Keeping Toronto's Lights On:
A review of the Central Toronto Area Intergrated Regional Resource Plan

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In April 2015 the Independent Electricity System Operator (IESO) released its "integrated resource plan" to keep the lights on in Central Toronto.[1] The objective of integrated resource planning (IRP) is to develop a long-term plan to provide a clean and reliable supply of electricity at the lowest possible cost.

In addition to considering the traditional options to meet our electricity needs (e.g., large centralized electricity generating stations and high-voltage transmission lines), an IRP is also meant to consider all cost-effective small-scale local sources of supply (e.g., solar, bio-energy and combined heat and power) as well as energy conservation and efficiency.

Unfortunately, the IESO's Plan fails to achieve the following two key objectives of the IRP process.

- First, it has failed to develop a plan to procure **all** of Central Toronto's cost-effective energy conservation and efficiency resources that can help to avoid the need for new higher-cost supply options.
- Second, it has failed to develop a plan to ensure that **all** the electricity needs of Central Toronto's hospitals, emergency services, large multi-unit residential buildings and its public transit system will be met in the event of a failure on Hydro One's transmission system or a widespread or long-lasting blackout.

The IESO's plan fails to secure all cost-effective conservation and fails to ensure a robust emergency power system for Central Toronto

Acquiring all of Central Toronto's Energy Conservation and Efficiency Resources

To evaluate the cost-effectiveness of energy conservation and efficiency investments, one must first estimate the cost of keeping our lights on by investing in new electricity supply.

Ontario is planning to re-build the Darlington Nuclear Station and six of the Bruce Nuclear Station's aging nuclear reactors between 2016 and 2031.[2]

According to Ontario Power Generation's so-called "high-confidence" estimate, electricity from a re-built Darlington Nuclear Station will cost 8.9 cents per kWh. However, every nuclear project in Ontario's history has gone massively over-budget — on average by 2.5 times — and the Darlington project is already hundreds of millions of dollars over budget. Therefore, if history repeats itself, the cost of power from a re-built Darlington would be 16.6 cents per kWh.[3]

In addition, according to the IESO there will need to be additional high-voltage transmission capacity to serve Central Toronto in the long-term. One option to meet this need would be to build a submarine transmission line from the Pickering Nuclear Station to the Toronto waterfront.[4]

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Therefore all energy conservation and efficiency options that can meet our electricity needs at a lower cost than re-building the Darlington Nuclear Station (8.9 to 16.6 cents per kWh) and building new transmission capacity to serve Central Toronto are cost-effective. In fact, by seeking to acquire all lower cost energy conservation and efficiency resources, the IRP could lower bills for **all** Ontario electricity consumers. Unfortunately, the Plan fails to do so.

On the contrary, the Plan recommends implementing only one new conservation program to help keep the lights on in downtown Toronto: a demand response program to reduce peak demands on the hottest days of the summer when our air conditioners are running full out.[5]

This is an inadequate response given that Toronto's electricity consumption per person is 45% greater than that of New York City. [6]

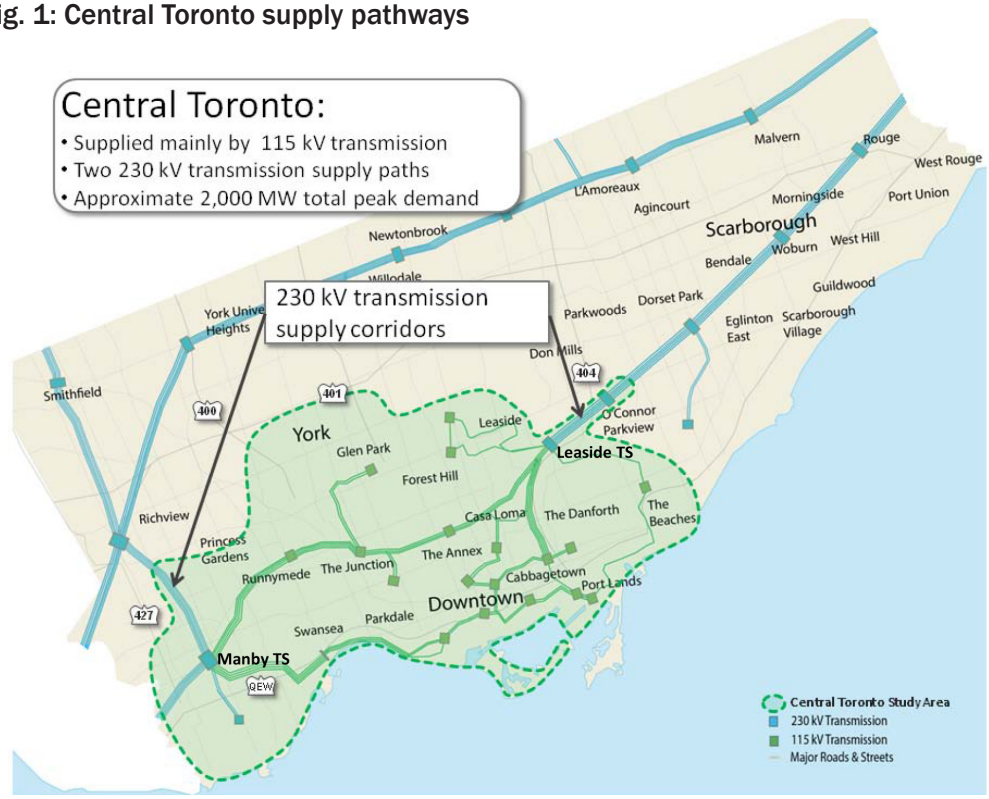
Ensuring a Reliable Electricity Supply for Central Toronto's Hospitals, Subways, Streetcars and Water Treatment Facilities

