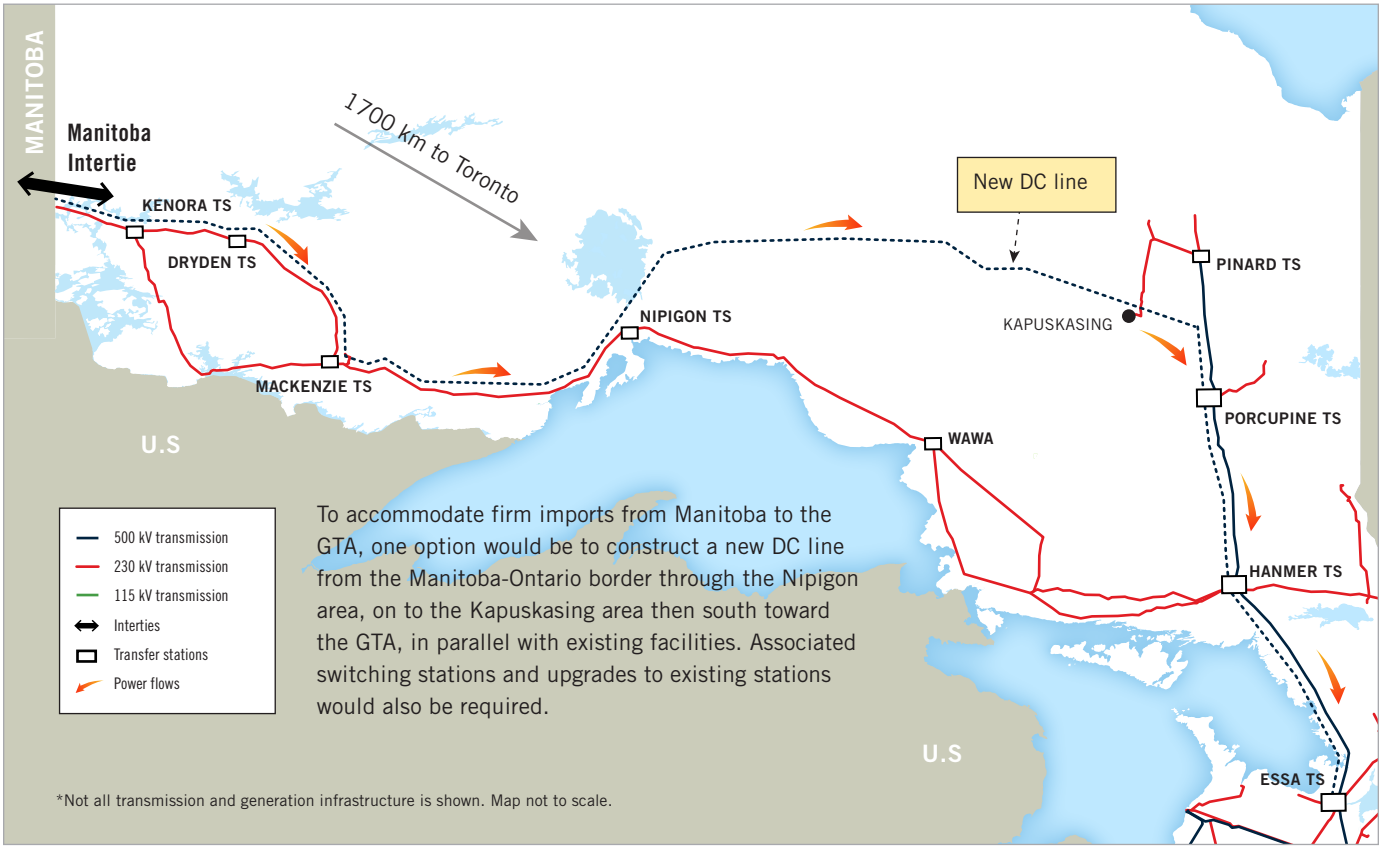
An agreement could be made as outlined above to optimize day-night, weekly or seasonal operations potentially including some storage options. Again, the size of the agreement would be a crucial factor. Given the size of Manitoba's generation fleet, any sizable import deal would likely require upgrades to their transmission system and potentially the need to develop new generation assets. These factors could significantly increase the all-in cost associated with a firm arrangement.

