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# ONTARIO'S ELECTRICITY SYSTEM: IS THERE LIGHT AT THE END OF THE TUNNEL?

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# TABLE OF CONTENTS

**Page**

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# ONTARIO'S ELECTRICITY SYSTEM: IS THERE LIGHT AT THE END OF THE TUNNEL?

## INTRODUCTION

According to Ontario's Independent Electricity System Operator (IESO),[1] the province faces a significant electricity shortfall in the next few years as coal plants are retired and some nuclear plants reach the end of their useful life. Demand, meanwhile, is expected to grow at an average annual rate of 0.9% as Ontario's population increases and its economy expands.[2] Meeting this demand is becoming increasingly challenging. Already Ontario's electricity system is showing signs of strain.

The summer of 2005 was particularly taxing. A new all-time record for electricity demand in Ontario was set on 13 July 2005, with demand peaking at 26,160 megawatts (MW).[3] Through the summer, the IESO issued 12 public appeals asking customers across Ontario to reduce their use of electricity. Despite this, the IESO was forced to reduce voltage by 5% on 3 and 4 August in order to maintain the system's reliability.[4] Some industrial and institutional consumers, including hospitals, were negatively affected.

Insufficient generating capacity in Ontario has also increased the province's reliance on costly electricity imports from neighbouring jurisdictions with which Ontario is interconnected, particularly during periods of high demand. The share of electricity imports as a percentage of Ontario's total electricity consumption has increased in recent years, topping 6% in 2003 and 2004, up from the 3-4% range in the previous six years.[5]

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(1) The IESO was formerly known as the Independent Electricity Market Operator (IMO).

(2) Independent Electricity System Operator, *10-Year Demand Forecast*, 8 July 2005.

(3) Ontario's existing installed generation capacity is 30,114 MW, though in practice it is not possible to generate this much power at any given moment due to such factors as unscheduled outages, planned maintenance and weather conditions.

(4) Voltage reductions are often referred to as "brownouts."

(5) Independent Electricity System Operator, http://www.ieso.ca/.

The near-term outlook for Ontario's electricity system reflects these stresses. In its latest report, the IESO warned that, following the April 2005 closure of the Lakeview coal-fired generating station in Mississauga, rotating blackouts ("emergency rotational power outages") are to be expected in Toronto in the absence of new measures to increase the supply of electricity, shore up the transmission infrastructure, and/or reduce demand.(6)

Ontario's power situation stems from a succession of problematic management decisions by successive governments and utility executives that have resulted in an increasingly vulnerable electricity system and a stranded debt load of approximately $20 billion.(7)

Recent attempts at electricity sector restructuring, aimed at increasing the involvement of the private sector, have been characterized by one critic as "indecipherable and improvisational" and have met with limited success. The current provincial government is now seeking a balance between private and public involvement in Ontario's electricity sector and has set up the Ontario Power Authority (OPA) to oversee and guide developments in the coming years.(8) Important new investments in both generation and transmission are urgently needed as the government moves ahead with its plan to shut down the province's remaining coal-fired generating stations in an effort to improve air quality and provide up to half of Ontario's greenhouse-gas reduction contributions under the Kyoto Protocol.(9)

Ensuring the sustainability of its electricity system is one of the most critical challenges facing Ontario. This paper outlines the options under development and consideration.

## ELECTRICITY AND ONTARIO'S ECONOMY

Ontario is Canada's industrial heartland and long-time economic engine. To a large extent, that engine is powered by the supply of relatively cheap, reliable electricity, which has played a key role in the development of the province's energy-intensive sectors such as manufacturing, chemicals, paper and metals.

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(6) Independent Electricity System Operator, *10-Year Outlook*, 15 August 2005.

(7) Stranded debt is debt that cannot reasonably be serviced and retired by commercial companies (in this case the Ontario Hydro successor companies, notably Ontario Power Generation and Hydro One) in a competitive electricity market. See the 2003 Annual Report of the Office of the Provincial Auditor of Ontario.