The IESO's plan calls for the development of just one new conservation program despite the fact that Torontonians use 45% more power per person than New Yorkers

The Central Toronto Area has a peak electricity demand of approximately 2,000 megawatts (MW).[7] Most of Central Toronto's electricity needs are met by two Hydro One transmission supply paths.

The first supply path brings power from eastern Ontario (e.g., Pickering and Darlington Nuclear Stations) to the Leaside Transformer Station. The second Hydro One supply path brings electricity from Niagara Falls and the Bruce Nuclear Station to the Manby Transformer Station on the west side of Toronto (see Figure 1 below).

Fig. 1: Central Toronto supply pathways



In addition, Central Toronto has 571.5 MW of local electricity generation capacity, namely, the 550 MW Portlands Energy Centre on the Toronto waterfront and a number of very small solar and natural gas-fired generating facilities with a total capacity of only 21.5 MW.[8]

This means Toronto can meet only meet 29% of its electricity requirements from local sources. By contrast, New York City is required to be able to meet 80% of its electricity needs from local sources.[9]

Moreover, Central Toronto's hospitals, multi-unit high-rise buildings, emergency services and public transit system do not appear to have sufficient diesel emergency generation capacity to meet 100% of their needs during a power outage. And in the event of a prolonged outage they might not have sufficient fuel supplies to operate their diesel generators until the end of the blackout.

In fact, many current emergency power systems are meant only to keep a few vital systems running to allow for the orderly shutdown of operations or a building evacuation. They are not designed to fully replace grid-supplied power and do not support uninterrupted facility operation. For example, most multi-residential high-rise buildings do not have sufficient back-up generation to supply water above the fifth floor in the event of a power failure. In the face of increasingly unstable weather brought on by our changing climate, this lack of full preparedness is a concern.

In fact, according to the *Plan*, there is the need for an "assessment of options for increasing resiliency in preparation for possible widespread system outages resulting from low probability-high impact events, either caused by catastrophic failure of multiple critical system elements or extreme weather events such as ice storms and flooding."[10]

A low-cost option to increase the resiliency and security of Central Toronto's electricity supply is to make better use of natural gas to provide both heat and power. Virtually all of the buildings in Central Toronto use natural gas to provide just one service, namely heat. It is much more efficient to use these same molecules of gas to simultaneously produce two services — heat and electricity. This is what combined heat and power (CHP) plants do.

Combined heat and power plants can have an overall energy efficiency of 80-90%. As a result, they can produce electricity at a low cost. According to the IESO, a 10 MW baseload CHP plant could produce electricity at cost of 5.8 to 6.8 cents per kWh.[11]

Therefore the installation of small-scale CHP plants in Central Toronto has the potential to *increase* Central Toronto's electricity security of supply and *reduce* electricity rates for **all** Ontario electricity consumers by reducing the need for much higher cost nuclear re-build projects. Unfortunately, the IRP puts off any decision about increasing Toronto's CHP capacity until some unspecified future date.

While acknowledging the risk of high-impact grid outage events, the IRP essentially ignores the potential to develop combined heat and power projects in Central Toronto

Apparent Conflicts of Interest

The IESO's Plan, which was produced with the assistance of a Technical Working Group (Hydro One and Toronto Hydro), does not seek to procure all the energy efficiency and small-scale generation resources that can lower our electricity bills and reduce the need for higher-cost nuclear re-builds. This lack of ambition may be at least partly due to the following potential conflicts of interest.