Ontario's transmission system is connected to Manitoba at Kenora. Imports can be used directly in Ontario's northwestern region or flow on through Wawa, to the Sault Ste. Marie area, on to Sudbury and down toward Barrie and the Toronto area, a distance of 1,700 km.

The existing northern Ontario electrical system cannot accommodate firm imports from Manitoba to serve southern Ontario load, as there are significant bottlenecks along the lines between Marathon and loads in the south.

There are also limitations within various electrical zones in the north, such as on the 115 kV connection between Kenora and Dryden and the 230 kV connection from Atikokan to Thunder Bay.

Figure 5



Recently, Ontario's northwest region has seen a loss of major industry and a decline in regional electrical load. As a result, after meeting local electricity needs, much of the power produced in the region currently flows east and often results in congestion due to limited transmission capability. Any firm capacity from Manitoba would tend to aggravate this and would not be beneficial at this time.

An import of about 200 MW from Manitoba could be accommodated when regional load grows sufficiently to absorb the power directly in the northwest. However, any import delivery to the GTA would require significant upgrades to the Ontario transmission system and incur significantly higher than average losses due to the long distances.

Ontario has conducted ongoing discussions with Manitoba about securing small amounts of import capacity over the second half of this decade to meet local area reliability concerns in northwestern Ontario. While proposals have shown that the costs would compare favourably against other supply options, further efforts are required to ensure that the reliability requirements associated with this capacity would be met.

New transmission facilities would be required to import an additional 1,000 MW of capacity across the Manitoba border. At a minimum a direct current line, complete with new switching stations and upgrades to existing stations would be needed to link Manitoba all the way to Toronto. The cost of this new infrastructure is estimated to be somewhere between $2 billion and $3 billion.

It is important to note that with the potential for future high load growth as a result of the Ring of Fire project, there may be an opportunity for limited firm imports to help address the need for increased local needs.

United States: Michigan, New York, Minnesota

At present, Ontario is a net exporter of energy to markets in New York, Minnesota and Michigan, primarily because higher prices in those regions are attracting Ontario-based generation. These exports have reduced costs for Ontarians by approximately $300 million in 2013. With prices expected to continue to exceed Ontario prices, it is unlikely that a long-term import arrangement would provide value to Ontario ratepayers.

In addition, states like Michigan continue to rely on a primarily coal-fired generation fleet. While EPA standards are resulting in a significant level of coal retirements throughout the U.S., imports from these jurisdictions may not be considered to be as clean as Ontario-based generation given that coal can often be on the margin. As a result, the scenarios considered for New York and Michigan included only limited analysis of increasing the import capability.

Imports from Michigan

Ontario connects with Michigan through three circuits near Sarnia and one in Windsor. These connections include phase-angle regulating transformers that help control power flows. From these interties, energy travels to stations near Chatham and London and eastward to the rest of the Ontario grid.

Roughly 400 MW of additional capacity could be accommodated through the existing transmission infrastructure in the 2020-2030 time-period. Transmission enhancements in the London, Chatham and Sarnia areas would be required to increase this capability beyond 400 MW. There is no current cost estimate for this option.

Imports from New York

Ontario's transmission system is connected to New York via four primary circuits at Niagara Falls and two others near Cornwall. The Niagara interties connect to the Sir Adam Beck station near Queenston. Transmission elements from the Beck Station also supply the Niagara Peninsula and connect to the rest of the Ontario grid through the Hamilton area.

There is no available capacity to deliver additional imports through the Niagara area, given forecasts for demand as well as expected generation in the area.

The import capability from Niagara could be increased if the remaining approximate four kilometres of double-circuit 230 kV line between Allanburg and Middleport was completed. Due to ongoing local concerns, this remaining section of the new transmission circuit has not been completed. The new line would add up to about 800 MW of import capability from Niagara. The cost of completing this work would be approximately $5 million given that only a short section of the circuit is left to be completed.