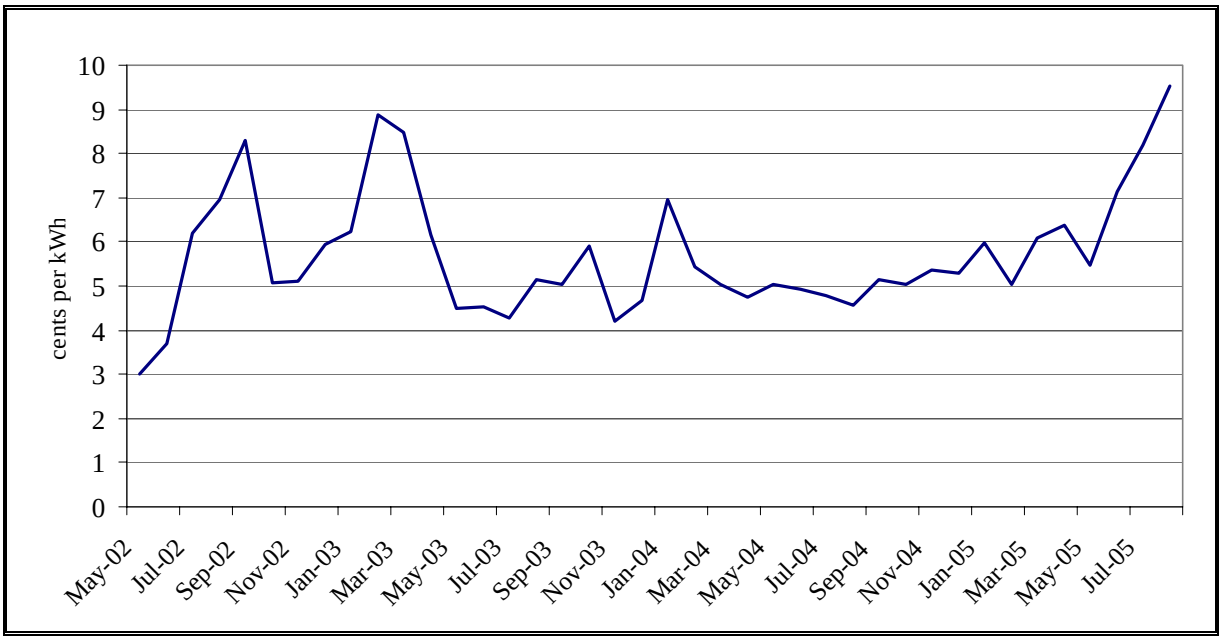
(8) In December 2004, the Government of Ontario passed the *Electricity Restructuring Act, 2004*, which created the Ontario Power Authority. The OPA's responsibilities include developing an integrated power system plan – a plan for conservation, supply, and transmission – based on a 20-year outlook.

(9) The coal-fired generating stations in question are owned and operated by Ontario Power Generation, itself owned by the province.

Today, there is growing anecdotal evidence that the lack of a reliable and low-cost supply of electricity is becoming a competitive disadvantage for many businesses operating in Ontario. For example, the Ontario Minister of Natural Resources' Council on Forest Sector Competitiveness has warned that rising electricity prices are putting enormous pressure on the province's already beleaguered forest industry. This industry, which employs some 85,000 people and is described by the Council as the economic bedrock of northern Ontario, has long depended on low-cost electricity, since electricity can account for up to one-third of operating costs.(10)

Under the current market structure, industrial electricity consumers are exposed to fluctuations in electricity prices to a much greater extent than residential customers.(11) Figure 1 illustrates the volatility of Ontario's spot wholesale electricity market since it was opened to competition in May 2002.

**Figure 1: Wholesale Electricity Prices in Ontario Since Market Opening**




Source: Data from the Independent Electricity System Operator, http://www.ieso.ca/. The monthly price is calculated as a weighted average of hourly prices.

(10) Minister's Council on Forest Sector Competitiveness, *Final Report*, submitted to the Honourable David Ramsay, Ontario Minister of Natural Resources, May 2005, http://www.mnr.gov.on.ca/mnr/forests/industry/woodsupply/ministers_council/forestsector_report.pdf.

