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# Powering Canada's Economic Heartland Is there Life after Coal?

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by

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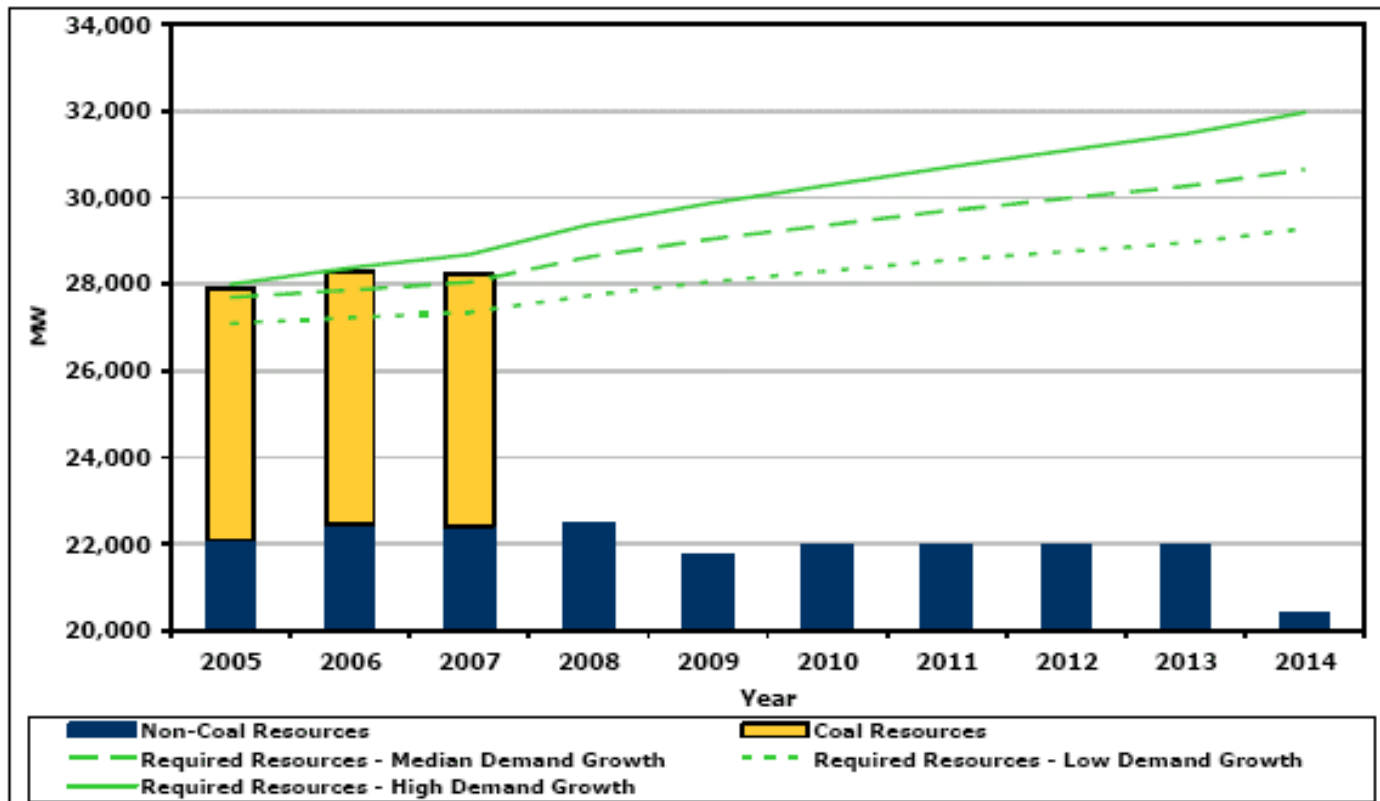
# Canada





# Ontario – Supply / Demand

## Resource Adequacy Outlook – Annual Peak





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# Ontario – Electricity Crisis

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*“Ontario needs to refurbish, rebuild, replace or conserve 25,000 megawatts of generating capacity by the year 2020 to meet growing demand while replacing its polluting coal-fired generating plants. That represents 80 per cent of Ontario's current generating capacity and would require an investment of \$25 to \$40 billion.”*



