THE ONTARIO RELIABILITY OUTLOOK

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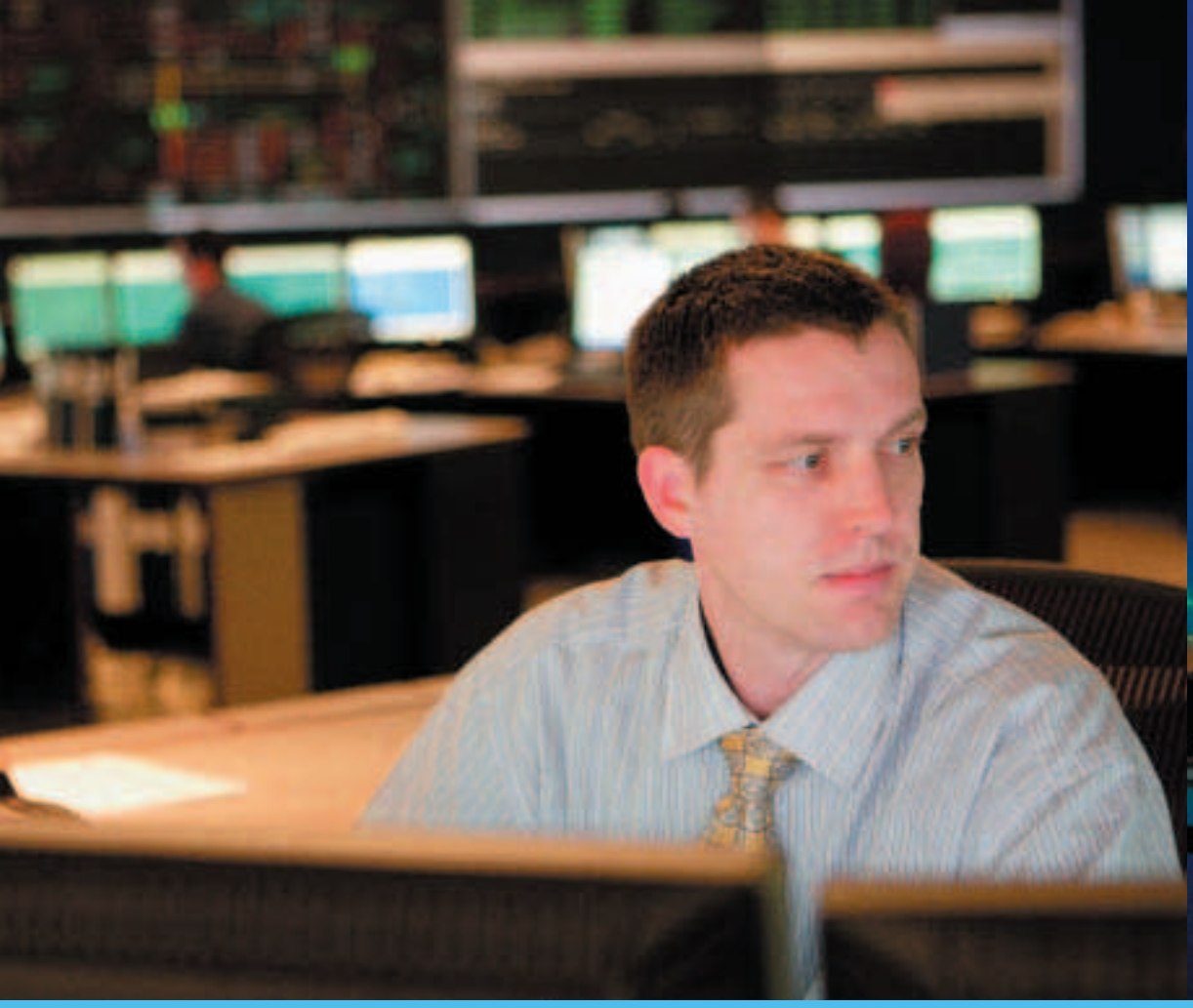
Power to Ontario. On Demand.