(11) The electricity pricing mechanisms currently in force in Ontario are beyond the scope of this paper. For an overview, please see IESO, "Price Overview," http://www.ieso.ca/imoweb/media/md_prices.asp, and "How Generators Are Paid," http://www.ieso.ca/imoweb/siteShared/generators_pricing.asp?sid=ic.

Industry groups have warned that Ontario's increasingly shaky electricity outlook, reflected in the rise in the wholesale price of electricity, is constraining additional investments in the province's manufacturing capacity.(12) As the Honourable Perrin Beatty, President and CEO of Canadian Manufacturers & Exporters noted in a recent speech, power interruptions are costly and undermine confidence in the system and, as such, reduce Ontario's attractiveness as a location in which to invest.(13) The President and CEO of the IESO echoed this sentiment in a recent speech. He stated that "Ontario businesses, industries and residents are not being provided the level of assurance they expect for a reliable supply of power when there are frequent power warnings, voltage reductions or routine reliance on emergency control actions to meet our power needs."(14)

## RENEWING ONTARIO'S ELECTRICITY SYSTEM

The Ontario government's strategy for renewing the province's electricity system is broadly outlined below. Potential pitfalls are also identified.

### A. Coal Phase-Out

The Government of Ontario has pledged to close all existing coal-fired generating stations by 2009 in an effort to clean up Ontario's air and reduce greenhouse gas emissions, which are linked to climate change. These power plants, and the Nanticoke generating station in particular, are amongst the most important sources of pollution in North America, releasing significant quantities of smog and pollutants such as sulphur dioxide and nitrogen oxides that cause acid rain. They contribute to making Ontario one of the largest North American sources of chemicals released from industrial activities.(15)

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(12) Canadian Manufacturers & Exporters, *Manufacturing Challenges in Canada*, http://cme-mec.ca/mfg2020/Challengespdf.pdf.

(13) Canadian Manufacturers & Exporters, "Recharging Canada's Industrial Heartland," Speaking notes for the Honourable Perrin Beatty, President and CEO, Ontario Energy Association Awards Dinner, Niagara Falls, Ontario, 13 September 2005, http://www.cme-mec.ca/pdf/Energy_OEA_SEPT132005.pdf.

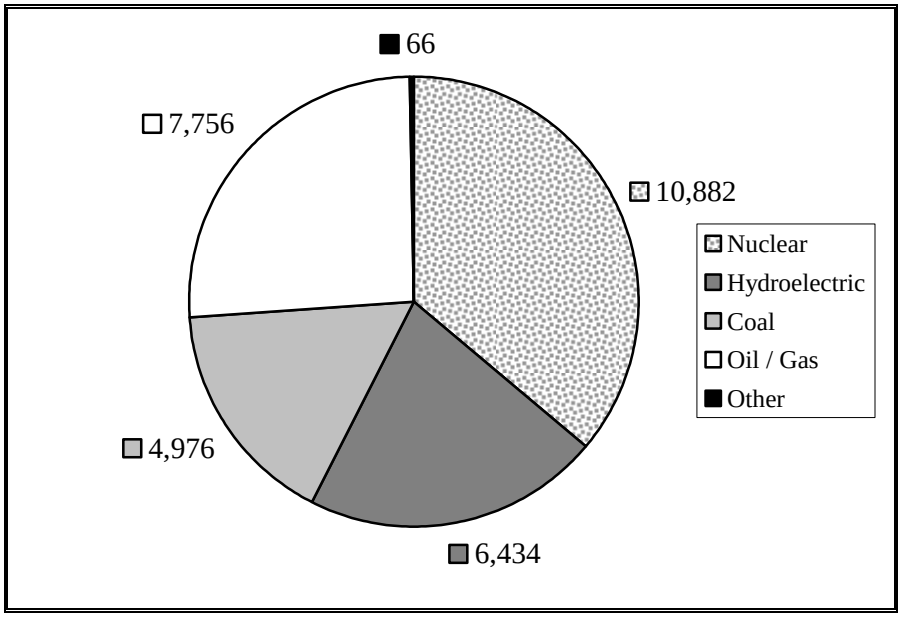
(14) Independent Electricity System Operator, "The Evolving Ontario Energy Market," Notes for remarks by Dave Goulding, President and CEO, Ontario Energy Association Conference, 14 September 2005.

