

Energizing the Drummond Report

How Ontario can reap multi-billion dollar electricity savings

ONTARIO CLEAN AIR ALLIANCE RESEARCH | www.cleanairalliance.org

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Executive Summary

The Ontario Clean Air Alliance supports the Drummond Commission's 11 recommendations pertaining to Ontario's \$16 billion per year electricity sector, including eliminating the Ontario Clean Energy Benefit (OCEB) rebate. This measure alone would reduce the provincial deficit by \$1.1 billion per year. However, the Drummond Report missed two significant options for reducing electricity costs:

1. eliminating the subsidy for our money losing coal-fired power plants; and
2. reducing our dependency on new or rebuilt high-cost nuclear reactors.

In 2011, Ontario Power Generation received a \$367 million subsidy from the Ontario Electricity Financial Corporation, an agency of the Government of Ontario, to subsidize the operating losses of its Nanticoke and Lambton coal-fired power plants. Ontario no longer needs its coal plants to keep our lights on since we now have a large surplus of coal-free generation capacity. Eliminating this unnecessary subsidy will save Ontario up to \$367 million per year over the next three years.

The Government of Ontario's *Long-Term Energy Plan* calls for the re-building of the Bruce B and Darlington Nuclear Stations and the construction of two new nuclear reactors at Darlington despite the fact that our electricity needs could be met at a much lower cost with a combination of water power imports from Quebec; additional energy efficiency investments; and natural gas-fired combined heat and power plants. The savings from switching to these lower cost options could be between \$1.7 billion and \$9.1 billion per year by 2030.

In short, potential electricity sector savings range from \$1.4 billion per year today to up to \$9.1 billion per year by 2030. These savings could be used to invest in high quality healthcare, public education and deficit reduction.

The Drummond Report overlooked two important opportunities to save billions – ending coal subsidies and opting for lower cost energy sources rather than high-cost nuclear

Introduction

According to the Drummond Commission, Ontarians want excellent public services at a cost that they can afford. The Commission proposes a three-pronged strategy to achieve this goal:

1. a reduction in the rate of growth in government expenditures;
2. sharpening the efficiency of literally everything the government does so Ontarians get the greatest value for money from the taxes they pay; and
3. shifting the mandate of business support programs from job creation to improving productivity in order to raise Ontario's GDP and government revenues.¹

Specifically, the Commission recommends the following annual rates of spending growth for Government of Ontario programs to 2017-18.

Table 1: Recommended Annual Rates of Spending Growth²

Health Care	Education	Post Secondary Education (Excluding Training)	Social Programs	All Other Programs
2.5%	1.0%	1.5%	0.5%	- 2.4%

In total the Drummond Report provides 362 recommendations to the Government of Ontario. According to Mr. Drummond all of these recommendations must be implemented in order to eliminate the provincial deficit or the rejected recommendations must be replaced by better ideas that deliver similar fiscal benefits.³

Eleven of the Drummond Report's 362 recommendations are with respect to Ontario's \$16 billion per year electricity system.⁴ According to the Commission there are "a number of potentially large opportunities to source efficiencies" in this sector and slow down the projected 46% increase in electricity rates between 2010 and 2015.⁵

The Ontario Clean Air Alliance supports the Drummond Commission's 11 electricity sector recommendations. In this report we will highlight the merits of three of the Commission's major recommendations in this area and provide additional recommendations for multi-billion dollar per year savings that we believe are consistent with the Drummond Commission's approach.

Drummond Recommendation 12-10: Eliminate the Ontario Clean Energy Benefit as quickly as possible

The Ontario Clean Energy Benefit (OCEB) provides residential, farm and small business customers with a 10% rebate on their electricity bills. This subsidy costs the Government of Ontario \$1.1 billion per year. According to the Drummond Commission this rebate is inappropriate since it discourages energy conservation and because “there are more effective uses for the over \$1 billion per year spent on this initiative.”⁶

OCAA Commentary

The OCEB benefits large electricity consumers the most. A more equitable and financially responsible approach would be to replace it with a rebate program that is targeted at low income consumers.

In fact, fundamentally, the OCEB does not save Ontarians any money whatsoever. It simply transfers costs from utility bills to tax bills. Such costing “sleight of hand” has a long tradition in the Ontario electricity sector and is part of the reason the province currently has a \$13.4 billion electricity system stranded debt.⁷ Mr. Drummond is right that we would be better off with transparent, full-cost energy pricing that allows consumers to make intelligent decisions about their power usage.