Another alternative would be to examine the potential to reinforce the existing 230 kV transmission lines that currently limit the import capability between Niagara and Hamilton. There is no cost estimate for this option.

Imports from Minnesota

Ontario has a small intertie connection with Minnesota that is only able to transfer 100 MW, depending on the season. Imports from Minnesota would encounter the same overall constraint as imports from Manitoba. The Minnesota system has a high penetration of wind power and as a result has sought arrangements that allow it to leverage Manitoba's large hydro resources as a large storage system to help manage variability. For these reasons, Minnesota is not a favourable candidate for a long-term import deal with Ontario.

The import scenarios for Quebec, Manitoba and the United States (summarized in Appendix F) demonstrate that from a technical perspective the interties are capable of providing clean capacity-backed imports that the province could rely on its resource for planning adequacy needs. However significant further analysis and assessment of any specific proposal would need to be undertaken to accurately identify the cost of specific transmission enhancements, as well as the impact to the all-in cost to deliver the power.

As with all significant enhancements to the power system, there is a long regulatory and environmental assessment process to be completed before developing any new facilities. The time needed to complete these processes, build the necessary infrastructure and complete arrangements with other jurisdictions makes reliance on significant levels of firm imports in the next five to seven years challenging.

Calculating All-in Cost of Firm Import Arrangements

As outlined above, the evaluation of import arrangements needs to consider cost of the commodity at the Ontario border as well as the costs to deliver the power to the load center. Considerations for the commodity costs at the border would include the seller's cost of production, any incremental transmission and the opportunity value of selling it to another buyer.

Currently the all-in cost for delivery of Ontario generation ranges from $70/MWh to $90/MWh.

Below are several areas that will need to be considered when determining the all-in cost on any firm import arrangement.

Transmission

Depending on the location of the import and the volume of energy delivered, the cost for incremental transmission could add to the all-in cost about $20/MWh to $30/MWh to upwards of $100/MWh for low energy delivery amounts.

Commodity Price at the Border

To date the discussions Ontario has had with neighbouring jurisdictions prices the commodity at the border from low to the mid $70/MWh for small amounts to over $100/MWh for larger amounts over sustained periods.

The commodity costs at the border would need to be lower than $50 to $60/MWh to be competitive when considering the all-in cost of even the more modest transmission investments.

This estimate does not include the costs associated with the environmental assessment or regulatory approval process, nor does it consider the job creation and economic development opportunities that the made-in-Ontario alternatives provide.

Conclusions and Recommended Course of Action

This report identifies limited opportunity for reliance on significant quantities of long-term firm imports arrangements. The interties can however provide economic alternatives to fill some shorter term supply needs as they evolve over the period outlined in the 2013 LTEP.

Firm imports can be relied upon to meet the province's adequacy if they can be achieved without compromising the reliability benefits of the current interties, and at a cost-effective price that takes into account the costs of any transmission enhancements needed to reliably transmit those imports to Ontario's major load centres.

Firm imports can be acquired either through contracts or through a market mechanism such as a capacity auction. Structured properly, both types of arrangements could play a role in utilizing Ontario interconnections in the interest of Ontario ratepayers, and both have been used in other jurisdictions.

In addition to imports, the interties could be utilized to allow Ontario generators to sell capacity that is surplus to the province's needs to an external jurisdiction. This would provide revenues to facility owners, helping them to remain viable and provide energy in Ontario when economic, with potential savings for the Ontario ratepayer. The IESO is actively considering a capacity auction for Ontario, and as part of its mandate the OPA periodically explores opportunities for medium- to long-term import arrangements with other jurisdictions.

Given Ontario's circumstances, this naturally points toward enhanced east-west relationships while maintaining the existing north-south ties. Our recommended course of action for consideration by the Ministry is as follows:

1. The IESO and the OPA should work with Hydro-Québec and Manitoba to explore opportunities for clean imports when such imports would have system benefits and are cost effective for Ontario ratepayers.
2. The OPA should continue to evaluate and regularly update the Minister of Energy on the specific parameters for clean-energy import arrangements that would best meet Ontario's needs and circumstances.
3. The IESO should allow for capacity imports and exports in developing the design for a potential capacity market for Ontario.
4. In providing for capacity imports and exports, the current ability of the interconnections to support reliability and operating flexibility should be maintained. This will mean that only a portion of intertie capacity could be allocated for capacity imports.
5. Opportunities to enhance the benefits of the interties should be pursued by the IESO, including more frequent intertie scheduling, and expanded provision of ancillary services through intertie transactions.