ABOVE: IESO Control Room

COVER: Innergex's Glen Miller Hydroelectric Facility near Trenton

CONTENTS

Tembec-Spruce Falls
Operations – Kapuskasing

EXECUTIVE SUMMARY

Progress has been made in addressing a number of the reliability issues that were identified in the Ontario Reliability Outlook released in February 2006. However, significant challenges still remain, particularly given the recent demand and supply experiences over the summer months.

The provincial government has directed the Ontario Power Authority (OPA) to initiate a number of new projects to facilitate retirement of coal-fired generation and address growing provincial demand.

The Independent Electricity System Operator (IESO) has revised its demand and supply assumptions for the Ontario resource adequacy assessment as a result of the recent summer experience, particularly in 2005, when hot weather conditions caused record electricity demands through increased air conditioner use, and drought-like conditions limited available hydroelectric energy to meet those demands.

The change in planning assumptions highlights the need for an additional 2,500 to 3,000 megawatts (MW) of supply and demand-side initiatives over those previously identified. In making this change now, the IESO recognizes the impact it will have on the government's coal replacement program. Significant delays in the current coal replacement schedule will be needed given the time required to implement the additional initiatives to maintain future reliability.

Through the regular issues of the Ontario Reliability Outlook, the IESO reports on progress of the inter-related generation, transmission and demand management projects underway to meet future reliability requirements. As project commitments are made by the OPA, or included in the Integrated Power System Plan, the Ontario Reliability Outlook will monitor and report on the progress of infrastructure developments and their impact on future reliability.

Changes in Planning Assumptions

As evidenced in 2005, Ontario has become a summer peaking jurisdiction as a result of the continuous increase in air conditioner load. Based on recent experience, and recognizing summer weather impacts on demand and resources, the IESO has developed a better picture of future demand and expected available hydroelectric resources to help meet that demand.

The summer and winter peak demand forecasts outlined in this Outlook are based on recognition of the seasonal exposure to peak demand periods, a change from previous forecasts which were based on weekly or monthly periods of forecast demand. This change results in significantly improved demand estimates that better capture the higher loads being experienced over the summer period, while also reducing the forecast uncertainty.

Hydroelectric capacity accounts for approximately 25 per cent of Ontario's installed capacity and has contributed an average 24 per cent of the province's total energy supply annually over the past 10 years. Actual hydroelectric energy production is also subject to large variations, as evidenced in the summer of 2005 when drought-like conditions in parts of Ontario resulted in the available hydroelectric energy being 15 per cent less than forecast.

Much of the hydroelectric capacity has limited storage, which historically has been adequate for the one or two hour winter peaks but is not sustainable over the higher and longer peaks now being experienced on hot summer days. Unlike winter peaks, which predictably occur in mid-winter, summer peaks can occur at any time from late spring to early fall.

Based on a thorough analysis of summer hydroelectric operation over the past 10 years, the IESO has reduced its forecasts for the amount of hydroelectric resources reliably available over summer peak periods.

This summer experience has now been better factored into the outlook, resulting in a significant reduction in the capacity of hydroelectric resources which can be counted on to supply the summer peak.

Initial changes in the planning assumptions were first presented in the March 2006 18-Month Outlook and subsequently modified following discussions with market participants.

The resulting 2,500 to 3,000 MW overall increase to forecast resource requirements better reflects the resources needed to reliably serve Ontario's electricity consumers. Recognizing these changes will help better prepare for occasions like last summer when reliance on imports or emergency control actions, such as voltage reductions, were necessary; provide additional value and incentive for load-related reduction and conservation initiatives; and lead to better capacity planning decisions to ensure that the transition period for shutting down coal-fired generation can be successfully managed.

The IESO is working closely with the OPA to ensure that forecasts in IESO Outlooks and the OPA Integrated Power System Plan are consistent in reflecting continuing reliability needs.