Drummond Recommendation 12-15: Procure larger generation facilities through a request for proposal (RFP) process.

OCAA Commentary

The Government’s *Long-Term Energy Plan* is proposing to finance the re-building of the Darlington and Bruce B Nuclear Stations through sole-source contracts with Ontario Power Generation (OPG), Bruce Power and/or SNC-Lavalin. This approach is imprudent and unfair for a number of reasons.

First, sole-source contracting fails to guarantee the province’s consumers that their new electricity supplies are being procured at the lowest possible cost.

Second, sole-source contracting unfairly denies OPG’s, Bruce Power’s and SNC-Lavalin’s competitors the opportunity to submit competing bids using non-nuclear energy sources.

Third, every nuclear project in Ontario’s history has gone over budget — on average by 2.5 times.⁸ As a result, Ontario’s consumers and taxpayers are still paying down the \$20.9 billion stranded debt which is a legacy of the former Ontario Hydro’s nuclear program.⁹ In 2011 the stranded debt payments cost Ontario’s consumers and taxpayers \$2 billion.¹⁰

A sole-source contract with OPG for rebuilding the Darlington Nuclear Station would needlessly expose Ontario’s consumers and taxpayers to the risk of being on the hook, once again, for a multi-billion cost overrun. Ontario’s renewable and natural gas-fired power producers are not allowed to pass their cost overruns on to consumers or taxpayers. The same rules should apply to nuclear power producers, both for market fairness and to protect Ontario’s consumers and taxpayers.

OCAA Recommendation #1: Supplement Drummond Recommendation 12-15 with the requirement that the Government procure larger generation facilities exclusively from investor-owned companies pursuant to an all-in, fixed price contracts to ensure that Ontario’s electricity consumers and taxpayers will not be on the hook for any future cost overruns.

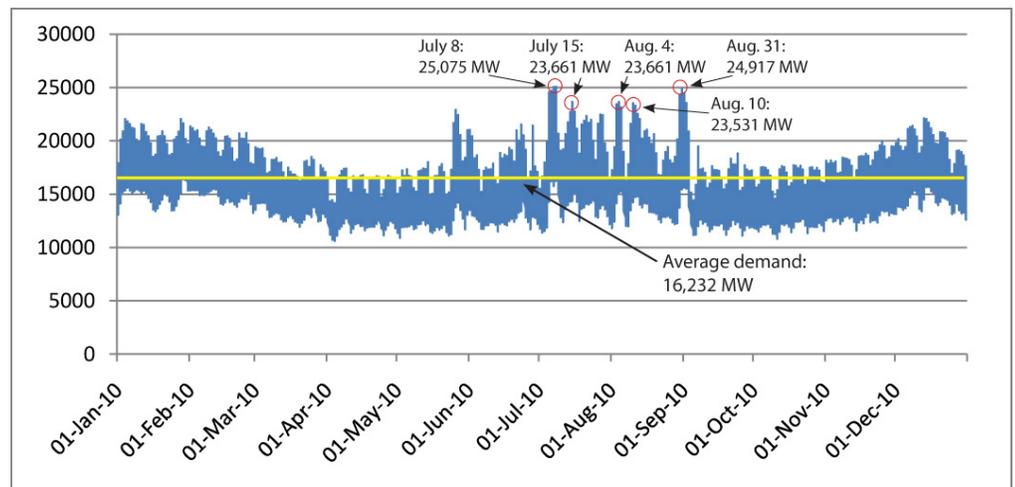
Drummond Recommendation 12-18: Make regulated prices more reflective of wholesale prices by increasing the on-peak to off-peak ratio of time-of-use pricing and by making critical peak pricing available on an opt-in basis.

OCAA Commentary

The differential between peak and off-peak rates needs to be increased to reduce the current air conditioning subsidy and the need for high cost and highly unpopular natural gas-fired peaking plants (e.g., York Energy Centre in King Township).

Figure 1, which plots Ontario’s demand for electricity during each hour of 2010, highlights two important facts. First, on an annual basis, our demand for electricity spikes during about a dozen very hot summer afternoons when our air-conditioners are running full out. Second, during these summer spikes in demand (needle peaks), the demand for electricity is up to 50% higher than Ontario’s average annual hourly demand.