(15) Commission for Environmental Cooperation of North America, *Taking Stock: 2002 North American Pollutant Releases and Transfers*, Montréal, May 2005.

Most environmentalists and health care professionals strongly support the government's plan to phase out the use of coal by the beginning of 2009. But electricity experts are concerned about the impact this rapid change could have on the reliability of Ontario's electricity grid.

The IESO has characterized this initiative, the cornerstone of the government's electricity strategy, as the "largest and most significant electricity system change ever undertaken in Ontario," as it will remove 6,434 MW of generating capacity from the grid, representing approximately 21% of the current total.(16) Figure 2 offers a snapshot of Ontario's existing installed generation resources (as of August 2005).(17)

**Figure 2: Ontario's Installed Generating Capacity, by Fuel (MW)**




Source: Data from Independent Electricity System Operator, *10-Year Outlook* (2005).

Adding to the challenge is the fact that several of Ontario's nuclear power generation units will soon be reaching the end of their useful life. One nuclear unit at the Bruce A generating station, rated at 769 MW, could be shut down as early as 2009, while three

(16) Independent Electricity System Operator, *10-Year Outlook* (2005).

(17) Ontario can also import up to 4,000 MW at any one time, depending on system conditions. Ontario is interconnected with Quebec, New York, Michigan, Minnesota and Manitoba. In practice, imports tend to be expensive and cannot always be relied on due to system limitations.

units at the Pickering B generating station, each rated at 516 MW, will require re-tubing by 2013.(18)

In all, it is anticipated that Ontario needs about 13,000 MW of additional, more environmentally friendly, generating capacity by 2014 to meet its growing electricity needs.(19) Ontario's Energy Minister has noted that $25-40 billion in new investments will be needed over the next 20 years to strengthen and renew the province's electricity generation and transmission infrastructure.(20)

### B. Initiatives to Boost Supply

The provincially owned Ontario Power Generation (OPG) currently generates the bulk of Ontario's electricity. The Government of Ontario would like to see the private sector become increasingly involved in power generation in Ontario; but due in large part to ongoing uncertainty surrounding the restructuring of Ontario's electricity market, investors have in recent years largely shied away from building new power plants in Ontario.(21)

Rather than push ahead with fundamental electricity market reforms, the Government of Ontario has opted to focus its efforts on contracting directly with the private sector to build new generating capacity. This approach entails potentially significant financial risks for the province and, ultimately, for the electricity ratepayers and taxpayers of Ontario, as the province is providing investment guarantees to private-sector electricity generators in an effort to attract investments.(22)

Since the beginning of 2004, the Government of Ontario has launched four Requests for Proposals (RFPs) to increase the province's electricity generation capacity.(23)

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(18) Ontario Power Generation has announced that it will not be returning Pickering A units 2 and 3 to service.

(19) Independent Electricity System Operator, *10-Year Outlook* (2005).

(20) Ontario Ministry of Energy, Notes for remarks by the Honourable Dwight Duncan, Minister of Energy, to the Canadian Club of Toronto, 2 May 2005.

(21) For more on this subject, see Michael J. Trebilcock and Roy Hrab, "Electricity Restructuring in Ontario," *The Energy Journal*, Vol. 26, No. 1, 2005.

(22) *Ibid*.

(23) The new suppliers will bid into the wholesale market but will nevertheless receive basic investment guarantees under the terms of their contract with the Ontario Ministry of Energy.

Three of the RFPs have been for new renewable energy projects which altogether could add up to 1,600 MW of low-impact, but mostly intermittent, generation capacity to the grid. These projects are at various stages of development, and at least one, the 67.5-MW Melancthon Grey Wind Project near Shelburne in southern Ontario, is already under construction. Projects to reduce electricity demand, particularly during peak periods, are also at various stages of development.