# Current Generation Mix

	<b>Total Capacity (MW)</b>	<b>Number of Stations</b>
<b>Nuclear</b>	<b>10,882</b>	<b>5</b>
<b>Coal</b>	<b>6,434*</b>	<b>4</b>
<b>Oil / Gas</b>	<b>4,976</b>	<b>20</b>
<b>Hydroelectric</b>	<b>7,756</b>	<b>67</b>
<b>Miscellaneous</b>	<b>66</b>	<b>2</b>
<b>Total</b>	<b>30,114</b>	<b>98</b>

\* Lakeview Generating Station has been shut down earlier in the year and as such, is not included in this value. 5

Source: IESO 18-Month Outlook, June 27, 2005



# New Supply

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- Huge Effort over the past year to address this issue resulting in:
  - Approved a new tunnel at Niagara Falls. This will enable an increase of 1.6 TWh per annum.
  - Approval of the restart of Pickering Unit 1 (515 MW)
  - Completion of the Renewables I RFP– (395 MW)
  - Completion of the Clean Energy Supply RFP – (2,235 MW)



# New Supply

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- And many new initiatives underway:
  - Renewables II and III (1000 MW + 200 MW)
  - Bruce Units 1&2 Refurbishment (1540 MW)
  - Technical Study for new hydro in Manitoba (1500 MW)



# The Plan to Replace Coal

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- Lakeview GS (1,140 MW) has been closed on April 1, 2005
- Thunder Bay GS (310 MW) will close in 2007
- Atikokan GS (215 MW) will close in 2007
- Lambton GS (1,975 MW) will close in 2007
- Nanticoke GS (3,938 MW) will have units closed through 2008 with the last unit to close early in 2009.

*“This transition [from coal] represents the largest and most significant electricity system change ever undertaken in Ontario and involves major technical considerations. It also involves significant risks and challenges that need to be addressed.”*

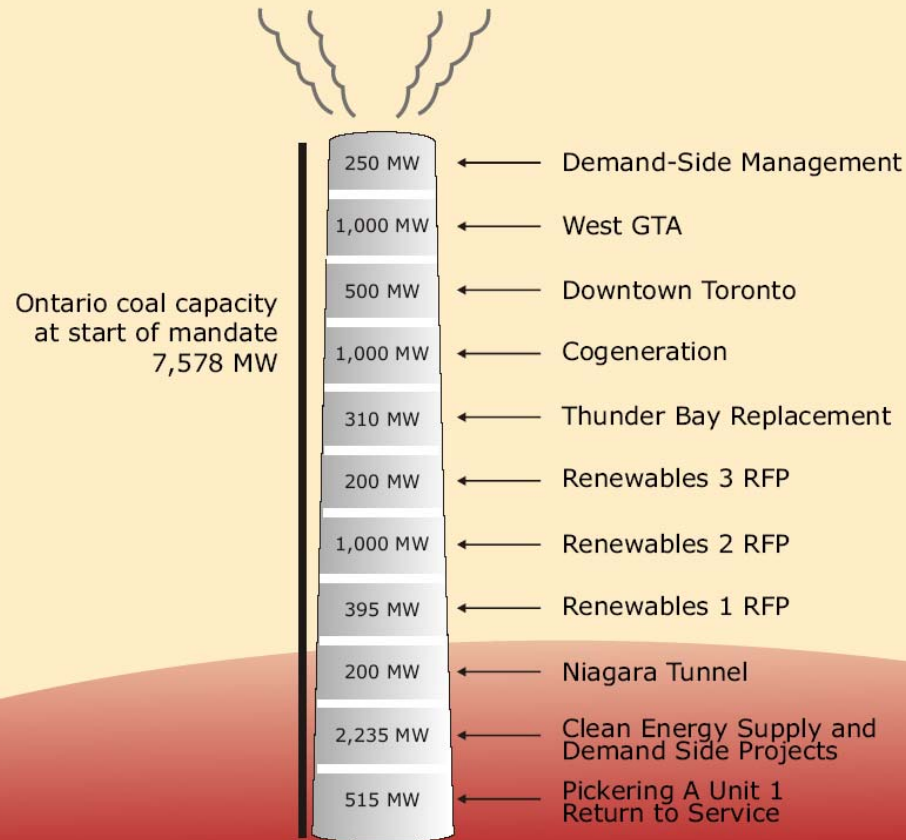


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# The Plan to Replace Coal

## Coal Replacement

The McGuinty Government has set in motion 7,605 MW of capacity additions to help support the replacement of coal.