Figure 1: Ontario’s Demand for Electricity in 2010



Reducing demand on the dozen extreme demand days is crucial for two reasons. First, the cost of building new simple-cycle gas-fired power plants and transmission capacity to supply these needle peaks far outstrips what Ontario is recovering through its current peak period electricity prices. Specifically, it can cost up to \$1.19 to \$1.64 per kWh to supply power during these peak periods¹¹, while the billing rate for this power is only 14 cents per kWh (peak summer rate).

Second, these peaks typically occur on smog alert days. Needless to say, firing up fossil fuel-fired power plants to meet our electricity needs on smog alert days is not good for our lungs.

The corollary of Ontario's policy of undercharging for power during extreme peak periods is that we overcharge for electricity during off-peak periods, when electricity can cost consumers more than four times its actual cost of production. This doesn't make sense.

Meanwhile, electric heat is still widely used in some Ontario communities. An increase in the peak/off-peak price differential when combined with the installation of electric thermal storage heaters will reduce the electricity bills of electric heating customers in the winter. These devices, which store heat in ceramic blocks or other mediums, can be charged up in off-peak periods when electricity costs are low and discharged during the day when costs are higher. While relatively new to Ontario, they have been in use in the United States and Europe for more than 20 years.

Ontario's electric utilities can help their customers reduce their electric heating bills by renting electric thermal storage heaters or by providing low-interest on-bill financing for them.

Ontario Clean Air Alliance's Additional Recommendations for Achieving Electricity Cost Savings

There are two major additional options for reducing Ontario's electricity bill that were not included in the Drummond Report: eliminating the subsidies for our money-losing coal plants; and reducing our dependency on new or rebuilt high-cost nuclear reactors.

Eliminating the Subsidies for the Coal-Fired Power Plants

Ontario's dirty coal-fired power plants are no longer profitable. Between January 2009 and December 2011, the Ontario Electricity Financial Corporation (OEFC) paid Ontario Power Generation (OPG) \$1.037 billion to subsidize the operating losses of its Nanticoke and Lambton coal-fired power plants.¹²

In 2011, OPG received a \$367 million subsidy for its unprofitable coal plants.¹³ At this rate, additional future coal plant subsidies will be \$1.101 billion for the period until the coal plants are permanently shut down on December 31, 2014.

As of January 25, 2012, Ontario's coal-free generation capacity was 31% greater than our forecast peak demand during the summer of 2012. Furthermore, according to the Independent Electricity System Operator (IESO), as of March 31, 2012, it will be 36% greater than this summer's forecast peak demand.¹⁴ But Ontario's required reserve margin (available resources required above peak demand) to meet our reliability standard is only 20.4%.¹⁵

In the past, the IESO has maintained that one or more of Nanticoke's units may need to be operated at minimum output from time-to-time to provide grid stability.¹⁶ However, in the fourth quarter of 2011 Hydro One installed dynamic reactive compensation at its Nanticoke and Detweiler Transformer Stations to ensure grid stability when coal burning ceases at Nanticoke.¹⁷

Nevertheless, out of an abundance of caution, the IESO maintains that Nanticoke should remain on standby reserve until Hydro One's new Static Var Compensator units have demonstrated "reliable operation over two peak seasons".³²

The cost of maintaining Nanticoke on standby reserve until early 2013 will be dramatically less than \$367 million. As a consequence, there is no need for the OEFC to continue subsidizing the operating losses of Nanticoke and Lambton.

OCAA Recommendation #2: The Ontario Electricity Financial Corporation should stop subsidizing the operating losses of Ontario Power Generation's Nanticoke and Lambton coal-fired power plants.

Reducing Our Dependency on New or Re-Built Nuclear Reactors

Virtually all of Ontario's aging nuclear reactors will come to the end of their lives during the next ten years.

The Government of Ontario has issued a *Long-Term Energy Plan* that calls for the re-building of the Bruce B and Darlington Nuclear Stations and the construction of two new nuclear reactors at Darlington. In addition, the *Long-Term Energy Plan* calls for raising the percentage of Made-in-Ontario renewable electricity generation in our electricity supply mix from 23% in 2010 to 38% in 2030.¹⁸

Table 2 compares the costs per kWh of Ontario's electricity options.

