The Bremner Transformer Station vs. Energy Conservation and Distributed Generation

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As a result of the Ontario Power Authority's failure to aggressively pursue all of Toronto's cost-effective energy conservation and distributed generation opportunities, downtown Toronto's electricity demand may exceed its supply capacity in the future. In response, Toronto Hydro is proposing to build a new $272 million transformer station, near the CN Tower, to supply more electricity to downtown Toronto's office buildings and condos on hot summer days when their air conditioners are running full out.[1] This doesn't make sense since Toronto's electricity needs can be met at a lower cost *and* more securely by a combination of energy conservation and distributed generation (e.g., solar PV and combined heat and power).

Fortunately, Toronto Hydro and the Ontario Power Authority are currently working on a Toronto Regional Electricity Supply Plan which will examine all the options to meet our electricity needs including energy conservation and distributed generation. Therefore, by working together, they now have the opportunity to develop a smart plan to lower our energy bills and move Toronto to a clean, green and reliable energy future.

Lower Cost

Energy conservation and distributed generation are a lower cost option since they avoid the need for:

a) The proposed $272 million Bremner Transformer Station;

b) A $600 million third transmission line to serve downtown Toronto (e.g., the East Toronto Transmission Line)[2]; and

c) $3.2 billion of new nuclear generation capacity.[3]

That is, energy conservation and distributed generation can avoid approximately $4 billion of conventional electricity supply-side infrastructure.

More Secure Supply

In addition, unlike the proposed Bremner Transformer Station, energy conservation and distributed generation can also ensure that the lights will stay on in downtown and central Toronto if Hydro One's Leaside Transformer Station unexpectedly goes out of service.

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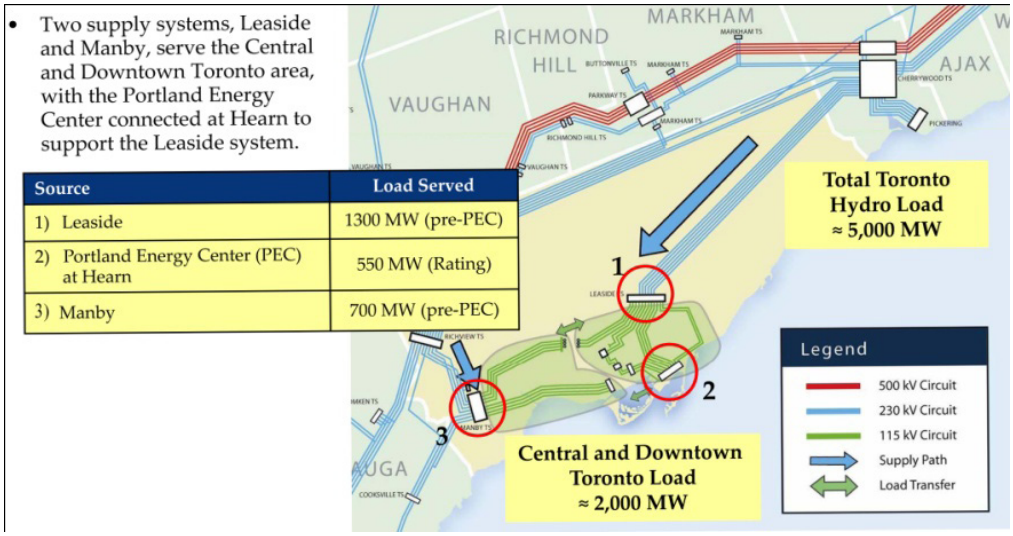
Figure 1: Downtown Toronto's Major Electricity Supply Sources



Currently, virtually all of downtown and central Toronto's electricity is provided by just three sources:

a) The Portlands Generating Station on the waterfront;

b) Hydro One's transmission lines that bring electricity from east of Toronto to its Leaside Transformer Station; and

c) Hydro One's transmission lines that bring electricity from west of Toronto to its Manby Transformer Station in Etobicoke.