Concerns Being Addressed

Progress has been made in addressing one of the prime concerns raised in the February 2006 Ontario Reliability Outlook – the need for new generation in Toronto by summer 2008. In response to that need, the Minister of Energy issued a directive to construct the 550 MW Portlands Energy Centre project. The directive also calls for 300 MW of conservation and demand management in Toronto by 2010.

Overloading of the 500 kilovolt (kV) transmission system serving the western part of the Greater Toronto Area (GTA) is also being addressed. Construction has started on the 860 MW Sithe Goreway gas-fired generating facility in the west GTA and the OPA has issued a Request for Proposals (RFP) for 500-600 MW of new supply in the vicinity of the Trafalgar Transformer Station (TS) in the north Oakville area. Both projects were a result of directives from the Minister of Energy. In addition, Hydro One has begun work to increase the capability of the transformers at the Trafalgar TS to address overloading concerns experienced last summer. This will provide an increase in load supply capability that is expected to be sufficient until at least 2010, when the new generation from the RFP is expected to be available.

The outlook for the summer of 2006 is improved compared to last summer as a result of the addition of more than 600 MW of nuclear, gas-fired and hydroelectric generation over the past year, the introduction of two new market mechanisms to enhance reliability, and the implementation of transmission infrastructure projects by Hydro One and Great Lakes Power. A number of new generation projects are also forecast to be in service in time to meet 2007 summer peak demands.

Three new wind farms totalling approximately 200 MW of installed capacity have also been added to the system. While the energy provided by wind generation ranges from 20 to 40 per cent annually, the contribution of this capacity at summer peak times can be much lower. For forecast purposes, the IESO has assumed that 10 per cent of installed wind capacity can be reliably considered over these periods.

The IESO is working with the OPA and the Canadian Wind Energy Association to assess the impacts of integrating a substantial amount of wind into Ontario's power system by the year 2020.

Increased conservation and demand management are helping to address the province's reliability needs through decreased consumption and load shifting to off-peak hours. The provincial government has set a target for a five per cent reduction in peak demand by 2007 and programs offered through the Conservation Bureau of the Ontario Power Authority, local distribution companies and the IESO help to support this. The implementation of the provincial government's Smart Meter Initiative, supported by comprehensive information and education efforts, will improve the ability of Ontario's electricity customers to better manage their electricity costs and enhance the reliability of the power system during peak periods.

Needed Transmission Enhancements

Transmission enhancements are required over the next decade to accommodate planned new generation. Major transmission projects are required to deliver additional electricity from the Bruce area, to enable the planned expansion of hydroelectric capability in the northeast and to increase the capability to supply Toronto load. A number of local transmission or generation initiatives are also needed in areas throughout Ontario.

Approximately 2,400 MW of new generation is expected to be installed in the Bruce area within the next four to five years including 900 MW of new wind generation and 1,500 MW of nuclear generation from the refurbished Units 1 and 2 at the Bruce A nuclear generating station. A new transmission line is required to reliably deliver the full capacity of that new generation but under the current approvals process, the line would not be in service in time to fully accommodate the additional generation. Measures to mitigate this impact in the short-term are being considered.

Expansion of the generating capability from the four existing hydroelectric stations on the Lower Mattagami River in Northeast Ontario could result in 450 MW of additional generation. Required transmission enhancements have been identified by Hydro One and are being reviewed by the IESO. These required enhancements could be addressed in time to incorporate additional generation.

The Portlands Energy Centre gas-fired generating facility and conservation initiatives will address near-term concerns of overloading on the transmission circuits serving central Toronto. A third transmission path is required to maintain reliability longer term and to provide a diversity of supply paths into the city.

Streamlining of the approvals processes would assist timely incorporation of required transmission and generation.

Coal Replacement Policy

The Ontario government's coal replacement schedule will require significant delays as a result of the IESO's revised planning assumptions and delays to the in-service schedule for replacement generation and transmission initiatives.