The key message of Table 2 is that energy efficiency, water power imports from Quebec and natural gas-fired combined heat and power (CHP) plants can meet our electricity needs at a much lower cost than our existing nuclear reactors or the proposed Darlington Re-Build Project. For example, the cost of importing water power from Quebec would be less than the cost of operating our existing nuclear reactors, and less than one-third the cost of re-building the Darlington Nuclear Station. Nevertheless, the *Long-Term Energy Plan* assumes that

Ontario's water power imports from Quebec will meet none of our electricity needs between now and 2030.

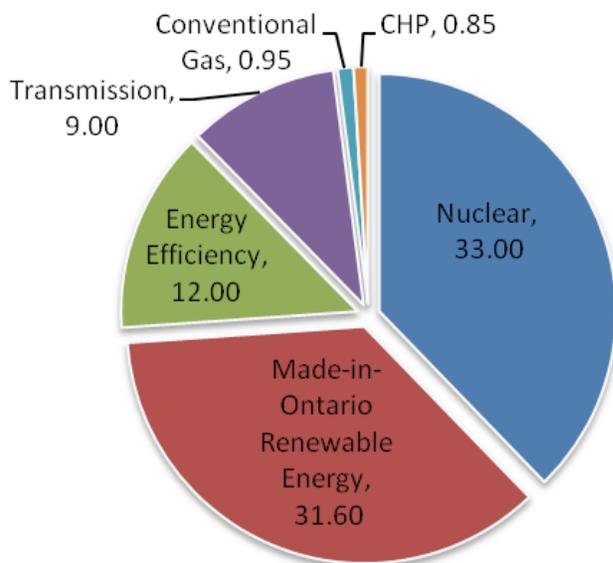
Meanwhile, all made-in-Ontario renewable power options, with the exception of solar, are already cheaper than new nuclear sources. The important thing to note about these renewable sources is that costs for wind, solar and biomass are all falling, while nuclear costs continue to rise, thanks to increased security and safety measures, rapidly diminishing global interest in using nuclear power, and the rising cost of highly specialized materials required for nuclear plants.

Table 2: Ontario's Electricity Options: A Cost Comparison¹⁹

Energy Efficiency	Water Power from Quebec	Natural Gas-Fired Combined Heat and Power	Existing Nuclear Reactors	Ontario Water Power Feed-in-Tariff	Ontario Wind Power (Onshore) Feed-in-Tariff	Ontario Biogas Feed-in-Tariff	Darlington Re-Build Project	Ontario Solar Feed-in-Tariff
2.3 – 4.6 cents per kWh	5.8 cents per kWh	6 cents per kWh	8.0 – 9.1 cents per kWh	12.2 – 13.1 cents per kWh	11.5 cents per kWh	10.4 – 19.45 cents per kWh	19 – 37 cents per kWh	34.7 – 54.9 cents per kWh

According to the Government of Ontario, the total capital cost of its *Long-Term Energy Plan* will be \$87 billion (2010\$). Figure 2 provides a break-out of these forecasted expenditures by resource option.

Figure 2: Estimated Capital Cost of Long-Term Energy Plan: 2010 to 2030 (\$ Billions)²⁰



As Figure 2 reveals, the *Long-Term Energy Plan*'s proposed capital expenditures (in billions of dollars on pie chart) on the lowest cost options to meet our electricity needs (energy efficiency, water power imports from Quebec and CHP) are dramatically lower than the proposed capital expenditures on the higher cost options. Specifically, the Government is planning to invest only \$12.85 billion on the low cost options versus \$74.5 billion on the high cost options despite the fact that the lower cost options can replace all of our aging nuclear capacity.²¹

But even these figures underestimate how dramatically the *Long-Term Energy Plan* deviates from a least-cost plan to keep our lights on since it assumes that all of the nuclear projects will be completed on budget. In fact, every nuclear project in Ontario's history has gone over budget – on average by a factor of 2.5.²² Therefore, a more realistic estimate of the nuclear capital costs is \$82.5 billion (\$33 billion x 2.5). That is, the *Long-Term Energy Plan*'s proposed expenditures on the low cost options constitute only 9% (\$12.85 billion) of its probable total capital cost (\$136.5 billion).

