The Benefits and Costs of Increased Electricity Trade Between Quebec and Ontario

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The Opportunity

Quebec is the fourth largest producer of water power in the world and it has a large and growing surplus of power available for export.

However, according to the Quebec Energy Commission, Hydro Quebec can only obtain high prices for its exports during the 300 peak demand hours of each year. And as a result of transmission constraints, Quebec can only export 10 billion kWh per year during high price periods. As a consequence, approximately two-thirds of Hydro Quebec's electricity exports are sold at an average price of only 3 cents per kWh. According to the Quebec Energy Commission, Hydro Quebec's low-price electricity exports will grow by 50% between 2014 and 2022 from 20.1 billion kWh to 31.1 billion kWh per year.[1]

In addition, Quebec has an opportunity to produce even more low-cost power by investing in energy efficiency and reducing its domestic customers' electricity bills, which would free up more of its existing heritage water power capacity for export. According to Professor Pierre-Olivier Pineau of the University of Montreal, cost-effective energy efficiency investments could increase Quebec's export potential by approximately an additional 30 billion kWh per year.[2]

Quebec has an opportunity to produce even more low-cost power by investing in energy efficiency and reducing its domestic customers' electricity bills.

Ontario, on the other hand, needs new electricity supply since most of its aging nuclear reactors will come to the end of their lives during the next ten years.

In 2014 the Pickering Generating Station's fuel and operating costs *alone* were 8.2 cents per kilowatt-hour (kWh).[3] While Pickering's Canadian Nuclear Safety Commission (CNSC) operating licence expires in 2018, Ontario Power Generation (OPG) is planning to seek CNSC approval to continue operating Pickering until 2024.[4]

According to OPG, the cost of electricity from a re-built Darlington Nuclear Station will be 7 to 8 cents per kWh.[5] However, every nuclear project in Ontario's history has gone massively over budget – on average by 2.5 times.[6] If history repeats itself, electricity from a re-built Darlington Nuclear Station could cost 15 cents per kWh or more.[7]

Clearly, there is excellent potential for increased mutually-beneficial electricity trade between Ontario and Quebec at a price that will raise Hydro Quebec's export revenues and lower Ontario's electricity costs.

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Expanding the Quebec-Ontario Electricity Transfer Capacity

Currently, the electricity transfer intertie capacity between Ontario and Quebec is 2,788 megawatts (MW).[8] However, as a result of transmission constraints on the Hydro One system, Ontario is unable to import 2,788 MW from Quebec during *every* hour of the year. Specifically, Ontario's maximum potential electricity imports are capped at between 16.5 to 18.5 billion kWh per year.[9]

According to Ontario's Independent Electricity System Operator (IESO), with upgrades to the Hydro One transmission system costing $825 million, Ontario could import 24.4 billion kWh per year from Quebec.[10]

In addition, the IESO has identified the potential to increase the intertie capacity between Ontario and Quebec to 4,288 MW by building a new intertie near Cornwall. According to the

IESO, this new intertie could cost Ontario up to $1.4 billion; and there "would also be additional transmission build required in Quebec to supply the additional 1,500 MW".[11]

That is, for a total infrastructure investment of approximately $2 billion the Quebec-Ontario electricity transfer capacity could be increased to 4,288 MW. This would permit Ontario to import up to 37.6 billion kWh per year from Quebec – the equivalent of 27% of Ontario's annual electricity consumption.[12]

An Infrastructure Investment with Multiple Returns

Firming Ontario's Intermittent Solar and Wind Energy

In addition, enhancing the inter-provincial electricity transfer capacity can allow Hydro Quebec's huge water power reservoirs to be used, like a giant battery, to convert Ontario's intermittent solar and wind power into a firm, 24/7 source of base-load electricity. When Ontario's solar or wind power production is above average, the surplus generation can be exported to Quebec to help keep the lights on in Montreal. As a result, Hydro Quebec can store more water in its reservoirs. This stored water, acting like a battery, can be used to generate renewable electricity to be exported back to Ontario when its solar or wind power production is below average.

Seasonal Capacity Exchange

Quebec's demand for electricity peaks in the winter and Ontario's peak occurs on hot summer days when our air-conditioners are running full-out. In 2014 Ontario and Quebec signed an agreement whereby Ontario will make 500 MW of electricity capacity available to Quebec in the winter, and Quebec will make 500 MW available to Ontario in the summer. This agreement will provide cost savings for both provinces.[13]

The seasonal exchange was capped at 500 MW due to constraints on Hydro One's transmission system.[14] The infrastructure investments, noted above, would allow both provinces to exchange up to 4,288 MW of power.

Lower Greenhouse Gas Emissions

Water power imports from Quebec can lower Ontario's greenhouse gas emissions by reducing the need for gas-fired generation to supply peak day demands and to provide back-up for nuclear reactors when they are shut down for repairs. The Darlington Nuclear Station, for example, has been off line for one hour in every six since it came into service in the early 1990s.[15]

Conclusions

Expanding the electricity transfer capacity between Quebec and Ontario can provide multiple economic and environmental benefits for Canada, namely:

- Lower electricity rates for Ontario consumers and businesses;
- Lower greenhouse gas emissions;
- "Firming" of intermittent renewable power supplied by solar and wind;
- Reducing Ontario's and Quebec's need for new peaking electricity generation capacity; and
- Higher electricity export revenues for Hydro Quebec and therefore higher revenues for the Government of Quebec.

Endnotes

1 Commission sur les enjeux energetiques du Quebec, *Maitriser Notre Avenir Energetique*, (2 fevrier 2014), pages 176 – 183.
2 Chaire de gestion du secteur de l'energie, HEC Montreal, *2016 Etat De L'Energie Au Quebec*, page 28.
3 Ontario Energy Board Docket No. EB-2013-0321, Undertaking JT1.14; Refiled: 2014-06-03.
4 Ontario Power Generation, *News*, "OPG Ready To Deliver Refurbishment Of Darlington Nuclear Station", (January 11, 2016).
5 Ontario Power Generation, News, "OPG Ready To Deliver Refurbishment Of Darlington Nuclear Station", (January 11, 2016).
6 Ontario Clean Air Alliance Research, *The Darlington Re-Build Consumer Protection Plan*, (September, 2010), Appendix A.
7 Ontario Clean Air Alliance Research, *Ontario's Electricity Options: A Cost Comparison*, (January 14, 2016).
8 Ontario Energy Board Docket No. EB-2008-0272, Exhibit I, Tab 5, Schedule 6.
9 Email from Jordan Penic, Independent Electricity System Operator (IESO) to Jack Gibbons, Ontario Clean Air Alliance, (November 21, 2014).
10 IESO, *Review of Ontario Interties*, (October 14, 2014), pages 23 & 24 & Appendix F; and Ontario Clean Air Alliance Research, *Ontario's Long-Term Energy Plan: A One Year Review*, (November 10, 2014), page 5.
11 *Review of Ontario Interties*, pages 25 & 26; and *Ontario's Long-Term Energy Plan: A One Year Review*, page 5.
12 In 2015 Ontario's total electricity consumption was 137 billion kWh. IESO, *News Release*, "IESO Releases 2015 Ontario Electricity Data", (January 12, 2016).
13 Ontario, Office of the Premier, *Backgrounder*, "Agreements Reached at Quebec-Ontario Joint Meeting of Cabinet Ministers", (November 21, 2014).
14 IESO, *Review of Ontario Interties*, (October 14, 2014), page 23.
15 Ontario Energy Board Docket No. EB-2013-0321, Undertaking J14.3.

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