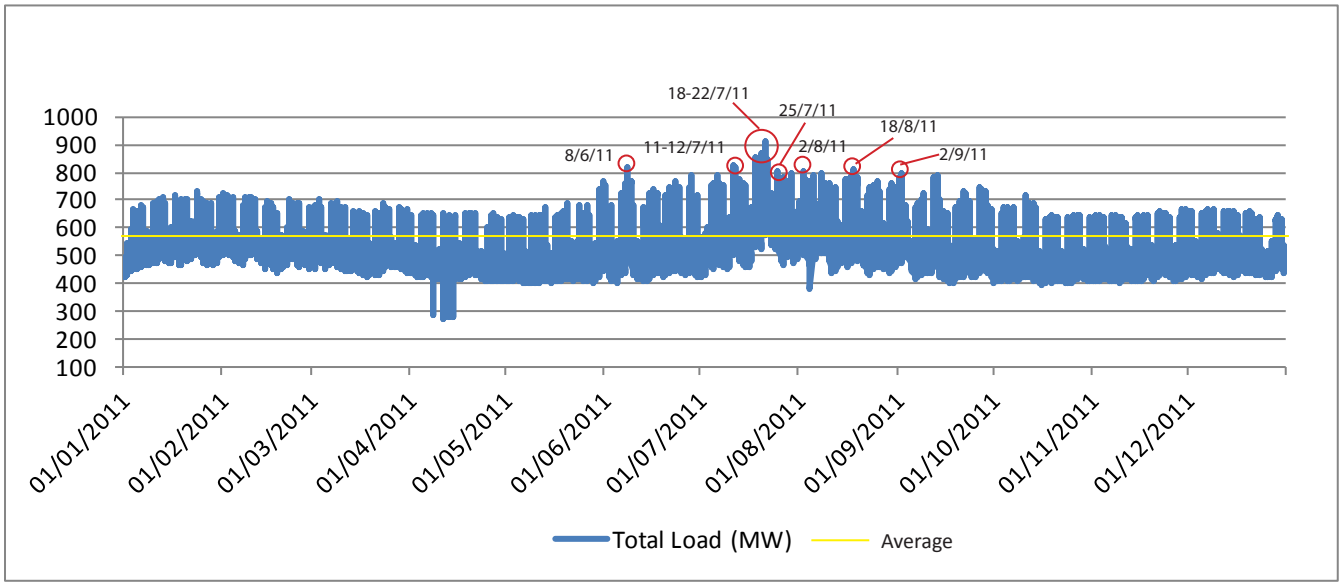
According to the Ontario Power Authority, if the Leaside Transformer Station loses power, downtown and central Toronto would experience a 300 megawatt (MW) power shortage, which would lead to rotating black-outs.[4] By investing in energy conservation and efficiency and by installing small scale solar PV and combined heat and power plants in downtown and central Toronto, we can keep the lights on even if we lose one of our three major electricity supply sources.

At present, Toronto can meet only approximately 13% of its peak day electricity needs from local sources.[5] On the other hand, New York City is required by the New York State Reliability Council to be able to meet 80% of its peak day electricity needs from power plants located within NYC.[6]

Downtown Toronto's Load Profile

The chart on page 3, which plots downtown Toronto's demand for electricity during every hour of 2011, reveals a number of important facts. First, the demand for electricity spikes on a dozen very hot summer days when the downtown office towers' and condos' air-conditioners are running full out. Second, on these days, the peak hourly demands for electricity can be more than 50% higher than downtown Toronto's annual average demand of 564 MW. Third, these summer needle peaks last for only a few hours at a time.

Figure 2: Downtown Toronto's Hourly Electricity Demand in 2011



Toronto Hydro Load Forecast

The summer peak day demand in downtown Toronto was 914 megawatts (MW) in 2011.

According to Toronto Hydro, downtown Toronto's electricity demand on hot summer days will exceed the capacity of its existing transformer stations to deliver electricity from the Hydro One high-voltage transmission grid starting in 2017.

Table 1: Forecast Electricity Demand in Excess of Existing Transformer Station Capacity on Hot, Summer Days in Downtown Toronto[7]

2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
2 MW	9 MW	20 MW	33 MW	54 MW	71 MW	92 MW	111 MW	134 MW	151 MW

The demand/supply imbalance can be eliminated by Made-in-Toronto energy conservation and distributed generation investments which will reduce the need for electricity from outside of Toronto to power downtown Toronto's air-conditioners.

Energy Conservation Opportunities

Toronto's electricity consumption per person is 56% higher than that of New York City.[8] As a result, there is a huge untapped energy efficiency potential in downtown Toronto's buildings.

The Building Owners and Managers Association (BOMA), the Real Property Association of Canada (REALpac), the Greater Toronto CivicAction Alliance and the City's Better Building Partnership all have programs to encourage and help building owners to reduce their energy consumption.

In addition, Enwave is planning to expand its Deep Lake Water Cooling system which will reduce the need for electricity for cooling.

Toronto Hydro's and the Ontario Power Authority's (OPA) payments to building owners to *reduce* their wasteful electricity consumption are dramatically lower than the OPA's payments to power companies to *produce* electricity. Specifically, their payments to building owners to save electricity can be 1 cent per kWh or less.[9] The OPA should be willing to pay building owners up to the same amount to save a kWh that it pays nuclear power companies to produce a kWh.