Clearly, the Government has the option to reduce our electricity costs by *increasing* the proportion of our future electricity needs that are met by energy efficiency, water power imports from Quebec and CHP and *reducing* the proportion of our needs that are met by re-investing in higher cost nuclear energy.

According to Ontario Power Generation (OPG), the cost of re-building the Darlington Nuclear Station would be, at most, 8 cents per kWh.²³ Assuming that we actually could re-build or build new nuclear reactors for 8 cents per kWh, the annual savings from replacing the Government's nuclear re-investment plan with the lower cost options would be up to \$1.7 billion per year by 2030.²⁴

However, OPG's 8 cents per kWh cost estimate is not credible for four reasons. First, it is at the lower end of the cost range for operating our *existing* nuclear reactors (see Table 2). Second, every nuclear project in Ontario's history has gone over budget – on average by a factor of 2.5. Third, independent experts like Moody's Investors Service have projected much higher costs for new nuclear projects, namely 15 cents per kWh.²⁵ Fourth, current re-build and new projects in Ontario, New Brunswick, Finland and France are all running significantly over budget and behind schedule.

According to our estimates, the cost of re-building the Darlington Nuclear Station would be at least 19 cents per kWh.²⁶ Assuming this is an accurate estimate of the cost of new or re-built reactors, the annual savings from replacing the Government's nuclear re-investment plan with the lower cost options would be up to \$9.1 billion per year by 2030.²⁷

OCAA Recommendation #3: The Ontario Power Authority (OPA) should be directed to develop a new long-term electricity plan that will reduce Ontario's total electricity bill to the maximum extent possible by increasing the proportion of our future electricity needs that are met by energy efficiency, water power imports from Quebec and CHP and reducing the proportion of our electricity needs that are met by re-investing in higher-cost nuclear power.

This recommendation is directionally similar to the Drummond Commission's Recommendation 1-1 which recommends that all Government of Ontario programs, with the exception of health care, education and social services, should be reduced by 2.4% per year until 2017-18.

In 2011 Ontario's total electricity bill was approximately \$16 billion per year. A 2.4% bill reduction per year would lower Ontario's total electricity bill to \$13.5 billion in 2018 – a savings of \$2.5 billion.

Ontario has the potential to replace all of its existing aging nuclear reactors by 2030 by an integrated combination of energy efficiency, water power imports from Quebec and combined heat and power:

- While Ontario's total electricity consumption has fallen by 10% since 2005, we still have a large untapped energy efficiency potential given that our electricity consumption per person is 27% greater than New York State's.³³
- In 2011 imports from Quebec met only 1.8% of our electricity needs despite the fact that they can meet 17% of our electricity needs without the need for new transmission capacity between Ontario and Quebec.³⁴
- Ontario's potential incremental combined heat and power potential is between 10,000 and 15,000 MW, whereas our existing nuclear capacity is 11,446 MW.³⁵ That is, combined heat and power alone could displace all or virtually all of Ontario's nuclear supply.

OCAA Recommendation #4: The OPA should be directed to negotiate a long-term electricity supply contract with Hydro Quebec.

In 2010, Vermont signed a 26-year deal with Hydro Quebec to import water power at a cost of 5.8 cents per kWh. Pursuant to the *National Energy Board Act*, Hydro Quebec must give Ontario an opportunity to purchase electricity on terms and conditions (including price) as favourable as its export sales.

Today, 12% of Hydro Quebec's electricity sales are to customers outside of Quebec. Most of these export sales are to the United States pursuant to short-term contracts.²⁹

Quebec's electricity consumption per person is the highest in the world and double that of Ontario's.³⁰ As a result, the cost-effective pursuit of energy

efficiency by Hydro Quebec will simultaneously reduce its customers' electricity bills, make Quebec's industries more competitive and free up more of its existing hydro-electric generating capacity for export sales to Ontario and the U.S.

OCAA Recommendation #5: Tie the compensation for the CEOs and senior executives of the Ontario Power Authority, Ontario Power Generation, Hydro One, the Independent Electricity System Operator and the Ontario Energy Board to their contributions to reducing the total cost of supplying electricity services to Ontario consumers while improving environmental performance.

