The Perfect Storm in Favour of Green Power:

Why There Has Never Been A Better Time To Not Buy New Nuclear Reactors

Renewable is Doable Backgrounder: May 2009

Things Have Changed:

The assumptions used by the Ontario Power Authority in 2005 when it planned for an expansion of nuclear power and placed a limit on renewable generation have drastically changed. The following factors call for a reconsideration of the government's intention to purchase additional nuclear reactors:

- → Electricity demand is dropping (even after accounting for the effects of the economic crisis). This eliminates the need for additional nuclear capacity.
- → The Independent Electricity System Operator (IESO) warns that continued excess nuclear baseload capacity is a threat to system stability.
- → Nuclear costs have more than doubled or tripled from what they were estimated to be in 2005.
- → Nuclear vendors are unwilling to take on the risk of cost over-runs.
- → The cost of new renewables is predicted to continue to fall.[1]

With the passage of the Green Energy Act, the government has established a framework that could allow green energy to expand beyond the marginal long-term targets in the current electricity plan. Together, these factors add up to a 'perfect storm' in favour of replacing nuclear reactors with a combination of enhanced energy efficiency, new renewable power sources, and combined heat and power plants that recycle waste energy into electricity.

Today's Choice:

- → We have a Green Energy Act, but no new space on the grid for green energy. New Renewables are currently capped at 8 per cent of Ontario's electricity supply mix.
- → With no room on the grid, the Ontario government must make a choice this year to invest in green energy or new nuclear capacity.
- → The aging Pickering B station is scheduled to retire beginning in 2013, opening up 2000MW of space on the grid that could easily be supplied by a portfolio of green power options.

Recommendations:

In response to these changed conditions, the government should:

1. **Give Green Energy *Time* to Grow.** Forgo, or at a minimum delay, the decision to purchase a new nuclear reactor in order to allow the Green Energy Act time to produce results.

2. **Give Green Energy *Space* to Grow.** Commit to closing the Pickering B nuclear station and replace it with green energy to provide space on the grid for green sources of energy above and beyond what is in the current electricity plan.

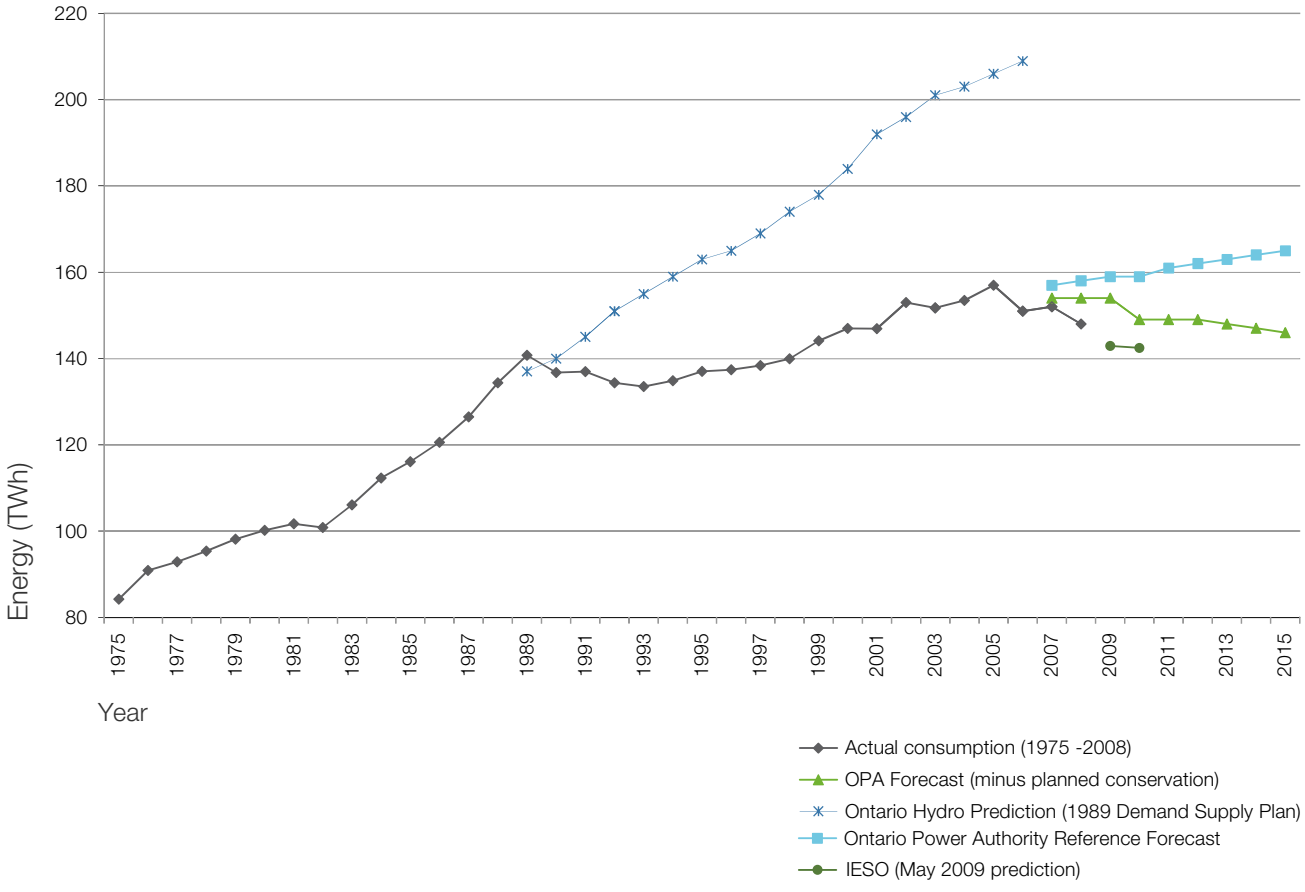
Why There Has Never Been A Better Time To Not Buy New Nuclear Reactors