Unfortunately, the promotion of energy conservation is **not** a profitable course of action for Toronto Hydro. In fact, the utility is actually encouraged to under invest in conservation. All of the funding for Toronto Hydro's conservation programs is provided by the OPA. And according to the OPA-Toronto Hydro funding agreement, Toronto Hydro can earn a profit bonus of up to $8.5 million by *under spending* its conservation budget even if it fails to achieve its minimum energy conservation targets established by the Ontario Energy Board.[10]

Distributed Generation

Solar PV

Solar photo-voltaic (PV) is the ideal supply option to help meet downtown Toronto's peak day electricity needs since its maximum output occurs on the hot sunny afternoons when the air-conditioners are running full out. According to a report prepared for Toronto Hydro and the Ontario Power Authority, there is the potential for 1,300 MW of solar PV to be installed in downtown and central Toronto.[11]

Combined Heat & Power

Virtually every building in Toronto uses natural gas to provide just one service, namely, heat. It is much more efficient to use these same molecules of natural gas to simultaneously produce heat and electricity. This is what combined heat and power (CHP) plants do. As a result, they can have an overall energy efficiency of 80-90%.

While the University of Toronto and the Senator David Croll Apartments on Bloor Street already have combined heat and power plants, Toronto has a huge untapped CHP potential. In fact, according to a report prepared for Toronto Hydro and the Ontario Power Authority, there is the potential for 1,000 MW of CHP in downtown and central Toronto.[12]

1. CHP plants should be installed at Toronto's downtown hospitals (e.g., Sick Kids, St. Michael's, Toronto Western) to ensure that they will be able to operate at full capacity during a black-out.

2. Enwave's district energy system provides heating for 140 institutional, commercial and government buildings in downtown Toronto. The heat is provided by gas-fired boilers located at its Walton Street, Pearl Street and Queen's Park stations. These steam plants should be converted to CHP to increase their energy efficiency and to increase our electricity supply security.
3. Toronto Community Housing Corporation's gas boilers at Regent Park, St. James Town and Moss Park should be converted to CHP to save money and ensure that the lights will stay on in these communities if there is a black-out.
4. Northland Power's 90 MW CHP project on the Toronto waterfront should proceed. In addition to producing electricity this project would provide steam for Redpath Sugar, the proposed new buildings on the LCBO property, and other Waterfront Toronto developments in the East Bayside.

Short-Circuit Constraints

When the short-circuit upgrades to Hydro One's Leaside, Hearn and Manby Transformer Stations are completed in 2013 & 2014[13], it will be possible to connect up to 490 MW of CHP or 733 MW of solar PV to the Toronto Hydro grid in downtown and central Toronto.[14] In addition, there are many low-cost technical fixes that can be implemented to permit additional CHP and solar PV to be connected to Toronto Hydro's distribution grid.[15]

Back-Up for the Windsor Transformer Station

According to Toronto Hydro, the proposed Bremner Transformer Station is also needed to provide back-up for its Windsor Transformer Station while its obsolete switchgear equipment is replaced. However, the needed back-up can be provided at a much lower cost (approximately $22 million) by installing feeder ties from the Esplanade or Strachan Transformer Stations to Windsor.[16]

The Smart Solution

The smart solution to meet downtown Toronto's electricity needs is to pursue all of our cost-effective energy conservation, renewable energy and combined heat and power options before considering building a new transformer station to facilitate the import of more higher-cost nuclear power. However, this integrated, least-cost solution will require the support of the Ontario Power Authority, which provides the financing for: a) Toronto Hydro's energy conservation programs; and b) all of the province's new electricity supply resources.

Fortunately, Toronto Hydro is currently working with the Ontario Power Authority to develop a Toronto Regional Electricity Supply Plan. The Plan, which will examine all the options to meet our electricity needs, including energy conservation and distributed generation, will be publicly released by April 2013. Therefore, by working together, Toronto Hydro and the Ontario Power Authority have the opportunity to develop a smart plan to lower our energy bills and move Toronto to a clean, green and reliable energy future.

Specifically, Toronto City Council and the Government of Ontario should request Toronto Hydro and the Ontario Power Authority to develop a plan which will ensure that:

1. all the cost-effective, reliable and feasible energy conservation and demand management opportunities in the City of Toronto are implemented;
2. all the cost-effective, reliable and feasible renewable energy opportunities (e.g., deep lake water cooling, geo-thermal, solar thermal and solar PV) in the City of Toronto are implemented;
3. Toronto will not be subject to rolling black-outs if the Leaside Transformer Station unexpectedly goes out of service;
4. all of Toronto's hospitals, emergency facilities and subways will be able to operate at full capacity in the event of a provincial or North American black-out;
5. Enwave's Walton Street, Pearl Street and Queen's Park steam stations are converted to combined heat and power (CHP);
6. Toronto Community Housing Corporation's gas boilers at Regent Park, St. James Town and Moss Park are converted to CHP;
7. Northland Power's CHP and district energy project on the Toronto waterfront proceeds; and
8. the promotion of energy conservation is a profitable course of action for Toronto Hydro.