This recommendation is similar to the Drummond Commission's Recommendation 5-28:

"Tie compensation for CEOs and senior executives in all parts of the health care system to strategically targeted health outcomes, not the number of interventions performed, through a performance pay framework. Mirror this performance pay approach throughout each hospital, Community Care Access Centre, long-term care facility, etc. at the physician and health care worker levels."³¹

OCAA Recommendation #6: Direct the Ontario Energy Board to encourage Ontario's municipal electric utilities and Hydro One to aggressively pursue all energy efficiency opportunities that will reduce their customers' electricity bills.

OCAA Recommendation #7: Direct the Ontario Energy Board to ensure that the aggressive promotion of reliable, feasible and cost-effective energy efficiency is always an electric utility's most profitable course of action.

In 2003 the mandates of Ontario's municipally-owned electric utilities (e.g., Hydro Ottawa, Toronto Hydro) and Hydro One (which serves rural Ontario and very large industrial consumers) were expanded to include the promotion of energy efficiency. According to the Government of Ontario, these electric utilities will play a key role in helping Ontario achieve its energy conservation and efficiency targets.

Ontario's electric utilities are ideal agencies to help remove the market barriers to energy conservation and efficiency for the following reasons:

- They have existing relationships with every electricity consumer in the province.
- They are knowledgeable and trusted sources of energy information.
- They can establish rental and on-bill financing (in co-operation with financial institutions) programs to help their customers overcome the

high-up front capital cost barrier to energy efficiency and renewable energy investments.

- They can provide financial incentives to encourage their customers to pursue all their cost-effective energy savings opportunities. These financial incentives will be needed as long as governments continue to subsidize energy consumption.

Premier McGuinty and his Ministers of Energy have repeatedly stated their strong support for the promotion of energy efficiency by Ontario's electric utilities. Nevertheless, two of Ontario's energy bureaucracies, the Ontario Energy Board and the Ontario Power Authority, have responded with red tape to limit our electric utilities' ability – and motivation – to implement innovative, customer-focused energy efficiency programs that will maximize bill savings for Ontario's consumers.³⁶ Therefore there is a need for additional direction from the Government of Ontario to the Ontario Energy Board on this issue.

Conclusion

There is no reason that the electricity system should be exempt from the kind of “value for money” efficiency paradigm recommended in the Drummond report for all public services. In fact, there are tremendous savings to be had by focusing on lower cost, lower risk supply options instead of continuing to artificially support the nuclear and coal industries.

Similarly, as a net importer of energy, Ontario has little to lose and everything to gain from a rigorous focus on increasing energy efficiency and productivity throughout its economy. But that won't happen if we continue to disguise the true cost of electricity and give energy planners a pass on meeting the same kind of performance standards being recommended for the rest of the Ontario public sector.

In reality, the electricity sector is ideally suited for this sort of approach, where cost savings can lead to lower bills for residents and greater productivity can lead to more competitive industries, while producing overall budgetary savings that can be used to sustain services like education and health care and reduce Ontario's deficit.