Over the last two years, the provincial government has initiated a number of projects for increased supply or demand management to replace the need for coal-fired generation.

The need for an additional 2,500 to 3,000 MW resulting from the change in planning assumptions adds to the amount of replacement generation required to allow the coal units to be retired while maintaining reliability of the power system.

Appeal processes related to obtaining project and site approvals for the proposed replacement generating facilities to facilitate the shutdown of Lambton have delayed construction and pushed back the in-service dates, requiring Lambton units to operate beyond the end of 2007. It is expected to take another 18 months to two years to construct the facilities once approvals to proceed have been granted. The in-service dates for new generation and transmission facilities remain uncertain and contribute to the requirement for significant delays in the current coal replacement schedule.

Further resolution of the expected in-service dates and other system infrastructure additions will permit a better assessment of the extent of the delay to the shutdown of the Lambton units.

Significant delays are also required for Nanticoke and further analysis is needed to determine the impact of the revised planning assumptions and other considerations on the Nanticoke shutdown schedule.

As recommended in the February issue of the Ontario Reliability Outlook, necessary staffing, fuel and maintenance provisions are being made at the Lambton and Nanticoke coal-fired generating stations to allow for the continued operation of the facilities for reliability reasons beyond their announced shutdown dates.

The IESO will continue to monitor the progress of the coal replacement program and will provide timely advice and notice on when circumstances are such that the units can be put on standby status and then removed from service.

Finally, the IESO reiterates its concern expressed in the February report for an expedited, but thorough and time-bound regulatory approvals process. Needed projects are at risk of not being in service in time under the current complex process and changes are required.

CHANGES IN PLANNING ASSUMPTIONS

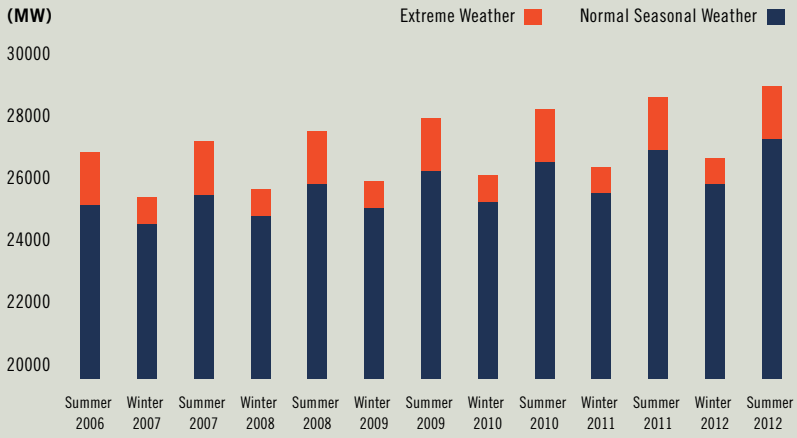
Weather continues to have an increasing impact on Ontario's electricity demands. The hot, humid weather conditions in the summer of 2005 resulted in a new Ontario peak demand of 26,160 MW, more than 700 MW higher than the previous record set in 2002. The 2002 hourly peak was eclipsed on seven different days during the 2005 summer. The most recent example of the weather-related impact on electricity demand occurred at the end of May 2006. Unusually high temperatures resulted in a peak demand of 24,857 MW, more than 4,500 MW higher than the previous May peak set in 2004.

Experiences in recent years, during which Ontario became a summer-peaking jurisdiction, have provided new information on the different challenges faced in order to meet demands during hot, summer weather. Not only are peaks higher during the summer, but during a heat wave high demand levels can persist over a longer peak period before dropping overnight. This can affect the requirement for resources – particularly hydroelectric resources – which can be energy limited during summer conditions.