Endnotes

1 The cost of phases 1 & 2 are $195 million and $77 million respectively. Navigant Consulting, *Business Case Analysis: Downtown Toronto-Electric Supply Evaluation*, Prepared for Toronto Hydro Electric System, (April 2012), pages 21 & 26.

2 Ontario Power Authority, *Ontario's Integrated Power System Plan: Discussion Paper 7: Integrating the Elements – A Preliminary Plan*, (November 15, 2006), page 114.

3 According to the Ontario Power Authority, three hundred megawatts (MW) of energy conservation and/or distributed generation is needed to avoid rolling blackouts in downtown and central Toronto if the Leaside Transformer Station unexpectedly goes out of service. Furthermore, 300 MW of energy conservation and distributed generation in Toronto will avoid the need for 300 MW of new nuclear generation outside of Toronto. According to the result of a 2009 Government of Ontario competitive bidding process, the cost of new nuclear generation is $10.8 million per MW. Ontario Power Authority, *Integrated Power System Plan*, (2007), Exhibit E, Schedule 5, page 21; and Tyler Hamilton, "Nuclear bid rejected for 26 billion reasons", *Toronto Star*, (July 14, 2009).

4 Ontario Power Authority, *Integrated Power System Plan*, (2007), Exhibit E, Schedule 5, page 21.

5 The Portlands Generating Station has a capacity of 550 MW. There are 552 distributed generation facilities in Toronto with a total capacity of 87.6 MW. Toronto's peak day demand in 2011 was 4,919 MW. Anthony Haines, President & CEO, Toronto Hydro Corporation, *Electricity Infrastructure and Economic Development* in Toronto, Power Point Presentation to City of Toronto Economic Development Committee, (October 16, 2012), page 15; and Ontario Energy Board, *2011 Yearbook of Electricity Distributors*, (September 13, 2012), page 66.

6 Email to Jack Gibbons from Paul DeCotis, Director, Energy Analysis, New York State Energy Research and Development Authority, (March 6, 2007).

7 The Navigant forecast of excess demand was expressed in mega volt-amperes (MVa) which we have converted to megawatts (MW) by multiplying by 0.93. Navigant Consulting, *Business Case Analysis*, page 10.

8 New York City's electricity consumption per person in 2011 was 6,557 kWh (54,060 GWh/8,244,910 people). Toronto's electricity consumption per person in 2011 was 10,223 kWh (25,592 GWh/2,503,281 people). Ontario Energy Board, *2011 Yearbook of Electricity Distributors*, (September 13, 2012), page 66; New York Independent System Operator, *Power Trends 2012: State of the Grid*, page 17; and www.nyc.gov/html/dcp/html/census/popcur.shtml.

9 Toronto Hydro's and the OPA's payments to building owners to save electricity are 10 cents per kWh for the first year's electricity savings. If the energy efficiency investment provides savings for ten years then this payment is equal to 1 cent for each kWh of the investment's life-cycle savings. https://www.torontohydro.com/sites/electricsystem/electricityconservation/businessconservation/Pages/RetrofitProgram.aspx

10 Ontario Clean Air Alliance, *An Energy Efficiency Strategy for Ontario's Homes, Buildings and Industries*, (October, 2011), page 30.

11 Navigant Consulting, *Central and Downtown Toronto Distributed Generation: Final Report*, (July 28, 2009), Prepared for Toronto Hydro Electric System and Ontario Power Authority, page 2.

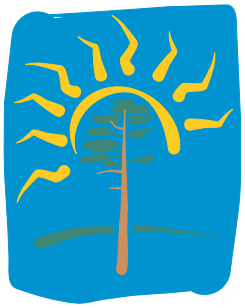
12 Navigant Consulting, *Central and Downtown Toronto Distributed Generation: Final Report*, (July 28, 2009), Prepared for Toronto Hydro Electric System and Ontario Power Authority, page 2.

13 Ontario Energy Board Docket No. EB-2012-0031, Exhibit D1, Tab 3, Schedule 3, Appendix A, page 3.

14 Ontario Energy Board Docket No. EB-2011-0144, Exhibit D1, Tab 12, Schedule 4, Appendix A: Navigant Consulting Ltd., *Toronto Hydro System Connection Capacity and Enabling Options for Distributed Generation*, Presented to Toronto Hydro Electric System, (May, 2011), page 36.

15 *Toronto Hydro System Connection Capacity and Enabling Options for Distributed Generation*, pages 37 – 51.

16 Navigant Consulting, *Business Case Analysis*, pages 19 & 29.



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