Endnotes

- 1 Commission on the Reform of Ontario's Public Services, *Public Services For Ontarians: A Path To Sustainability And Excellence*, (2012), pages 1 to 7, 310 & 311.
- 2 Ibid., page 7.
- 3 Ibid., page v.
- 4 We have calculated Ontario's wholesale cost of electricity in 2011 to be approximately \$12.96 billion based on the following assumptions: Ontario's total province-wide demand for electricity in 2011 was 138.7 TWh net of 2% transmission losses (141.5 TWh x 0.98) and an average wholesale cost of power of \$93.46 per MWh. According to the Ontario Energy Board, the total revenues of Ontario's electric distribution utilities in 2010 was \$3.05 billion. Estimates for 2011 are not yet available. See: Independent Electricity System Operator, *Monthly Market Report*, (December 2011), page 20; and *News Release*, "Composition of Ontario's Electricity Supply Mix Continues to Change" (January 6, 2012); Association of Major Power Consumers of Ontario, *Electricity in Ontario*, (December 12, 2011), page 23; and Ontario Energy Board, *2010 Yearbook of Electricity Distributors*, page 7.
- 5 *Public Services For Ontarians: A Path To Sustainability And Excellence*, page 331.
- 6 Ibid., pages 328 & 329.
- 7 Ontario Electricity Financial Corporation, *Annual Report 2011*, page 5.
- 8 Ontario Clean Air Alliance Research Inc., *The Darlington Re-Build Consumer Protection Plan*, (September 2003), Appendix A.
- 9 *Public Services For Ontarians: A Path To Sustainability And Excellence*, page 330.
- 10 Ontario Electricity Financial Corporation, *Annual Report 2011*, page 12.
- 11 Environmental Commissioner of Ontario, *Re-thinking Energy Conservation in Ontario – Results: Annual Energy Consumption Progress Report – 2009 (Volume Two)*, November, 2010, page 35.
- 12 Ontario Power Generation, *2011 Year End Report*, page 60; and *2010 Year End Report*, page 68.
- 13 Ontario Power Generation, *2011 Year End Report*, page 60.
- 14 Independent Electricity System Operator, *18-Month Outlook Update*, (February 24, 2012), pages 3, 7 & 8.
- 15 IESO, *Ontario Reserve Margin Requirements 2012-2016*, (February 23, 2012), page 1.
- 16 February 12, 2010 telephone conversation between Terry Young and Kim Warren of the IESO and Jack Gibbons, Ontario Clean Air Alliance; and January 4, 2011 email from Terry Young to Jack Gibbons.
- 17 Independent Electricity System Operator, *18-Month Outlook: From December 2011 to May 2013*, (November 24, 2011) pages v and 10; and February 24 & 28, 2012 emails from Allan Cowan, Director, Major Applications, Hydro One to Jack Gibbons, Ontario Clean Air Alliance.
- 18 Government of Ontario, *Long-Term Energy Plan*, (2010), pages 10 and 19.
- 19 In 2010 Vermont signed a 26 year deal with Hydro Quebec to import water power at a price of 5.8 cents per kWh. In 2011 the regulated price for OPG's nuclear generation was 5.5 cents per kWh and during the first six months of 2011 Bruce A's revenues, exclusive of the additional payments it receives from the Ontario Power Authority for its fuel costs, were 6.6 cents per kWh. For the fiscal year ending March 31, 2011, the Ontario Electricity Financial Corporation's revenues to service the stranded nuclear debt were \$2.036 billion and Ontario's total nuclear generation in 2010 was 82.9 TWh. Thus the nuclear stranded debt revenues per kWh of nuclear generation were 2.5 cents per kWh. Therefore the total cost of electricity

from our existing nuclear reactors is between 8 (5.5 cents plus 2.5 cents) and 9.1 (6.6 cents plus 2.5 cents) cents per kWh exclusive of the Bruce A's fuel costs. See Hydro Quebec, *Press Release*, "Vermont and Quebec reach new energy agreement", (August 12, 2010); Ontario Power Generation, *2011 Second Quarter Report*, page 8; TransCanada, *Quarterly Report to Shareholders*, (July 28, 2011); Ontario Electricity Financial Corporation, *Annual Report 2011*, page 12; Independent Electricity System Operator, *News Release*, "Diverse Supply Mix Provides Flexibility in Operating Ontario Power System – Integration of Renewable Resources Well Underway", (January 7, 2011); Ontario Ministry of Energy, *Ontario's Feed-in Tariff Program: Two-Year Review Report*, (March 2012), Appendix 4. For references for all the other resource options see: Ontario Clean Air Alliance, *An Energy Efficiency Strategy For Ontario's Homes, Buildings and Industries*, (October 2011), pages 2 and 25.

- 20 According to the *Long-Term Energy Plan*, approximately 600 MW of our incremental generation will be CHP and according to the Ontario Power Authority, the capital cost of CHP is \$1.413 million per MW. See *Long-Term Energy Plan*, pages 35, 36 and 55; and Ontario Power Authority, *Integrated Power System Plan*, Exhibit G, Tab 2, Schedule 1, page 7, Updated August 29, 2008.
- 21 Ontario Clean Air Alliance Research Inc., *Powerful Options: A review of Ontario's Options for replacing aging nuclear plants*, (May 19, 2009).
- 22 Ontario Clean Air Alliance Research Inc., *The Darlington Re-Build Consumer Protection Plan*, (September 2010), Appendix A.
- 23 Ontario Energy Board Docket No. EB-2010-0008, Exhibit D2, Tab 2, Schedule 1, Pages 4 & 5.
- 24 According to the *Long-Term Energy Plan*, Ontario's total nuclear generation in 2030 will be 91.08 TWh and 74% of our nuclear capacity will consist of the re-built Bruce B and Darlington Nuclear Stations plus 2,000 MW of new nuclear at Darlington. Assuming the output of all of Ontario's reactors is proportional to their capacity, the output of the above-noted re-built and new capacity will be 67.4 TWh (91.08 TWh x 0.74). Assuming a cost of 8 cents per kWh, the annual cost of this new supply will be \$5.392 billion per year.