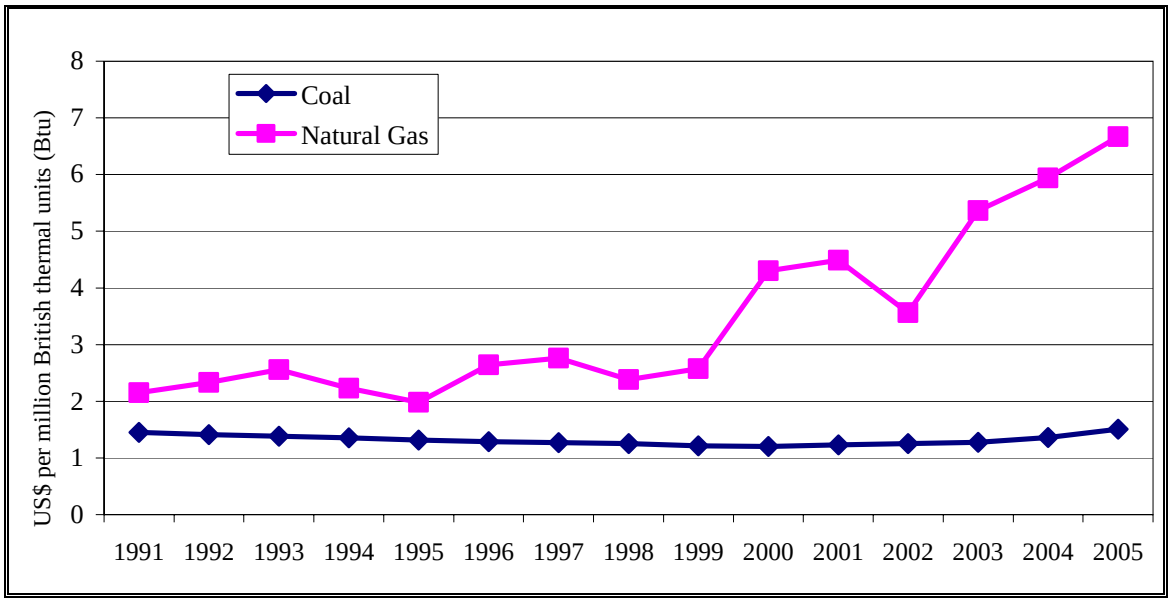
While these renewable energy and energy conservation projects have been well publicized, the Government of Ontario is necessarily counting on the timely construction of several new, privately owned and operated, natural gas-fired power plants and cogeneration (combined heat and power) facilities to replace Ontario's coal-fired generating stations. Some of these projects were the object of the government's first RFP in early 2004. In addition, the OPA will soon launch new procurement processes for up to 600 MW of new capacity in the downtown Toronto core, up to 1,000 MW in the western end of the Greater Toronto Area (GTA), and up to 1,000 MW of cogeneration projects across Ontario. Given the nature and location of these possible projects, it is likely that many, if not all, would need to be gas-fired, which also suggests that local opposition could be considerable, particularly in the GTA.

Modern gas-fired power plants nevertheless offer many advantages: they emit fewer pollutants than coal-fired power plants, they are more efficient, they are quick to build and have lower capital costs. Yet from a financial perspective, an aggressive shift from coal to natural gas for power generation is becoming increasingly risky.(24) While natural gas prices were relatively low throughout the 1990s, they have since been rising, as Figure 3 illustrates.(25) Coal prices, meanwhile, have remained stable. The result is that gas now costs upwards of four times as much as coal per unit of energy.

(24) There are also implications for system reliability, since coal-fired plants in Ontario have superior load following capability (i.e., they can ramp up and down rapidly in response to changes in electricity demand). For more on this subject, please refer to the IESO *10-Year Outlook* (2005).

(25) Figure 3 shows U.S. costs; similar Canadian data are not available.

**Figure 3:**
**Cost of Coal and Natural Gas for Electricity Generators in the United States**




Source: Data from U.S. Department of Energy, Energy Information Administration, *Electric Power Monthly*, October 2005.

Note: Values for 2004 and 2005 are preliminary.