Demand Forecast

To better reflect the impact of weather on the power system, particularly during the summer, the IESO is now using seasonal normalized weather in the long-term demand forecasts. The summer and winter peak demand forecasts outlined in this Outlook recognize the seasonal nature of these peak demand periods, and as demonstrated in late May 2006, the unpredictability and sudden significant increase in demand that can occur over the late spring and summer months. This represents a change from previous demand forecasts which were based on weekly normalized weather and will result in significantly improved demand estimates that better capture the higher loads being experienced over the summer period, while also reducing the forecast uncertainty.

ONTARIO PEAK DEMAND FORECASTS 2006 – 2012



These changes result in an increase in forecast normal weather peak demand of approximately 1,600 MW for the summer and 600 MW for the winter season.

Demand forecasts under extreme weather are also used in the IESO's assessments to test the delivery capability of the transmission system. These extreme weather demand forecasts have not changed as a result of the IESO's revised planning assumptions.

Hydroelectric Planning Assumptions

Considering the important contribution of hydroelectric resources along with the experience of summer 2005, the IESO has reviewed its hydroelectric capacity assumptions. This review concluded that a forecast based on historic values of production and capability to provide reserve capacity would provide a more accurate forecast of hydroelectric capacity to serve peak demand.

Hydroelectric capacity accounts for approximately 25 per cent of Ontario's installed capacity. Much of that capacity has limited storage which has been adequate for the one or two hour winter peaks. Unlike winter peaks, which predictably occur in mid-winter, summer peaks can occur at any time from late spring to early fall. And while hydroelectric capacity may be available for several hours each day, in most cases, limitations on the water available do not allow for energy production over the prolonged high-load periods typical of summer peak days.

Actual hydroelectric energy production is also subject to large variations, as evidenced in the summer of 2005 when drought-like conditions in parts of Ontario resulted in the available hydroelectric energy being 15 per cent less than forecast.

Initial changes in the planning assumptions were first presented in the March 2006 18-Month Outlook and subsequently modified following discussions with market participants.

Changes made to the demand forecast and hydroelectric assumptions will improve the IESO's overall forecast accuracy and help better identify occasions like last summer when reliance on imports or emergency control actions may be necessary. These changes will also lead to better capacity planning decisions to ensure that the transition period for shutting down coal-fired generation can be successfully managed.

The combined changes in planning assumptions for forecast demand and hydroelectric availability result in an increased resource requirement of between 2,500 and 3,000 MW over the summer months.

Thunder Bay Generating Station. Photo: Ontario Power Generation

COAL REPLACEMENT POLICY

Implementing the government's coal replacement policy is a significant and complex undertaking, requiring the replacement of 7,500 MW of supply at a time when the overall supply demand balance in the province has tightened dramatically in recent years. The provincial government has maintained its commitment to the reliability of the power system throughout the transition to cleaner supply.

The Lakeview coal-fired generating station was shut down in April 2005 as part of the provincial government's coal replacement policy.

The shutdown of the 211 MW Atikokan generating station is planned for 2007 and would follow the conversion of the two 155 MW Thunder Bay coal-fired units to natural gas.

The schedule for shutdown of both the 2,000 MW Lambton station and the 4,000 MW Nanticoke station are negatively affected by the schedule delays for the replacement generation and transmission initiatives and the revised planning assumptions for peak demands and hydroelectric energy.

Appeal processes related to obtaining project and site approvals for the proposed replacement generating facilities to facilitate the shutdown of Lambton have delayed construction and pushed back the in-service dates, requiring Lambton units to operate beyond the end of 2007. It is expected to take another 18 months to two years to construct the facilities once approvals to proceed have been granted. The in-service dates for new generation and transmission facilities remain uncertain and contribute to the requirement for significant delays in the current coal replacement schedule.

These delays will require the Lambton units to operate for a prolonged period beyond the end of 2007. After the new in-service dates for the replacement generation are determined and the related transmission enhancements are

confirmed, a revised schedule can be set that will allow the Lambton units to be put on standby status and then removed from service.