First, the IESO's unionized employees are represented by the Power Workers' Union (PWU) and the Society of Energy Professionals (SEP). The PWU owns 5.26% of the Bruce B Nuclear Station and the SEP owns 1.75%.[12] Therefore the pursuit of all cost-effective energy efficiency and small-scale generation resources in Central Toronto would not be in the financial self-interest of the IESO's employees' unions if it reduces the need for the re-building of the Bruce B Nuclear Station.

Second, Hydro One and Toronto Hydro are both regulated by the Ontario Energy Board (OEB). As a result of the OEB's rate-base methodology for setting electricity rates,

these two utilities' profits are directly linked to their investments in traditional supply-side infrastructure (e.g., transmission and distribution lines, transformer stations). As a result, everything else being equal, the pursuit of options that will reduce the need for new transmission and distribution system capital spending will reduce their profits.

The potential adverse impacts of these apparent conflicts of interest can be mitigated by expanding the membership of the Central Toronto Area IRP Working Group to also include organizations that are proponents of energy conservation and small-scale local generation (e.g., City of Toronto, Enbridge Gas Distribution, Enwave Energy Corporation, BOMA Toronto, Ontario Clean Air Alliance).

The IRP Technical Working Group needs to be expanded to include a greater variety of perspectives in order to create a fresh vision for meeting Toronto's electricity needs

Recommendations

The Minister of Energy should direct the IESO to develop by December 31, 2016 a new *Central Toronto Area Integrated Resource Plan* to:

- Obtain all of Central Toronto's cost-effective and achievable energy conservation and efficiency resources;
- Ensure that Central Toronto's hospitals, large multi-unit residential buildings, emergency services and public transit system can operate at full capacity in the event of the loss of a Hydro One transmission supply path or a widespread or long-lasting blackout; and
- Obtain all of Central Toronto's cost-effective and achievable small-scale generation resources.

The Minister of Energy should direct the IESO to establish the new *Central Toronto Area Integrated Resource Plan* in collaboration with a Technical Working Group that includes proponents of energy conservation and small-scale local generation (e.g., City of Toronto, Enbridge Gas Distribution, BOMA Toronto, Ontario Clean Air Alliance).

For more information on what Ontario needs to do to lower electricity costs by improving conservation, please see Ontario Clean Air Alliance Research Inc., *Putting Conservation First: The Next Two Steps*, (October 2015).

Thanks to the Echo Foundation and the Taylor Irwin Family Fund at the Toronto Foundation for their generous financial support.

Endnotes

1 IESO, *Central Toronto Area Integrated Regional Resource Plan*, (April 28, 2015).

2 Ontario Ministry of Energy, *Achieving Balance: Ontario's Long-Term Energy Plan*, (December 2013), page 30.

3 Ontario Clean Air Alliance Research Inc., *Ontario's Long-Term Energy Plan: A One Year Review*, (November10, 2014), pages 1 – 3.

4 IESO, *Central Toronto Area Integrated Regional Resource Plan*, (April 28, 2015), pages 81, 87 and 88.

5 *Central Toronto Area Integrated Regional Resource Plan*, pages 77 & 78.

6 Toronto's per capita electricity consumption in 2014 was 8994 kWh; New York City's was 6188 kWh. See: New York Independent System Operator, *Power Trends 2015: Rightsizing the Grid*, page 10; United States Census Bureau; Ontario Energy Board, *2014 Yearbook of Electricity Distributors*, page 65; and www.toronto.ca\ecdevdata.

7 *Central Toronto Area Integrated Regional Resource Plan*, page 12.

8 *Central Toronto Area Integrated Regional Resource Plan*, page 13 and Appendix C, page 4.

9 *Central Toronto Area Integrated Regional Resource Plan*, Appendix F, page 6.

10 *Central Toronto Area Integrated Regional Resource Plan*, page 80.

11 Some of the key input assumptions for the IESO's analysis are as follows: the CHP plant has a 90% average capacity factor, an energy efficiency of 80% and its capital costs are amortized over 20 years. Assuming a gas cost of $3 per MMBtu, the total cost of electricity from the CHP plant is 5.8 cents per kWh; assuming a gas cost of $5 per MMBtu, the total cost is 6.8 cents per kWh. At the time of writing the cost of gas was less than $3 per MMBtu. Emails from Terry Young, Vice President, IESO to Jack Gibbons, Ontario Clean Air Alliance, (July 14, 2015 and October 20, 2015).

12 "Bruce Power ownership finalized", *Owen Sound Sun Times*, (March 31, 2014).