Toronto on the electricity edge

Fixing Toronto's electricity security of supply problems

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Introduction

The City of Toronto is exposed to two serious electricity security of supply challenges. First, any loss of the Leaside electricity supply path would lead to a 300 megawatt (MW) power shortage in downtown and central Toronto. Second, in the event of a provincial or eastern North American blackout, Toronto's hospitals will not be able to operate at full capacity.

Loss of Leaside Electricity Supply Path

Fig. 1 - Toronto electricity supply sources¹⁶

As Figure 1 reveals, downtown and central Toronto receives virtually all of its electricity supply from three sources:

- 1. A high-voltage electricity transmission path that brings electricity from the east to the Leaside Transformer Station;
- 2. The Portlands natural gas-fired power plant on the Toronto waterfront; and
- 3. A high-voltage electricity transmission path that brings electricity from the west to the Manby Transformer Station in Etobicoke.

Downtown and central Toronto are reliant on three supply pathways. The loss of the Leaside pathway would cause a serious electricity supply shortage in the heart of the city.



FEBRUARY 2010

According to the Ontario Power Authority (OPA), a loss of the Leaside supply path (e.g., ice storm, wind storm, fire or flood at the Leaside Transformer Station) would lead to "about 300 MW of load that would be unsupplied and rotating outages for this load would be required."¹

As the OPA has noted: "History has shown that extreme events do happen, leading to widespread blackouts and loss of power for prolonged periods ranging from days to weeks. This is evidenced by the number of large scale blackouts in the last ten years (California 1996, Midwest Canada and U.S. 1998, Northeast Ice Storm 1998, Northeast Canada and U.S. 2003, Italy 2003, and European Union 2006). There are also numerous examples of extreme events in major urban centres, with significant impacts to residents and commerce (New York City 1997, 1999, 2006; Chicago 1998; Auckland 1998; San Francisco 1998; Detroit 2000; and Athens 2004)."²

Toronto's hospitals cannot operate at full capacity during a blackout

Toronto's hospitals cannot operate at full capacity during a blackout for two reasons. First, the capacity of their emergency diesel generators is significantly lower than their peak electricity demand. Second, in the event of a prolonged blackout they may not be able to obtain a continuous supply of diesel fuel.

For example, the peak demand (22 MW) of the University Health Network (Toronto General, Toronto Western and Princess Margaret) is 8 MW greater than its on-site diesel generation capacity (14 MW).³ Similarly, the peak demand of Sunnybrook (12.8 MW) is 8.2 MW greater than its on-site diesel generating capacity (4.6 MW).⁴

Security of Supply Solutions

There are two potential solutions to keep Toronto's lights on if the Leaside supply path is lost:

- Build a third transmission line to serve downtown and central Toronto at an estimated cost of approximately \$600 million.⁵
- 2. Install 300 MW of small-scale combined heat and power plants in downtown and central Toronto.

Most buildings and factories in Ontario use natural gas to produce just one service, namely, heat. It is much more efficient to use these same molecules of natural gas to simultaneously produce heat and electricity. Combined heat and power (CHP) plants can have energy efficiencies of 80 to 90%; compared to the energy efficiency of a nuclear reactor of only 33%.⁶

CHP plants can be installed in apartment buildings, condominiums, shopping centres, hospitals, schools, airports and factories. The University of Toronto, the Senator David Croll Apartments (at Bloor and Huron Streets) and the Pearson Airport have CHP plants. In addition, a number of Ontario hospitals (e.g., Kingston General Hospital, London's Victoria Hospital, Ottawa's Queensway-Carleton Hospital and the Sudbury Regional Hospital) have CHP plants that allow them to continue to operate at full capacity during a blackout.⁷

While building a third line to provide power to the Hearn Transformer Station on the

The capacity of emergency power systems at Toronto hospitals are often significantly lower than their peak electricity demands Toronto waterfront will ensure that Toronto's lights stay on if Leaside supply path is lost, it will *not* enable Toronto's hospitals to continue to operate at full capacity in the event of a provincial or North American blackout. Therefore the best option to meet Toronto's dual security of supply challenges is to install numerous small-scale, highefficiency CHP plants in Toronto's hospitals, buildings and factories.

