Ontario's electricty surplus

an opportunity to reduce costs

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Introduction

Ontario's electricity demand is falling and our electricity generation capacity is rising. But that has not led to lower electricity prices in the province, and with current plans to increase the use of costly and inflexible nuclear power, prices will continue to rise.

Since 2005, Ontario's total electricity consumption has fallen by 10%.[1] And according to the North American Electric Reliability Corporation, which is responsible for ensuring the reliability of the North American electricity grid, Ontario's electricity consumption and peak demand will continue to fall until at least 2021.[2] Falling electricity demand in Ontario is due to a combination of factors and is not simply a temporary recessionary effect:

- Capital equipment replacement cycles, where older inefficient equipment is replaced by new significantly more efficient technology (e.g., variable frequency drive motors and LED lighting).
- Direct efforts to incent efficiency improvements and reduce peak period demand, ranging from building retrofit incentives to price differentials.
- Structural changes in the Ontario economy, with a likely permanent decrease in industrial power use.
- Greater use of self-generated power in power hungry industries like pulp and paper, using waste products or combined heat and power systems.

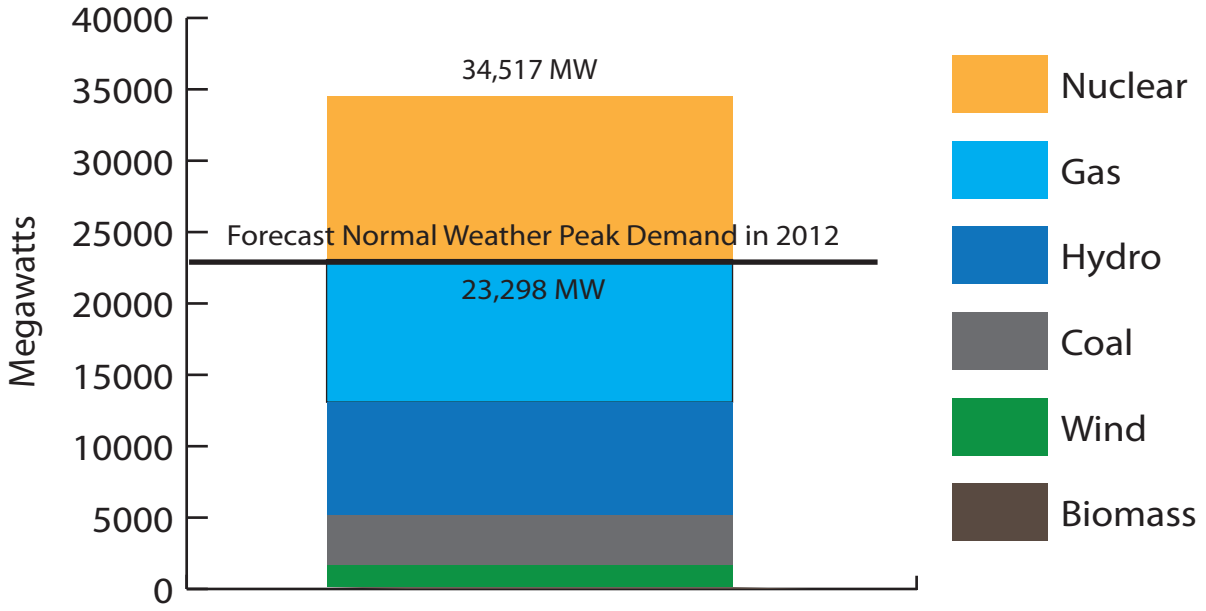
Meanwhile, Ontario continues to use more power per capita than many of its major competitors. We use 27% more electricity per person than New York State,for example. [24] This indicates that the province has plenty of potential to further drive down demand through more robust efficiency efforts. In fact, in order to close the productivity gap with major competitors and lower the pressure on the province's capital spending requirements, it only makes sense for the province to drive down demand as much as possible.

On the supply side, our electricity generation capacity has increased by 13% since September 2003.[3]

As a consequence, Ontario has a large surplus of excess electricity generating capacity. According to the Independent Electricity System Operator (IESO), our electricity generating capacity will exceed our forecast normal weather peak demand this summer by 48%. (See Figure 1 next page.)