Appendix A – Letter to IESO

Ministry of Energy

Office of the Minister

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Ministère de l'Énergie

Bureau du ministre

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APR 0 2 2014

Mr. Bruce Campbell
President and Chief Executive Officer
Independent Electricity System Operator
Station A, Box 4474
Toronto ON M5W 4E5

Dear Mr. Campbell:

On March 31, 2014, I directed the Ontario Power Authority (OPA) to move forward with the Large Renewable Procurement (LRP) Process. In this direction, I noted my concurrence with the recommendations outlined in the OPA's *LRP Report* (published February 28, 2014) and, based on these recommendations, provided instruction on moving forward with the development of the LRP competitive process.

Consistent with the instructions provided to the OPA in this March 31, 2014 direction, I am writing to you to request that the Independent Electricity System Operator (IESO) work with the OPA to study the impact of intertie capacities to support demand and reliability requirements from a power system planning perspective, including the potential benefits of various contracting arrangements for bringing energy and capacity for the province.

Although the LRP will be available for domestic projects only, the province remains open to the option of integrating out-of-province generation into future procurement processes where such imports have system benefits and are cost effective for Ontario ratepayers. As noted in the Long-Term Energy Plan, *Achieving Balance,* an arrangement with one of Ontario's neighbours to guarantee the firm delivery of clean power could offer a cost-effective alternative to building domestic supply.

The OPA's *LRP Report* identified a number of matters associated with out-of-province generation that should be explored further by the OPA and the IESO. These include:

- how import contracts integrate into or affect Ontario's electricity wholesale market;
- whether existing rules and codes contemplate import contracts, or whether new rules are required; and
- how to ensure an out-of-province project is metered according to Ontario requirements.

.../cont'd

I look forward to receiving a joint IESO and OPA report that will explore the potential benefits and challenges associated with out-of-province generation, in particular clean energy imports, raised in *Achieving Balance* and in the OPA's *LRP Report*. The final report should provide analysis on how the use of interties could contribute to meeting Ontario's demand and reliability requirements in a cost-effective way, identify and provide options to address any physical or operational constraints in and outside Ontario, and develop a draft course of action for consideration by the Ministry.

The IESO should engage and involve any stakeholders necessary to identify considerations (including those noted above) and provide recommendations.

It is my expectation that the IESO and OPA will provide a joint draft report back to me by June 30, 2014, with the final report to follow shortly thereafter.

Sincerely,

Bob Chiarelli
Minister

c: Colin Andersen, CEO, Ontario Power Authority
Serge Imbrogno, Deputy Minister, Ministry of Energy

Appendix B – Directive to OPA

Ministry of Energy

Office of the Minister

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Ontario

MAR 3 1 2014

Mr. Colin Andersen
Chief Executive Officer
Ontario Power Authority
1600–120 Adelaide Street West
Toronto ON M5H 1T1

Dear Mr. Andersen:

RE: Moving Forward with the Large Renewable Procurement (LRP) Process

I write in my capacity as the Minister of Energy in order to exercise the statutory power of ministerial direction I have in respect of the Ontario Power Authority (OPA) under the *Electricity Act, 1998,* as amended (the "Act").

Background

On June 12, 2013 and December 16, 2013, I directed the OPA to develop a new competitive process for the procurement of renewable energy projects generally larger than 500 kW that will take into account local needs and considerations before contracts are offered and to provide me with recommendations on the design of the new process by March 1, 2014.

I would like to take this opportunity to thank the OPA for its report, *Development of a New Large Renewable Procurement (LRP) Process: Final Recommendations Report* (the "LRP Report"), dated February 28, 2014, which includes recommendations for the Request for Qualifications (RFQ) stage and the Request for Proposals (RFP) stage of the competitive procurement process. I concur with the recommendations outlined in the LRP Report subject to the additional direction set out below.