1. Electricity Demand is Dropping (Not Increasing as Forecast)

In 2005, the Ontario Power Authority (OPA) claimed additional reactors were needed to address projected increases in electricity demand. In 2009, the OPA's projected electricity growth has failed to materialize, eliminating the need for additional reactors.

- → Per capita electricity consumption has been dropping steadily for 20 years, but in recent years total electricity consumption has been falling.[2] The IESO predicts that demand will fall 4 per cent in 2009 and an additional 0.3 per cent in 2010.[3] (See Figure 1.)
- → The steady decrease in consumption predates the economic crisis and the IESO predicts it will continue to drop even after the economy recovers because of structural change in the Ontario economy, higher levels of conservation and continuing growth in embedded generation.
- → Demand drop is a product of three factors: 1) Ongoing, long-term structural changes in the economy away from energy-intensive activities; 2) Natural conservation that occurs as older equipment is gradually replaced with newer, more efficient equipment; 3) The success of conservation programs.

Figure 1. Electricity Demand in Ontario: Actual and Predicted



Source: Ontario Power Authority, Ontario Hydro and Independent Electricity System Operator

2. Too Much Nuclear Capacity

Excess nuclear capacity due to falling demand results in "surplus nuclear baseload" which the Independent System Operator (IESO) warns is a threat to system stability.[4]

- → Nuclear reactors cannot be safely turned on or off quickly, and cannot be ramped up or down to meet the daily changes in demand.
- → Already the province is paying industry to consume excess electricity.[5]
- → Excess power at times of low demand results in direct competition for access to the grid, particularly between wind and nuclear power.

Perhaps as a consequence of these concerns, the IESO has suggested to the government that it consider alternatives to refurbishing the aging Pickering B reactors or replacing them with new nuclear output, stating:

- → "The Pickering decision could affect Ontario's electricity system capacity by the retirement of 2,000 MW of capacity from Pickering B combined with the possible re-assessment of sustaining the 1,000 MW of operable capacity from Pickering A. This capacity and associated energy might be replaced with stepped-up implementation of conservation, more installation of renewables, more intensive operation of existing gas generation, the introduction of new build gas generation, or higher volumes of imports.[6] "

3. Nuclear Costs Going Through the Roof (Again)

The estimated cost for new nuclear stations has more than doubled since the OPA first released its draft electricity supply plan in 2005.

The table below compares cost estimates from the OPA, with more recent estimates from investment analysts.

COST ESTIMATES FOR BUILDING NEW NUCLEAR REACTORS AND THE POWER THEY PRODUCE			
	Estimated Capital Cost (cost to build the plant)	**Cost to build a new 2000 MW reactor**	**Estimated Commodity Cost (price of electricity generated)**
Ontario Power Authority (IPSP 2008)	$2,907 / kW[7]	$5.8 billion	8.6 cents / kWh[8]
Moody's Investment Services (2008)[9]	$7,500 / kW	$15 billion	15.1 cents / kWh
Standard & Poor's (2008)[10]	$5,000 - $8,000/kW	$10 - $16 billion	N/A

- → Moody's Investment Services highlights the risk associated with investments in new nuclear relative to renewables: "Nuclear generation has a fixed design where construction costs are rising rapidly, while other renewable technologies are still experiencing significant advancements in terms of energy conversion efficiency and cost reductions.[11]
- → Nuclear costs were underestimated in 2005.[12] The OPA has admitted that at current cost levels, new nuclear stations are not economical.[13]
- → Nuclear vendors are unwilling to take on the risk of cost over-runs.[14]