Despite an electricity supply surplus, prices will continue to rise if the province proceeds with plans to increase use of costly and inflexible nuclear power

Figure 1: Ontario's Generation Capacity (June 2012) and Peak Demand[4]

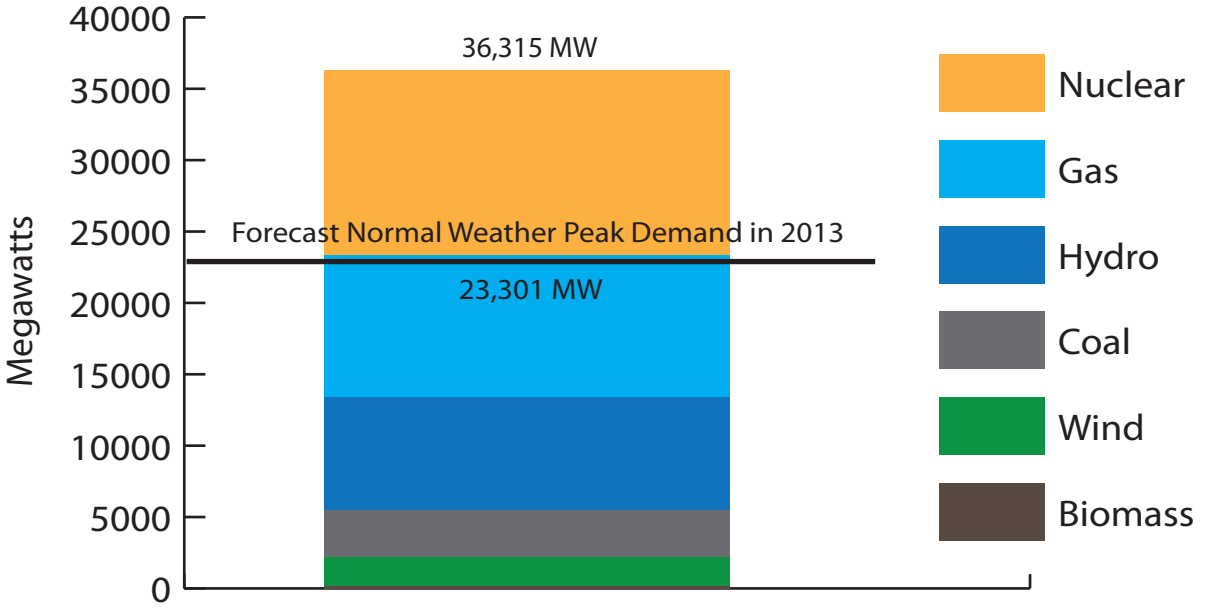


Furthermore, according to the IESO, our surplus supply will grow significantly over the next 12 months thanks to the return to service of two reactors at the Bruce Nuclear Station (1,500 MW), and the addition of 469 MW of new wind generation.

According to the IESO, this means that as of August, 2013, our electricity generation capacity will exceed our forecast normal weather peak demand by 56%. (See Figure 2 below.)

As a result, Ontario has a large window in which to plan for the orderly replacement of aging nuclear plants with lower cost, more flexible and safer power options.

Figure 2: Ontario's Generation Capacity (Summer 2013) and Peak Demand[5]



The effect of Ontario's electricity surplus on prices

As a consequence of rising supply and falling demand, the market price of electricity in Ontario has declined by 58% since 2006. Specifically, the average market price of electricity has plunged from 4.78 cents per kWh in 2006 to 2.03 cents per kWh during the first five months of 2012.[6]