Direction

Therefore, pursuant to my authority under section 25.32 of the Act, I hereby direct the OPA to undertake the following:

....2/

1. Development of the Draft RFQ

1.1 The OPA shall develop the RFQ in a manner that focuses on qualifying applicants for the RFP. Qualifications of applicants and their respective project teams should be robust in order to minimize the risk that projects fail to reach commercial operation. Qualifications should include appropriate financial capacity, appropriate energy development experience or other appropriate experience developing large complex infrastructure projects, experience with municipal engagement, experience with regulatory approvals, and experience undertaking the procedural aspects of consultation with Aboriginal communities that are required to support the Crown's duty to consult obligations. These qualifications will apply to all applicants.

1.2 The OPA shall complete its work on the draft RFQ and post it for review and comment by stakeholders no later than April 4, 2014. The OPA shall launch the RFQ by June 9, 2014.

1.3 The OPA shall make available information regarding connection availability on a transparent and more regular basis. The OPA shall engage with the Independent Electricity System Operator (IESO), electricity transmitters and electricity distributors to help ensure that timely and accurate information on connection availability is provided to applicants and other interested parties at both the RFQ and RFP stages.

2. Development of the Draft RFP

2.1 The OPA shall continue to develop draft RFP rated criteria in consultation with the Ministry of Energy. Future ministerial direction will define particular features of the final RFP.

2.2 The OPA shall also continue to undertake robust engagement and outreach with municipalities, Aboriginal communities, and other stakeholders as it develops the criteria; particularly with respect to community engagement requirements, potential approaches for evaluating local support of proposed projects (including connection lines) and potential mechanisms for encouraging municipal and Aboriginal participation.

2.3 In accordance with the recommendations, the OPA shall consider the following as it develops the draft RFP:

a) Rigorous community engagement requirements, recognizing that as qualified applicants approach the RFP stage they will be in a position to make detailed information available regarding proposed projects and thereby undertake more meaningful community engagement.

....3/

b) Approaches to encourage participation that recognize the unique circumstances of Aboriginal communities.

c) No limits on project size.

d) No project density restrictions. As noted in the OPA's recommendations, community engagement criteria for the RFP should capture issues important to a community, such as project density.

e) Appropriate parameters related to connection points and lines, and allowable grid-upgrades that the OPA shall continue to assess in consultation with the Ministry of Energy. Connection point parameters for the RFP shall be determined by future ministerial direction.

f) Dispatch provisions, developed in consultation with the Ministry, that provide for generator accountability in circumstances where generation is dispatched down or off. The OPA shall provide greater clarity to project developers and qualified applicants before the finalization of the RFP. Dispatch provisions for the RFP shall be determined by future ministerial direction.

g) The OPA, in keeping with the Government's commitment to protect prime agricultural areas for long-term use for agriculture, as stated in the Provincial Policy Statement (PPS) issued under the *Planning Act,* shall not enter into contracts with proponents of ground-mounted solar projects in Prime Agricultural Areas (as defined in the PPS) or on organic soils, subject to potential exemptions to be determined by future ministerial direction.

h) For the purposes of the LRP, proposed projects must be located in Ontario. However, there should be continued study by the OPA and the IESO of the impact of intertie capacities to support demand and reliability requirements from a power system planning perspective.

2.4 With regard to the integration of innovative technologies and energy storage into the LRP process, I would ask that the OPA conduct the necessary analysis and assessment of the parallel 2014 OPA/IESO storage procurement processes, undertake required discussions with industry, and report back to the Ministry by the end of 2014 to present options for mechanisms to integrate innovative technologies and energy storage into the next LRP procurement cycle. In the interim, I would ask that the OPA use rated criteria to reward applicants that support the integration of storage technologies in the 2014 LRP cycle to enable any early innovation even as the OPA reports back by the end of 2014 for future procurement cycles.

....4/

2.5 This direction supplements and amends previous directions to the extent that a previous direction is inconsistent with the provisions of this direction. All other terms of any previous direction remain in full force and effect.