4. The Green Energy Act Needs Space on the Grid

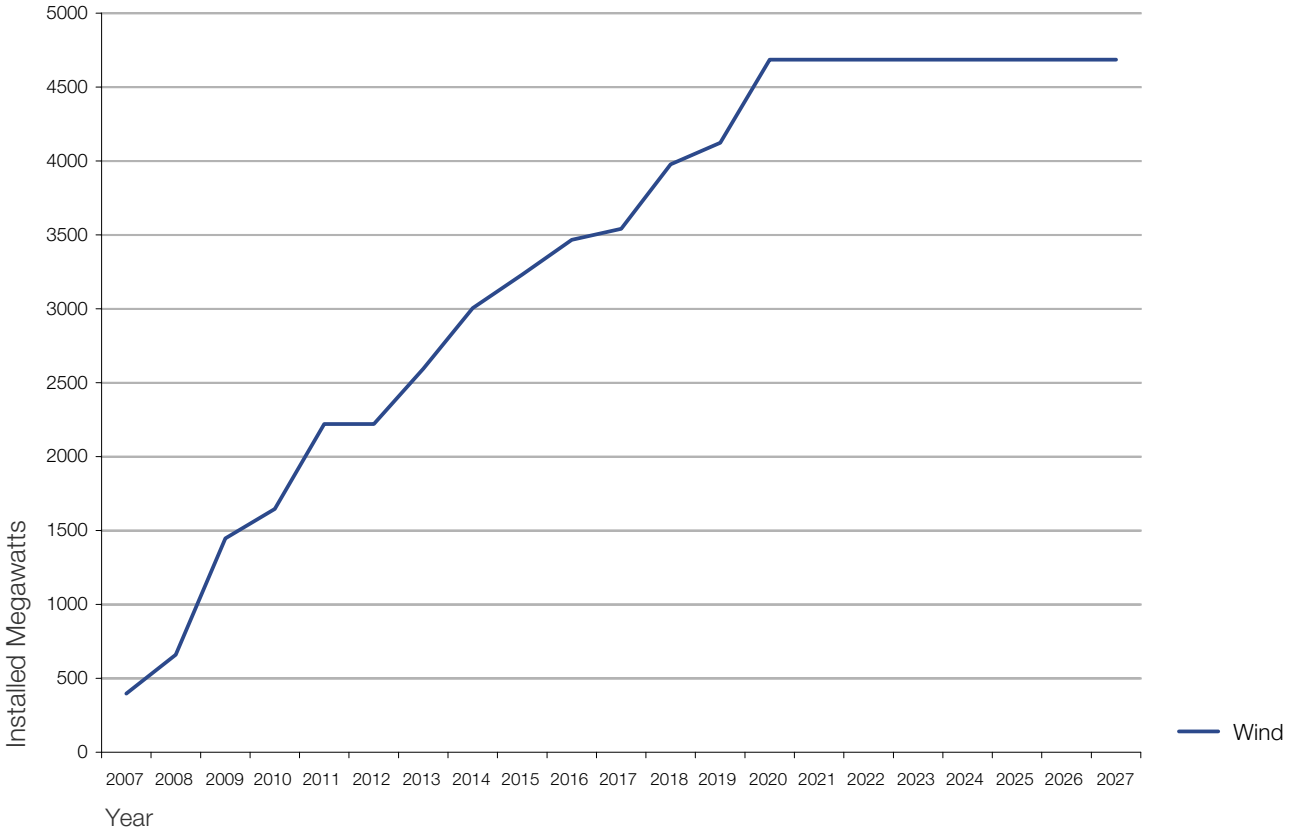
Ontario has passed a European-style Green Energy Act (GEA) that could create the conditions for conservation and renewable energy to thrive. A survey done by the OPA with respect to the GEA found over 15,000 MW of renewable energy projects already in the planning or development phase right now[15] – more than double what was envisaged in the IPSP in 20 years

However, the growth of green energy, even with a GEA, remains blocked:

- → Ontario's current electricity plan (the Integrated Power Supply Plan) caps renewable energy at 5,312 MW – or less than 8 per cent of the electricity supply mix - [16] over the next 20 years in order to ensure space for nuclear generation.
- → Because of the plan's commitment to building nuclear stations (over 50 per cent of the supply mix), wind development is planned to flatline to make space for new nuclear stations that are targeted to come online after 2018. (See Figure 2).
- → While the coal phase-out has driven an expansion of conservation, renewables, but principally gas-fired generation until 2014, maintaining nuclear at historic levels will limit the expansion of green power post 2014.

The reality is that nuclear and green sources of power are direct competitors for 'space' on the grid.