Installation of distributed CHP plants would also be significantly less disruptive than a transmission line cutting across Scarborough and through Riverdale / East Toronto.

On a cost basis, development of distributed CHP plants will also be less expensive than development of new nuclear units to supply the third line. And because they are located close to load, these CHP plants will not suffer the additional transmission and distribution losses that a third line would experience, particularly during periods of peak demand.

Barriers to CHP in Downtown and Central Toronto

There are three financial and technical barriers to the installation of small-scale, highefficiency CHP plants in downtown and central Toronto.

First Financial Barrier

Ontario's wholesale spot market price for electricity is substantially less than the total cost of building a new power plant. As a result, the only new electricity generation projects that are proceeding in Ontario are ones that have long-term supply contracts with the Ontario Power Authority that guarantee them a fair price for their electricity supply.

The standard offer program for CHP that the OPA was directed to develop in 2007 is still not in place.

In June 2007 Ontario's then Minister of Energy directed the OPA to establish a natural

gas-fired CHP standard offer program – a program that would pay a fixed price for each kWh of electricity produced by CHP plants. According to Minister Dwight Duncan's directive the goal was to have the standard offer program in place by December 2007.⁸ Unfortunately, the standard offer program has still not been implemented.

Paying hospitals, multi-residential, commercial, institutional and industrial customers to build CHP plants will benefit *all* of Ontario's electricity consumers since new CHP plants can help the province meet its electricity needs at a much lower cost than new nuclear reactors.⁹

Recommendation #1

Ontario's Minister of Energy and Infrastructure should direct the OPA to establish a CHP standard offer program immediately.

Second Financial Barrier

According to Toronto Hydro, it could cost it: up to \$500,000 to connect a 5.7 MW CHP plant at the Sunnybrook Health Sciences Centre to its distribution grid; up to \$500,000 to connect a 6 MW CHP plant at St Michael's Hospital to its distribution grid; and up to \$6 million to connect a 20 MW CHP system at the MARs Discovery District (Sick Kids, Toronto General Hospital, Mt. Sinai, Princess Margaret etc.). Fur-



thermore, according to Toronto Hydro, CHP customers must compensate it for 100% of its costs of connecting them to its distribution grid.¹⁰

Toronto Hydro's policy of requiring new CHP customers to compensate it for 100% of its costs of connecting them to the grid is contrary to the public interest for two reasons. First, new CHP plants in downtown Toronto will increase the electricity security of supply for *all* of Toronto Hydro's customers. Second, the installation of 300 MW of CHP in downtown Toronto will avoid the need for *all* of Toronto Hydro's customers to pay for a \$600 million new third transmission line to downtown Toronto.¹¹

The Ontario Energy Board recently amended its *Distribution System Code* to require new *renewable* energy generators to compensate Toronto Hydro for only a small fraction of its costs of connecting them to its distribution grid.¹²

On June 22, 2009 the City of Toronto asked the Ontario Energy Board to amend its *Distribution System Code* to ensure that Toronto Hydro's charges for connecting natural gas-fired CHP power plants to its distribution grid are the same as its charges for connecting renewable power plants.¹³ Unfortunately, the Ontario Energy Board has not yet implemented the City of Toronto's request.

Recommendation #2

Minister Duguid should direct the Ontario Energy Board to amend the Distribution System Code to ensure that Toronto Hydro's charges for connecting CHP plants to its distribution grid are identical to its charges for connecting renewable power plants to its distribution grid.

Technical Barrier

Currently, as a result of short circuit constraints at Hydro One's Leaside, Manby and Hearn Transformer Stations, only 80 MW of CHP can be installed in down-town and central Toronto.¹⁴

According to the Independent Electricity System Operator, Hydro One is currently not planning to remove these short circuit constraints until the winter of 2012/13.¹⁵

Recommendation #3

Minister Duguid should direct Hydro One to make eliminating the short circuit constrains at its Leaside, Manby and Hearn Transformer Stations a top priority for resolution as soon as possible.

Summary of Recommendations

1. Ontario's Minister of Energy and Infrastructure, the Honourable Brad Duguid, should direct the OPA to establish a CHP standard offer program immediately.

2. Minister Duguid should direct the Ontario Energy Board to amend the Distribution System Code to ensure that Toronto Hydro's charges for connecting CHP plants to its distribution grid are identical to its charges for connecting renewable power plants to its distribution grid.