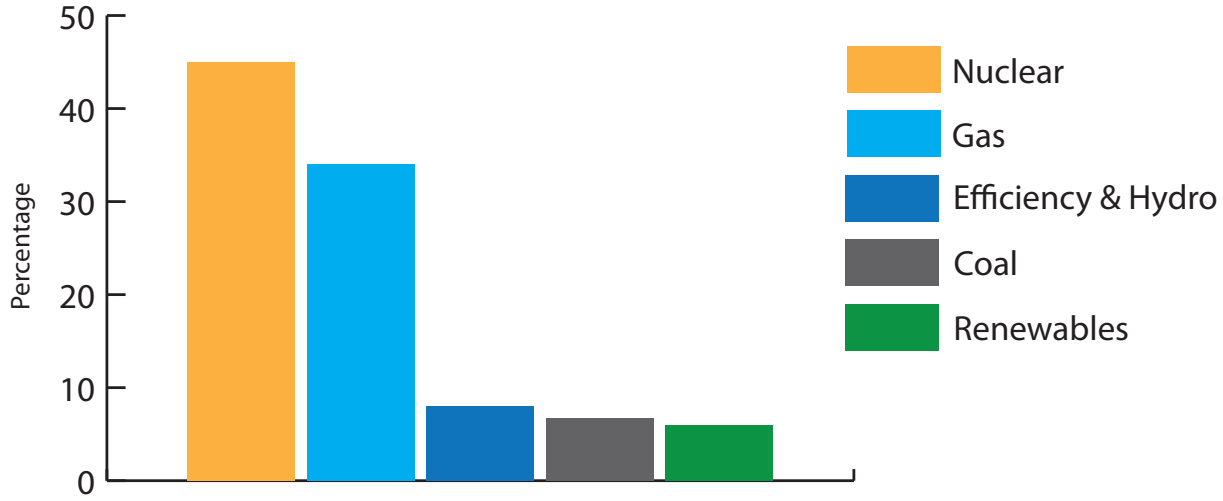
However, Ontario's electricity consumers have not benefited from the falling market price for electricity since the Government of Ontario has imposed a special charge on all electricity consumers (the Global Adjustment Charge) to provide a supplementary "out-of-market" revenue stream for Ontario's electricity generators. Table 1 provides a break-out of the total cost of electricity generation during the first five months of 2012. The total cost of electricity generation is four times the market price.

Table 1: Total Cost of Electricity Generation for Ontario Consumers: January – May 2012[8]

Market Price	2.03 cents per kWh
Global Adjustment Charge	5.41 cents per kWh
Nuclear Debt Retirement Charge	0.70 cents per kWh
Total Cost	**8.14 cents per kWh**

Between 2006 and 2011 inclusive, the majority of the Global Adjustment (GA) revenues have been used to subsidize nuclear and coal-fired electricity generation. Specifically, 45% of the GA revenues have been used to subsidize nuclear generation and 6.7% of these revenues have been used to subsidize our dirty coal-fired power plants. On the other hand, only 6% of the GA revenues have been used to subsidize new renewable generation, primarily wind and solar. Thirty-four percent of the GA revenues were used to subsidize natural gas-fired generation and 8% were used to subsidize energy efficiency programs and Ontario Power Generation's hydro-electric generation.[9]

Figure 3: Breakdown of Global Adjustment payments



In addition, due to the limited ability of our nuclear reactors to reduce their output when demand declines[7], there have been numerous hours when Ontario's total electricity production exceeds our total domestic demand for electricity. When this occurs the market price for electricity becomes negative and we pay consumers in Manitoba, Quebec and the U.S. to take away our excess electricity production.

Despite Ontario's growing surplus, according to a report prepared by Bruce Sharp for the Canadian Manufacturers & Exporters, Ontario's electricity prices are forecast to continue to rise during the next five years. Specifically, Mr. Sharp predicts that, between December 2011 and December 2016, electricity prices will rise by an additional 36 to 58%.[10]

How to Reduce Rising Electricity Prices

Shutting down superfluous generation can cut electricity costs by 7%

In the short-run, the most effective option to reduce rising electricity prices is to shut down superfluous electricity generating stations with the highest fuel and operating costs. Specifically, we can lower our electricity bills by shutting down our coal-fired power plants and the Pickering Nuclear Generating Station.

In the long-run, we can achieve additional savings by replacing the aging Bruce and Darlington Nuclear Stations with lower-cost and more flexible resource options, such as hydro imports from Quebec or combined heat and power plants.

Ontario's Coal-Fired Power Plants

A legally binding Government of Ontario regulation requires the Nanticoke, Lambton, Thunder Bay and Atikokan Generating Stations to cease burning coal by December 31, 2014. However, these coal plants are no longer needed to keep our lights on and they are money losers. Specifically, in 2011, Ontario Power Generation received a $367 million subsidy from the GA fund to cover the operating losses of its coal plants.[11]

Closing the coal plants could reduce our electricity rates by approximately $367 million per year or roughly 2.3%.[25]

Pickering A & B Nuclear Stations

Currently, there are six in-service nuclear reactors at the Pickering Nuclear Stations. According to the Ontario Power Authority (OPA), the current outlook for the plants is for:

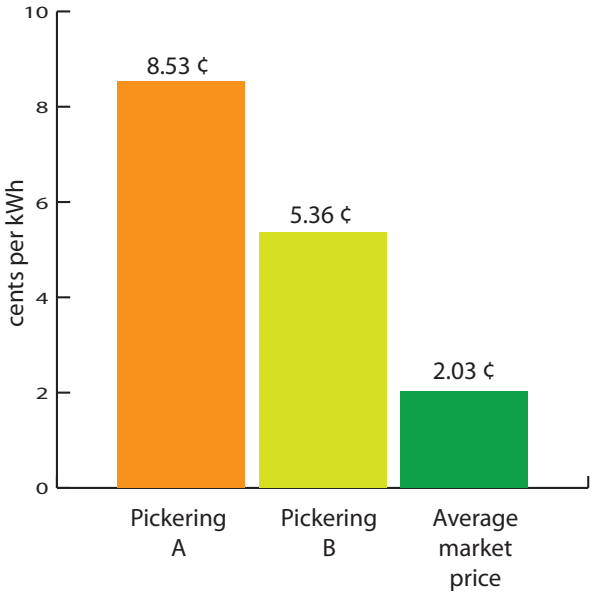
- one of these units to be shut down in May 2014;
- another unit to be shut down in November 2014;
- the remaining four units to be shut down in March 2015.[12]

According to a report prepared for Ontario Power Generation by ScottMadden Inc., the Pickering A Nuclear Generating Station is the highest cost nuclear power plant in North America. Furthermore, the Pickering B Nuclear Station is the 5th highest cost

nuclear power plant in North America..[13] Nevertheless, Ontario Power Generation is evaluating the potential to spend hundreds of millions of dollars to extend the life of these very high-cost reactors for another four to six years.[14]

Pickering A's ***fuel and operating costs alone*** are more than four times greater than the market price of electricity. Pickering B's fuel and operating costs are more than double the market price of electricity. (The market price of electricity is approximately equal to the fuel and operating costs of our new gas-fired power plants.)

Figure 4: Pickering fuel and operating costs versus market price of electricity[26]



Pickering A's cost per kWh is the highest in North America.

Shutting down the Pickering A and B Nuclear Stations would save Ontario's electricity consumers approximately $846 million per year or 5.3% of the province's total electricity costs.[15]

However, according to the OPA, two of the Pickering units must remain in service until alternative solutions are implemented to ensure a reliable electricity supply for the eastern Greater Toronto Area (GTA) during peak load periods. The OPA's preferred solution is a new "Oshawa Area" Transformer Station."[16] Alternatively, our reliability objectives could be achieved by adding a total of 1,000 MW of new supply and/or demand management (demand response or energy efficiency resources) in the eastern GTA.[17]

Meeting our Future Electricity Needs

The Government of Ontario's *Long-Term Energy Plan* is proposing to meet our future electricity needs by re-building the Bruce B and Darlington Nuclear Stations and with the construction of two new nuclear reactors at Darlington. According to the *Plan*, these projects will cost $33 billion. However, every nuclear project in Ontario's history has gone massively over budget — on average by a factor of 2.5. Therefore, a more realistic estimate of the total cost of the proposed nuclear spending program is $82.5 billion ($33 billion x 2.5).[18] This more realistic estimate is supported by the rising costs of new build projects in France and Finland and estimates for new reactors in Great Britain that have risen by a factor of 4.2 since planning started in 2003.[19]

Many non-nuclear supply options are cheaper and more flexible

Fortunately, Ontario has much lower cost options to keep our lights on. As Table 2 reveals energy efficiency, water power imports from Quebec, combined heat and power and wind power can meet our incremental electricity needs at a much lower cost than re-building the Darlington Nuclear Station.

Table 2: Ontario Electricity Options: A Cost Comparison[20]

Energy Efficiency	Water Power from Quebec	Natural Gas-Fired Combined Heat & Power	Wind Power	Darlington Re-Build Project
2.3 – 4.6 cents per kWh	5.8 cents per kWh	6 cents per kWh	11.5 cents per kWh	19 – 37 cents per kWh

In addition, these lower cost supply options, unlike nuclear, are dispatchable. That is, their output can be quickly and easily reduced when demand drops.[21] As a result, if we replace our aging nuclear reactors with these flexible resource options, we will no longer be forced to pay consumers in Manitoba, Quebec and the U.S. to take away our surplus base-load generation.