Figure 2. Future Wind Development in Ontario[17]



Today's Opportunity

Opportunity for Implementing the Green Energy Act: Replace Pickering B with Green Energy

The aging Pickering B station is scheduled to retire beginning in 2013 opening up 2000MW of space on the grid that can easily be supplied by a portfolio of green power options:

- → Replacing Pickering B with green energy would be less costly than a new nuclear station and green options are quick to deploy and do not require 10 years to build.
- → With demand dropping and load growth tenuous, green options are more flexible; they can be ramped up gradually and they can be switched on and off safely unlike a large centralized nuclear station.
- → The Pickering B retirement offers the smartest opportunity to open up space on the grid and give the Green Energy Act space to produce results.

Recommendations: There has never been a better time to not buy a new nuclear reactor

1. **Give Green Energy *Time* to Produce Results**. Forgo or delay[18] buying a reactor. The assumptions used to justify buying a new nuclear plant in 2005 have changed. Electricity demand is declining, nuclear costs are increasing, surplus nuclear baseload capacity threatens system stability and the Green Energy Act could, if permitted, allow green power to thrive.
2. **Give green energy *Space* to Grow.** Commit to closing the Pickering nuclear station and replace it with green energy. This would provide space on the grid for green sources above and beyond what is in the 2005 electricity plan.

renewable is doable
A Smarter Energy Plan for Ontario.

Endnotes

1 Moody's Investment Service, New Nuclear Generating Capacity: Potential Credit Implications for U.S. Investor Owned Utilities (Moody's Corporate Finance, May 2008), p. 15.

2 Ontarians used 148 terawatt hours (TWh) of electricity in 2008, down from 152 TWh in 2007 and the all-time high of 157 TWh in 2005. This situation is not unique to Ontario, as demand is dropping across much of North America. See: Rebecca Smith, "Surprise Drop in Power Use Delivers Jolt to Utilities", Wall Street Journal, November 21, 2008.

3 IESO, 18 Month Outlook Update from June 2009 to November 2010: An assessment of the Reliability and Operability of the Ontario Electricity System, May 2009.

4 The IESO began warning of this problem in its 2008 assessment of the Ontario Power Authority's Integrated Power System Plan, which found that nuclear units could be required to be shut down 77 times in 2012. This concern regarding 'surplus baseload generation' was repeated more publicly in the IESO's December 2008 18 Month Outlook report, and was featured in its March 2009 Outlook report.

5 Tyler Hamilton. "Now the province pays to give away electricity," Toronto Star, April 21, 2009.

6 IESO, The Ontario Reliability Outlook: December 2008, p. 7.

7 Ontario Power Authority, Exhibit G, Schedule 1, Tab 2, Table 1: Cost Assumptions for Planned Generation.

8 Ontario Power Authority, Exhibit G, Schedule 1, Tab 2, Table 5: Commodity Costs – Median Scenario.

9 Moody's Investment Service, New Nuclear Generating Capacity: Potential Credit Implications for U.S. Investor Owned Utilities (Moody's Corporate Finance, May 2008), p. 15.

10 Standard & Poor's, Construction Costs To Soar For New U.S. Nuclear Power Plants, (October 2008).

11 Moody's Investment Service, New Nuclear Generating Capacity: Potential Credit Implications for U.S. Investor Owned Utilities (Moody's Corporate Finance, May 2008), pp. 14 – 15.

12 Cost estimates were based primarily on nuclear vendors' research and development targets. Jim Harding, "Overnight Costs of New Nuclear Reactors", Evidence filed by the Green Energy Coalition as Exhibit L, Tab 8, Schedule 4 at the Ontario Energy Board Hearings on the Integrated Power System Plan.

13 In response to questioning at the Ontario Energy Board, the OPA admitted that at an overnight capital cost of $3,600 with an additional 2 cents in operating and maintenance costs and an 8% discount rate, nuclear stations would be uneconomical. See: Ontario Power Authority, EB-2007-0707, Exhibit, Tab 43, Schedule 3.

14 Given the history of cost over-runs on nuclear projects in Ontario, the government had said that it would negotiate a deal wherein it would be the company that builds the reactor, rather than ratepayers, that would take on this risk. However, recent statements by the Energy Minister indicate that this has proved impossible. See: Rob Ferguson, "Ontario delays picking reactor builder; Smitherman cites 'turmoil' in global credit markets for slowing Ontario plan to renew nuclear capacity", in the November 5, 2008 Toronto Star.

15 Survey results available at http://www.powerauthority.on.ca/fit/Page.asp?PageID=924&ContentID=10106

16 Ontario Power Authority, EB-2007-0707, Exhibit D, Tab 9, Schedule 1, p. 8.

17 Ontario Power Authority, EB-2007-0707, Exhibit D, Tab 9, schedule 1, p. 8.

18 According to the Ontario Electricity Act, the Ontario Power Authority is tasked with revising the Integrated System Power Plan (IPSP) every three years. A decision on whether new nuclear stations are economic and/or needed could be delayed until completion of the next iteration of the IPSP in three years. Such a decision could still allow the various environmental and regulatory approval processes to continue, keeping the nuclear option open for a future government.