As with crude oil, the price of natural gas spiked in 2005 and at the time of writing was routinely setting new record highs. Most analysts expect that natural gas prices will remain high throughout North America for some time, which implies high electricity prices in the short to medium term, especially if gas-fired power plants are relied upon to meet peak demand. To the extent that they put excessive pressure on the price of electricity, high gas prices could ultimately jeopardize the construction of additional gas-fired generating stations and cogeneration projects in Ontario, thus derailing the province's electricity strategy.

### C. Other Projects Under Way

OPG is returning one nuclear unit at Pickering A (unit 1 – 515 MW) to service very shortly. On the hydroelectricity front, it has begun construction on the Niagara tunnel, a $985-million project which, by the time it is completed in 2009, will increase the average annual energy output of the Sir Adam Beck hydroelectric complex.[26] OPG could yet choose to expand

(26) Ontario Power Generation, News release, "Ontario Power Generation Begins Niagara Tunnel Project," 14 September 2005.

the hydroelectric generating stations on the Mattagami River in northeastern Ontario, which could add up to 380 MW of generating capacity. Other major hydroelectric developments in Ontario are not expected in the near term.

### D. A Nuclear Renewal?

For its part, Bruce Power, the private operator of the Bruce nuclear complex, has reached an agreement with the Government of Ontario that will see Bruce Power refurbish two laid-up nuclear reactors (Bruce A units 1 and 2 – 769 MW each).(27) There is also growing speculation that the Government of Ontario is contemplating the construction of additional nuclear power plants, an idea that the industry, and the federally owned Atomic Energy of Canada Limited in particular, has been pushing for in recent years, and that was recommended in the March 2004 report from the Committee to Review Ontario Power Generation (the Manley Report).(28) It is expected that the construction of new nuclear power plants, if it were to take place, could begin sometime in the next decade.

### E. Tapping Into Other Provinces' Hydroelectric Potential

Again looking into the next decade, the Government of Ontario is hoping to tap into Manitoba's and Newfoundland and Labrador's considerable hydroelectric potential. Obtaining hydro power from other provinces would also, as an added benefit, contribute to reducing greenhouse gas emissions in Ontario by displacing the use of fossil fuels. It will, of course, require significant investments in new high-voltage transmission infrastructure linking the provinces. The Government of Canada's 2005 Budget allocated $250 million (the "Partnership Fund") for such Kyoto-friendly projects. The federal government has hinted that it will be contributing additional amounts to this Partnership Fund in the coming years. Ontario will be looking to Ottawa to support the development of east-west interconnections.

More details on these and other options for shoring up Ontario's electricity system, including the potential construction of new nuclear power plants, will be contained in the OPA's December 2005 report to Ontario's Energy Minister.

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(27) Bruce Power will receive $63 per MWh for the electricity produced by all of the Bruce A units. The risk of cost overruns will be borne jointly by Bruce Power and the Government of Ontario.

(28) Committee to Review Ontario Power Generation, *Transforming Ontario's Power Generation Company*, submitted to the Honourable Dwight Duncan, Ontario Minister of Energy, Toronto, 15 March 2004.

## CONCLUSION

The outlook for Ontario's electricity system in the near term continues to arouse concern, and the province's strategy for renewing its electricity sector is ambitious. What is increasingly clear is that wholesale and retail electricity prices will have to rise if relatively inexpensive coal-fired generating capacity is to be replaced in the near term by cleaner-burning, but more expensive to operate, gas-fired power plants, renewable sources of power, and energy conservation measures. This will come as a shock to Ontario consumers and taxpayers, who have long been artificially sheltered from increases in the price of electricity.

In the long term, ongoing concerns about air pollution and climate change could facilitate the development of an electricity transmission corridor linking Ontario to neighbouring provinces with untapped hydroelectric potential. Similar concerns could also precipitate the construction of additional nuclear plants in Ontario.

The decisions that are being taken today concerning the timing and structure of these sizable investments will largely determine the reliability and cost of Ontario's electricity supply over the coming decades, and can thus be expected to have an important impact on the economic future of Canada's most populous province.