Conclusions

The closure of Ontario's four coal-fired electricity generating stations and the Pickering Nuclear Station could reduce the province's total electricity bill by up to $1.2 billion per year or 7.6%.[22] At least 60% of this generating capacity can be shut down in 2013 without jeopardizing our security of supply.[23] The complete phase-out of this high-cost capacity will require the implementation of lower cost options to meet our peak electricity needs on the hottest summer days. Specifically, energy efficiency and demand response options, new gas-fired generation and/or a peak day electricity supply contract with Hydro Quebec. (Unlike Ontario, Quebec's peak electricity demand occurs in the winter and as a consequence Hydro Quebec has surplus generating capacity during the summer.)

Additional savings can be achieved during the next ten years by replacing our aging Darlington and Bruce Nuclear reactors with a mix of energy conservation and efficiency, Made-in-Ontario green power, water power imports from Quebec, and small-scale, high-efficiency combined heat and power plants instead of higher cost new and re-built nuclear reactors.

Recommendations

1. The Minister of Energy should direct the Ontario Power Authority and the Independent Electricity System Operator to develop a strategy to commence and complete the shut down of our high-cost and superfluous coal-fired electricity generating stations and the Pickering nuclear reactors as soon as practically possible.
2. The Minister of Energy should direct the Ontario Power Authority and the Independent Electricity System Operator to develop a comprehensive assessment of the potential to meet our future electricity needs using a mix of energy conservation and efficiency, Made-in-Ontario green power, water power imports from Quebec, and small-scale, high-efficiency natural gas-fired combined heat and power plants.

Endnotes

1 http://www.ieso.ca/imoweb/media/md_demand.asp.

2 North American Electric Reliability Corporation, *2011 Long-Term Reliability Assessment*, (November 2011), page 335.

3 Independent Electricity System Operator (IESO), *18-Month Outlook*, (September 24, 2003), page 5; and IESO, *18-Month Outlook Update*, (June 22, 2012), page 5.

4 IESO, *18-Month Outlook Update*, (June 22, 2012), pages 3 & 5.

5 IESO, *18-Month Outlook Update*, pages 3, 5 & 6.

6 IESO, *Monthly Market Report*, (December, 2006), page 24; and *Monthly Market Report*, (May, 2012), page 21.

7 According to the IESO:

"The amount of reduction available for reactor power manoeuvres is dependent upon the reactivity of the unit at the time and can vary. Initial manoeuvres can be performed with approximately 30 minutes notice and can only be performed on one unit at a time. Reductions on multiple units must take place sequentially, not simultaneously. If a further reduction must be achieved on a unit that has already been reduced, between 8 and 12 hours must elapse after the first manoeuvre has taken place before another can be initiated.

The operation of CSDVs [Condenser Steam Discharge Valves] in response to surplus baseload generation conditions is restricted to a maximum of 300 MW per unit. Frequent operation of the CSDVs will lead to increased inspection and repairs due to the wear induced by the action.

If a nuclear unit must be reduced beyond what is capable from reactor power changes or from the use of CSDVs, it must be shut down. Due to the build-up of elements called "reactor poisons" which inhibit the fission reaction in a nuclear unit, the unit must remain offline for between 48 and 96 hours following a shutdown, depending on the unit. This time allows for these reactor poisons to sufficiently decay so that the unit can be restarted."

IESO, *Dispatch Order for Baseload Generation: A Discussion Paper for Stakeholder Engagement 91 (Renewable Integration),* (November 2, 2011), page 9.

8 IESO, *Monthly Market Report*, (May, 2012), page 21. http://www.ieso.ca/imoweb/pubs/marketReports/monthly/2012may.pdf

9 The total Global Adjustment (GA) payments between 2006 and 2011 inclusive equaled $15,528,700,000. The total GA payments to Ontario Power Generation to cover the operating losses of its Nanticoke and Lambton coal-fired power plants was $1.037 billion. Market Surveillance Panel, Ontario Energy Board, *Monitoring Report on the IESO-Administered Electricity Markets*, (April, 2012), pages 58 – 60; and Ontario Power Generation, *2011 Year End Report*, page 60; and *2010 Year Report*, page 68.

10 Bruce Sharp, *Ontario Electricity Price Increase Forecast: December 2011 to December 2016*, (March 21, 2012), pages 13 & 14.