This direction takes effect on the date it is issued.

Sincerely,

Bob Chiarelli
Minister

c. James D. Hinds, Chair, Ontario Power Authority
Bruce Campbell, President and Chief Executive Officer, Independent Electricity System Operator
Tim O'Neill, Chair, Independent Electricity System Operator
Serge Imbrogno, Deputy Minister, Ministry of Energy
Halyna Perun, Director, Legal Services Branch, Ministries of Energy and Infrastructure

Appendix C – Stakeholder Engagement

Summary of Feedback

On April 24, 2014, the IESO launched a stakeholder initiative to help inform the joint IESO/OPA report requested by the Minister of Energy. Stakeholders were asked to identify any impacts and opportunities existing with the Ontario interties to further support the demand and reliability requirements of the power system. The Review of Ontario's Interties webpage included a backgrounder for stakeholders to guide input.

At the same time, the IESO contacted several key stakeholders whose current engagement in intertie transactions warranted direct outreach, through one-on-one discussions (in person or via teleconference) and/or email, with an effort to answer any questions that might help guide stakeholder input. These stakeholders were also encouraged to provide written input.

The common elements from all the intertie discussions and written submissions were:

1. The Frequency of Intertie Scheduling: Other jurisdictions use 15-minute scheduling. Is Ontario moving forward with this initiative? This could have a large impact on the effectiveness of increasing reliance on intertie transactions.

2. Importing and Exporting Capacity: The most notable barrier to increased activity on the interties is lack of ability to sell capacity into or out of Ontario. Many believe that a capacity market in Ontario would rectify this shortcoming. Resources need reciprocal treatment to ensure maximum utilization of the interties such as provisions to allow generators within Ontario to export their capacity if Ontario were to allow for capacity imports. Alternatively, stakeholders suggested some form of capacity procurement.

3. Firm Transmission Required: To ensure capacity external to the province is available when needed, would Ontario require firm transmission? While other jurisdictions have mechanisms in place, there is currently no mechanism to provide this in Ontario.

4. Maintaining Market Signals: Thought should be given to the importance of establishing a proper price signal, one which will ultimately drive investment decisions in the province.

5. Ensure Additional Capacity Fuel Supply is Green: If external areas have coal included in their supply, how can Ontario ensure that a purchase of capacity does not increase greenhouse gas emissions for Ontario? Other regions have Renewable Portfolio Standards and allow inter-regional trade in Renewable Energy Credits.

6. Market Rules and Protocols Need Amendments: Long-term transmission rights that are available on non-discriminatory terms, transferable among market participants and compatible with external markets, will provide significant benefits to market participants in Ontario and its ratepayers. In addition, the IESO should take necessary steps to optimize the allowable quantities of ancillary services through the interties.

Stakeholder Engagement Materials

Embedded in the backgrounder posted to the Review of Ontario's Interties webpage were the following questions to guide stakeholder input:

1. How could the interties be used further to meet Ontario's demand and reliability requirements?
2. Are there existing out-of-province resources that could provide cost-effective products or services to Ontario?
    a. If so, what are the products or services?
    b. What is preventing these resources from providing these products or services to Ontario today?
3. What additional barriers restrict the participation of out-of-province resources in Ontario's market?
4. Are the existing rules or codes sufficiently flexible to allow for the use of out-of-province resources in meeting Ontario's demand and reliability needs?
5. If not, what changes are required?
6. Do other jurisdictions use out of province/state resources to meet their demand and reliability needs?
    a. If so, which jurisdictions? How are these resources integrated into their electricity market?

All stakeholders were invited to provide input through email to stakeholder.engagement@ieso. ca or via an online survey. All submissions have been posted on the Review of Ontario's Interties webpage.