3. Minister Duguid should direct Hydro One to make eliminating the short circuit constrains at its Leaside, Manby and Hearn Transformer Stations a top priority for resolution as soon as possible.

Endnotes

- The Ontario Power Authority's analysis assumes that following the loss of the Leaside supply path, about 480 MW of load could be transferred to the Manby Transformer Station on an emergency basis. See Ontario Power Authority, *Integrated Power System Plan*, Exhibit E, Tab 5, Schedule 5, Page 21. Available online at http://www.powerauthority.on.ca/Page. asp?PageID=924&SiteNodeID=320
- 2. Integrated Power System Plan, Exhibit E, Tab 5, Schedule 5, Pages 18 & 19.
- 3. Email from Ed Rubinstein, Manager, Energy & Environment, University Health Network to Jack Gibbons, Ontario Clean Air Alliance, October 29, 2005.
- 4. Emails from Rudy Amrein, Director, Plant Operation and Maintenance, Sunnybrook Health Sciences Centre and Derek Pienczak, Senior Energy Engineer, Energy Solutions Canada, Honeywell to Jack Gibbons, Ontario Clean Air Alliance, October 19 & 21, 2009 respectively.
- 5. Integrated Power System Plan, Exhibit E, Tab 5, Schedule 5, Pages 31 to 36.
- 6. Ontario Power Authority, Supply Mix Analysis Report, Volume 2, (December 2005), Page 210; and Integrated Power System Plan, Exhibit G, Tab 2, Schedule 1, Page 7.
- 7. http://www.HealthPower.ca/facilities.php.
- 8. Letter from the Honourable Dwight Duncan, Minister of Energy to Dr. Jan Carr, CEO, OPA, June 14, 2007. Available online at http://www.powerauthority.on.ca/Page.asp?PageID=122&ContentID=6268
- 9. Ontario Clean Air Alliance, *Powerful Options: A review of Ontario's options for replacing aging nuclear plants*, May 19, 2009. Available online at: http://www.cleanairalliance.org.
- Ontario Energy Board Docket No. EB-2009-0139, *Hearing Transcript*, Volume 2, February 5, 2010, pages 85 & 87 to 97. Available online at http://www.rds.oeb.gov.on.ca/webdrawer/webdrawer.dll/webdrawer/search/rec&sm_udf10=eb-2009-0139&sortd1=rs_dateregistered&rows=200.
- 11. Hearing Transcript, Volume 2, February 5, 2010, page 20.
- 12. Ontario Energy Board, EB-2009-0077 Notice of Amendment To A Code: Amendments To The Distribution System Code, October 21, 2009. Available online at http://www.rds.oeb.gov.on.ca/webdrawer/webdrawer.dll/webdrawer/search/ rec&sm_udf10=eb-2009-0077&sortd1=rs_dateregistered&rows=200
- Letter from Richard Butts, Deputy City Manager, City of Toronto to Kirsten Walli, Secretary, Ontario Energy Board, June 22, 2009. Available online at http://www.rds.oeb.gov.on.ca/webdrawer/webdrawer.dll/webdrawer/search/rec&sm_ udf10=eb-2009-0077&sortd1=rs_dateregistered&rows=200
- Ontario Energy Board Docket No. EB-2009-0139, Exhibit Q1, Tab 4, Schedule 1-3, Navigant Consulting, Central and Downtown Toronto Distributed Generation: Final Report, Prepared for Toronto Hydro Electric System and Ontario Power Authority, June 28, 2009, page 32. Available online at http://www.torontohydro.com/sites/electricsystem/Pages/RegulatoryAffairs.aspx; and EB-2009-0139 Hearing Transcript, Volume 2, pages 46 & 47.
- 15. Independent Electricity System Operator, The Ontario Reliability Outlook, December 2009, page 20. Available online at http://www.ieso.ca/imoweb/ircp/reliability_outlook.asp.
- 16. Navigant Consulting, *Central and Downtown Toronto Distributed Generation: Final Report*, Prepared for Toronto Hydro Electric System and Ontario Power Authority, June 28, 2009, page 32.



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Thanks to the Toronto Atmospheric Fund Thanks to the Toronto Atmospheric Fund for its support of this project