**If successful, negotiations on the proposed restart of Bruce would add 1,540 MW of generation.**



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# The Issue of Price

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- Cost/Benefit Study: Replacing Ontario's Coal-fired Generation
  - Concluded that the cost to society is almost double with coal generation when compared to a system of refurbished nuclear and gas.
  - Includes health and environmental costs



# The Issue of Price

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- However; generation cost of coal is low
  - \$37/MWh
- Ontario Power Generation Legacy Units
  - \$45/MWh
- New Generation
  - Renewables I: \$80/MWh
  - CES: \$78/MWh



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# An Alternative Scenario

<b>Generation / Project</b>	<b>Capacity (MW)</b>
<b>Pickering Unit 1</b>	<b>515</b>
<b>Clean Energy Supply</b>	<b>2,235</b>
<b>Renewables I RFP*</b>	<b>206</b>
<b>Renewables II RFP*</b>	<b>400</b>
<b>Renewables III RFP*</b>	<b>140</b>
<b>Bruce Units 1&amp;2**</b>	<b>770</b>
<b>Pickering Units 2&amp;3***</b>	<b>1,030</b>
<b>Co-generation</b>	<b>1,000</b>
<b>Gas</b>	<b>1,100</b>
<b>Demand Side Management</b>	<b>200</b>
<b>Total</b>	<b>7,596</b>

\* Wind generation is assumed at 40% capacity value consistent with the IESO study

\*\* While Bruce Units 1&2 represent 1,540 MW, only half is considered as a replacement for coal as the other unit will replace Bruce Unit 3 as it goes down for refurbishment. It is then assumed that over the next 15 years there will always be one unit from Ontario's nuclear fleet down for refurbishment as the fleet is refurbished in sequence.

\*\*\* On Aug 12, OPG announced that it would NOT restart Pickering units 2&3



# Major Assumptions

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- Wind is assumed to achieve the maximum capacity value based on the IESO study (40%) rather than the more conservative value assumed in the IESO forecast (10%). (Note that this assumption in the IESO 2005 10-Year Outlook requires the restart of Bruce Units 1&2 to meet demand)
- Demand side management is assumed to achieve a significant target, which may not be achieved in the necessary time frame, based on the results of the recent CES RFP.
- Renewables II is assumed to achieve its specified 1,000 MW even though there is no guarantee that more than 450 MW will be accepted in the terms of the RFP
- Significant co-generation and gas is assumed but pricing and resource adequacy issues are likely to have an impact on gas decisions.



# The Role for Nuclear

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- Continues to be the Backbone of the Ontario system producing almost 50% of the energy
- Return to service of Pickering Unit 4 and Bruce Units 3&4 contributed 2000 MW
- Pickering Unit 1 almost back in Service
- Bruce Units 1&2 decision is imminent



# The Role for Nuclear

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- The entire nuclear fleet is near end of life
- Replacing the coal fleet is a significant challenge
- Imagine if the nuclear fleet (10,000 MW) also had to be replaced
- Essential to maximize the life of the current nuclear fleet through refurbishment and life extension



# Planning for the Future

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- In addition to replacing coal and maintaining the current nuclear fleet, there is a need to address growth in the system.
- OPA asked to consider conservation targets, renewable energy targets and the future mix for the balance of the system and deliver a report to the Minister December 2005



# Nuclear Decision

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- *“The toughest issue that must be grappled with is the future of nuclear energy.” “We cannot and must not postpone the decision on new nuclear any longer. We need to begin to make some decisions through an open and public debate.”*
- *“I think the people of Ontario need to know that that decision is coming quickly ... clearly we have to look seriously at nuclear. There is no doubt about it.”*
- *“Should the province decide to go ahead with new nuclear, the bigger and tougher questions are where do they go, how many, who owns them, who operates them ... and the final question - what technology do we use.”*



# Conclusion

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- Ontario needs to replace or rebuild 80% of the electricity system by 2020
- Replacing coal by 2009 with more environmentally acceptable options is difficult, but achievable.
- Nuclear power remains the backbone of the electricity generation system and will continue to do so for the foreseeable future.