The IESO met with the following market participants one-on-one:

- Brookfield
- Hydro One
- Hydro-Québec Energy Marketing
- Ontario Power Generation
- RBC Capital Markets
- Shell Energy

Submissions to the IESO Stakeholder Initiative

Brookfield Energy Marketing LP

http://www.ieso.ca/documents/consult/intertiereview/IR-20140523-Feedback-Brookfield.pdf

HQ Energy Marketing Inc.

http://www.ieso.ca/documents/consult/intertiereview/IR-20140523-Feedback-HQEnergyMarketing.pdf

Lake Erie Power

http://www.ieso.ca/documents/consult/intertiereview/IR-20140523-Feedback-LakeEriePower.pdf

Nalcor Energy

http://www.ieso.ca/documents/consult/intertiereview/IR-20140523-Feedback-NalcorEnergy.pdf

Ontario Clean Air Alliance

http://www.ieso.ca/documents/consult/intertiereview/IR-20140523-Feedback-OntarioCleanAirAlliance.pdf

Ontario Power Generation

http://www.ieso.ca/documents/consult/intertiereview/IR-20140523-Feedback-OPG.pdf

Shell Energy North America

http://www.ieso.ca/documents/consult/intertiereview/IR-20140523-Feedback-ShellEnergyNorthAmerica.pdf

Appendix D – Proposed Planning, Scheduling & Curtailment Requirements

Planning Requirements:

1. Commitment from the seller (with verification from the relevant operating jurisdictions) that the capacity is not used by another jurisdiction to meet its resource adequacy requirement.

2. Validation that the seller has firm transmission service or an equivalent delivery guarantee to the Ontario border. This is to ensure that the imported energy is not subject to frequent or routine curtailment in the external jurisdictions due to transmission constraints or transmission outages. This firmness of delivery must be verified by the IESO through appropriate system impact assessments.

Scheduling Requirements:

3. The energy must be schedulable to the IESO on a daily basis. The seller must offer the energy as an import into the IESO markets daily in both the day-ahead and real-time markets.

4. When the IESO calls on the energy, either through normal market scheduling or as a control action, the energy cannot be used by another jurisdiction as operating reserve.

Curtailment Requirements:

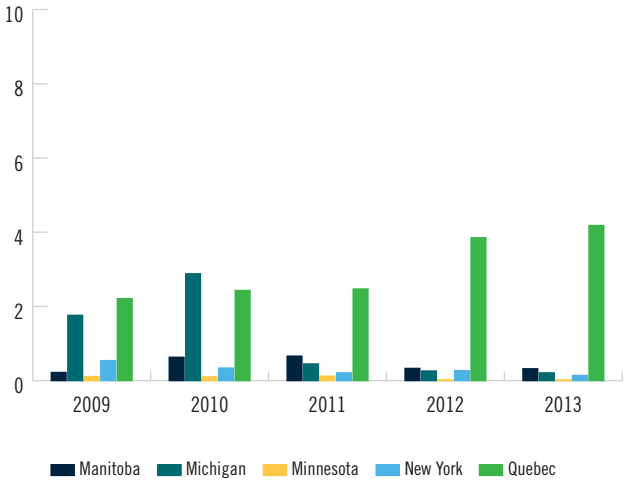
5. Ontario has the first right to call on the imported energy over any other jurisdiction in the event of a capacity shortage in Ontario.

6. The external jurisdiction cannot curtail the energy imported to Ontario due to a shortage of generation in the external control area.

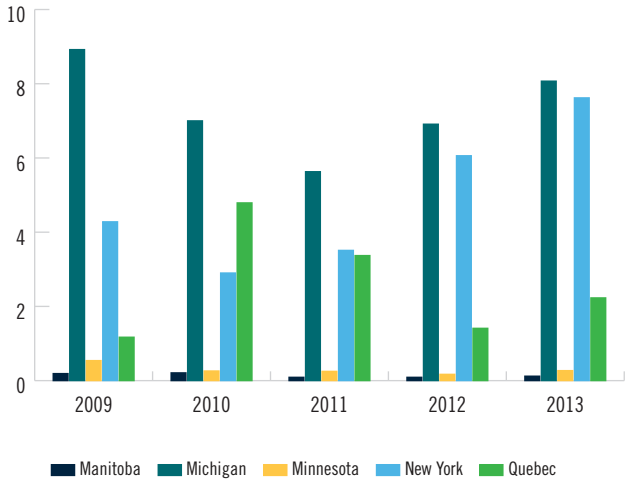
7. The external jurisdiction may curtail the energy import into Ontario to correct or prevent a violation of voltage, stability or thermal transmission in accordance with relevant reliability standards, but it must be done on a pro-rata basis and concurrent with the shedding of firm load within that jurisdiction.