Alternatively, we could obtain 76.4 TWh of resources by a combination of water power imports from Quebec, energy efficiency and CHP. Ontario's total interconnection capacity with Quebec is 2,788 MW. Therefore we can import 24,422,880 MWh per year from Quebec. Assuming a cost of \$58 per MWh, the total cost of these imports would be \$1,416,527,040 per year. In addition, the cost of obtaining 21,488,560 MWh of CHP per year at \$60 per MWh would be \$1,289,313,600; and the cost of saving an additional 21,488,560 MWh per year at a cost of \$46 per MWh would be \$988,473,760. Therefore the total cost of the lower cost alternatives would be \$3,694,314,400.

See *Long-Term Energy Plan*, pages 10, 19 and 24; and Ontario Energy Board Docket No. EB-2008-0272, Exhibit I, Tab 5, Schedule 6.

- 25 Moody's Investors Service, *New Nuclear Generating Capacity: Potential Credit Implications for U.S. Investor Owned Utilities*, (May 2008), page 15.
- 26 Ontario Clean Air Alliance Research Inc., *The Darlington Re-Build Consumer Protection Plan*, (September 23, 2010) page 2.
- 27 The cost of 67,400,000 MWh of re-built or new nuclear reactors at \$19 per MWh would be \$12,806,000,000 per year. See the Endnote 24 for our other assumptions.
- 28 Ontario Energy Board Docket No. EB-2008-0272, Exhibit I, Tab 5, Schedule 6; and Independent Electricity System Operator, *News Release*, "Composition of Ontario's Electricity Supply Mix Continues to Change: Consumer Response Supports Reliability", (January 6, 2012).
- 29 Hydro Quebec, *Annual Report 2010*, pages 3 and 97.

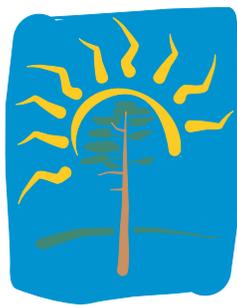
- 30 Equiterre and Ontario Clean Air Alliance Research Inc., *Higher Profits and Lower Bills: A New Electricity Strategy for Hydro Quebec*, (July 14, 2010), page 4.
- 31 *Public Services For Ontarians: A Path To Sustainability And Excellence*, page 497.
32. March 9 & 14, 2012 emails from Barbara Constantinescu, Director, Planning & Assessments, IESO to Jack Gibbons, Ontario Clean Air Alliance.
33. http://www.ieso.ca/imoweb/media/md_demand.asp; http://www.nyiso.com/public/webdocs/newsroom/power_trends/Power_Trends_2011.pdf; <http://quickfacts.census.gov/qfd/states/36000.html>; <http://www.fin.gov.on.ca/en/economy/demographics/projections/projections2010-2036.pdf>
34. In 2011 Ontario imported 2.5 TWh of electricity from Quebec and our total electricity demand was 142.5 TWh. The electricity transfer capacity between Ontario and Quebec is 2,788 MW. Email from Chantelle Valerio, IESO to Jack Gibbons, OCAA (March 13, 2012); IESO, *News Release*, “Composition of Ontario’s Electricity Supply Mix Continues to Change: Consumer Response Supports Reliability”, (January 6, 2012); and Ontario Energy Board Docket No. EB-2008-0272, Exhibit I, Tab 5, Schedule 6.
35. Ontario Clean Air Alliance Research Inc., *Powerful Options: A review of Ontario’s options for replacing aging nuclear plants*, (May 2009), page 7; and IESO, *18-Month Outlook Update*, (February 24, 2012), page 7.
36. Ontario Clean Air Alliance, *An Energy Efficiency Strategy for Ontario’s Homes, Buildings and Industries*, (October 2011), Appendix A.

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