11 Ontario Power Generation, *2011 Year End Report*, page 60. http://www.opg.com/investor/pdf/2011_Q4_FullRpt.pdf

12 Letter from Amir Shalaby, Vice-President, Ontario Power Authority to Carmine Marcello, Executive Vice President, Hydro One, (January 11, 2012); http://www.hydroone.com/RegulatoryAffairs/Documents/EB-2012-0031/Exhibit D/D1-03-03.pdf.

13 ScottMadden Inc., *OPG Nuclear 2009 Benchmarking Report*, (July 2, 2009), page 118.

14 Ontario Power Generation, *2012 First Quarter Report*, page 10; and http://www.opg.com/power/nuclear/pickering/.

15 The annual savings equal the difference between the Pickering Nuclear Station's fuel and operating costs and the market price of electricity multiplied by the average annual output of the Station between 2008 and 2010 inclusive. That is, the Pickering generation can be replaced by increasing the output of Ontario's under-utilized natural gas-fired electricity generating capacity. Pickering A's average annual output between 2008 and 2010 was 5.9 billion kWh; Pickering B's was 13.9 billion kWh. Ontario's total electricity bill is approximately $16 billion. Power Advisory LLC, *Incentive Regulation Options for Ontario Power Generation's Prescribed Generation Assets*, page 12 and *Energizing the Drummond Report*, page 2.

16 Letter from Amir Shalaby, Vice-President, Ontario Power Authority to Carmine Marcello, Executive Vice President, Hydro One, (October 3, 2011); http://www.hydroone.com/RegulatoryAffairs/Documents/EB-2012-0031/Exhibit D/D1-03-03.pdf.

17 Ontario Energy Board Docket No. EB-2012-0031, Exhibit D1-3-3, Appendix B, page 5; http://www.hydroone.com/RegulatoryAffairs/Documents/EB-2012-0031/Exhibit D/D1-03-03.pdf.

18 Ontario Clean Air Alliance, *Energizing the Drummond Report: How Ontario can reap multi-billion dollar electricity savings*, (March 22, 2012), pages 7 & 8.

19 Mycle Schneider, Antony Froggatt & Julie Hazemann, *World Nuclear Industry Report 2012*, p. 33-34. Available at: http://www.worldnuclearreport.org/spip.php?article30

20 Ontario Clean Air Alliance, *Energizing the Drummond Report: How Ontario can reap multi-billion dollar electricity savings*, (March 22, 2012), page 7.

21 According to the IESO:

"The ability for wind generators to pitch their turbine blades to follow dispatch instructions on a 5-minute basis makes them a very flexible resource. This flexibility can be achieved with no risk to public safety and with no known compromise of regulatory requirements on noise levels. The ability for solar generators to vary their output using inverters provides a similar level of flexibility, though the impacts associated with operating below 20% output will need to be investigated further with stakeholders to see if this restriction needs to be reflected in the dispatch order."

See: IESO, *Dispatch Order for Baseload Generation: A Discussion Paper for Stakeholder Engagement 91 (Renewable Integration),* (November 2, 2011), pages 11 & 12.

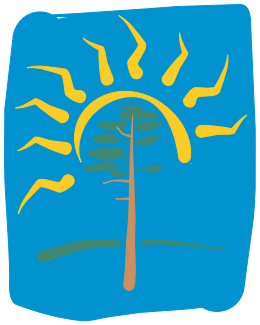
22 Ontario's total annual electricity bill is approximately $16 billion. See: Ontario Clean Air Alliance, *Energizing the Drummond Report*, (March 22, 2012), page 2.

23 According to the IESO, in 2013 our available generation capacity will exceed our required generation capacity by at least 4,000 megawatts assuming normal weather and our total coal and Pickering generating capacity will be 6,393 megawatts. IESO, *18-Month Outlook*, (June 22, 2012), pages 5 & 6 & Figure 4.2 on page 8.

24 Ontario Clean Air Alliance, *Energizing the Drummond Report: How Ontario can reap multi-billion dollar electricity savings*, (March 22, 2012), page 9.

25 Ontario's total annual electricity bill is approximately $16 billion. See *Energizing the Drummond Report*, page 2.

26. Power Advisory LLC, *Incentive Regulation Options for Ontario Power Generation's Prescribed Generation Assets*, Prepared for the Ontario Energy Board, (April 20, 2012), page 14.



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ALLIANCE
RESEARCH INC.

160 John St.
Suite 300,
Toronto, ON
M5V 2E5