Appendix E – Intertie Information Over Last Five Years

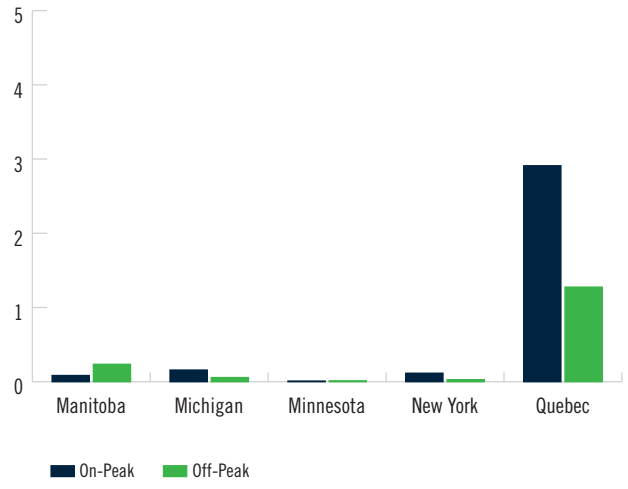
Annual Energy Imports (TWh)



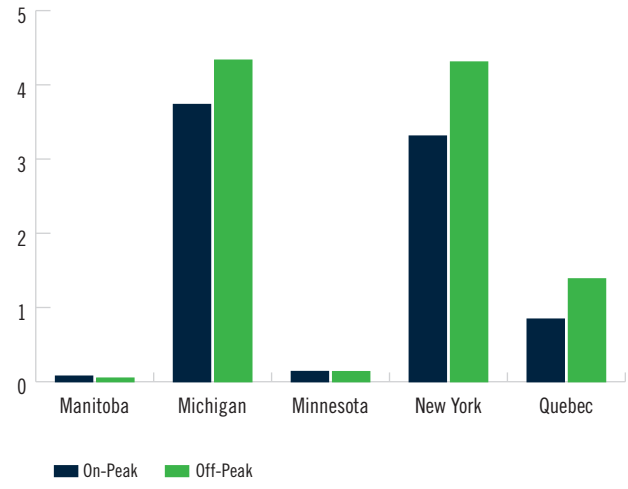
Annual Energy Exports (TWh)



2013 Imports (TWh)



2013 Exports (TWh)



Appendix F – Summary Table of Possible Transmission Investments

Note: These estimates have been developed from available information of varying quality. In some cases they are estimates provided by Hydro One using known inputs. In other cases they are extrapolations from these budget estimates. They are meant to convey only the possible orders of magnitude of these investments. Any decisions to pursue any of these projects would require further studies.

Region	Firm Import Scenarios (MW)	Notes	Estimated Total Cost of Transmission Upgrades (M$) Up to:	Estimated Time to complete Regulatory and Construction Phases
Manitoba	200	Supply local area needs north of Dryden	0	0
	1,000	DC Line from Manitoba to GTA	$3,000	8 to 10 years
Quebec	500	Using current facilities – the capability declines to zero by 2020 due to constraints in the Ottawa area	0	0
	1,000	Adding facilities to improve the Ottawa area flows	$325	3 to 5 years
	1,800	1. New 230 kV double circuit line between Cornwall and Ottawa 2. A new 230 kV circuit, approximately 8 km in length to connect existing circuits in the west of Ottawa 3. Additional voltage control equipment in the Ottawa area	$825 ($325 +$500)	5 to 7 years
	3,300	1. New 500 kV double circuit line from Bowmanville to Cherrywood 2. New HV dc Interconnection	$2,200 ($825 + $1,400)	7 to 10 years
Michigan	400	Using the existing facilities	0	0
New York	800	Complete the unfinished Niagara Reinforcement Project	$5	< 1 year