Studies underway on the shutdown of the Nanticoke units indicate that significant delays will also be required. In addition to being subject to the impacts of delays of in-service for replacement generation and changes in planning assumptions discussed above, the Nanticoke station provides voltage support necessary for power flows to the GTA. Not only is replacement generation required on line, but substantial transmission changes are also required to facilitate the shut down of Nanticoke.

The IESO is continuing to assess the need and timing for some Nanticoke units to be converted to operate as synchronous condensers, which provide reactive power without burning coal to operate.

This Reliability Outlook reinforces the need to have the Nanticoke and Lambton coal-fired units operate for a significant period of time beyond the announced shutdown dates. This action will support continued system reliability to accommodate the revised resource requirements from the changes in planning assumptions as well as schedule delays for replacement generation or reduced production from existing or new facilities.

Ontario Power Generation (OPG) has identified that, while earlier retirements can be accommodated if circumstances permit, it is problematic to extend the period of reliable operation if the necessary fuel, staffing and maintenance plans have not been put in place ahead of time. OPG has put plans in place to maintain the capability of its coal plants for as long as they are required, while also providing the flexibility to accommodate any change in the schedule of bringing replacement capacity on-line.

The IESO will continue to monitor the progress of the coal replacement program and will provide timely advice and notice on when circumstances are such that the units can be put on reserve status and then removed from service.

INTEGRATING WIND POWER

While early studies indicate wind power should make a significant contribution to the province's energy supply, there is less certainty as to how much peak-meeting capacity it can provide. Wind energy can vary widely on an hour-to-hour basis and cannot effectively be dispatched to meet changes in real-time demand.

This variable contribution from wind increases the need to have other supplies of capacity available to provide energy when wind resources are low. Some effort will also be required to integrate wind resources effectively into the provincial electricity system. The geographic diversity of projects around the province should provide some stability to wind output and reduce the impact of local fluctuations.

Integrating wind resources effectively into the provincial electricity system is not straightforward. Assessing the connection of wind generation has needed careful examination. The IESO's Connection Assessment and Approval process has helped to identify potential reliability issues and will ensure that they have been addressed before new wind farms connect to the grid.

Photo: Canadian Hydro/Chinodin Wind Power

The presence of wind on the Ontario grid will be a positive contribution to the province's future supply mix. Several wind projects are under development and are expected to be completed within the timeframe of this Reliability Outlook.

The IESO is working with the OPA and the Canadian Wind Energy Association to assess the impacts of integrating a substantial amount of wind into Ontario's power system by the year 2020. This study will provide a better understanding of wind generation's capacity and energy contribution as well as insight into system impacts which may arise from wind's inherent variability.

TABLE 1: GENERATION AND DEMAND RESPONSE PROJECTS PLANNED OR UNDERWAY IN ONTARIO

SOURCE OF PROJECT	GENERATION AND DEMAND RESPONSE PROJECTS PLANNED OR UNDERWAY	INSTALLED CAPACITY (MW)	PLANNED IN-SERVICE DATES
Wind generation projects resulting from Renewables I RFP[1]	Prince Wind Farm	99*	2006
	Blue Highlands Wind Farm	49.5*	Summer 2007
Biomass generation projects resulting from Renewables I RFP[2]	Woodward Avenue Plant	1.6	Summer 2006
	Trail Road Landfill Gas Generating Station	5	Early 2007
Hydroelectric generation project resulting from Renewables I RFP[3]	Umbata Falls	Up to 22.8	Before Summer 2008
Gas-fired generation project resulting from government directive for Western GTA	Goreway Station – Phase 1	485	Summer 2007
	Goreway Station – Phase 2	375	Summer 2008
Gas-fired generation project resulting from government directive for Central Toronto	Portlands Energy Centre Generation Project – Phase I Simple Cycle	350	Summer 2008
	Portlands Energy Centre Generation Project – Phase II Combined Cycle	200	Summer 2009
Gas-fired generation and demand response projects resulting from Clean Energy Supply RFP[4]	Loblaws Properties (Demand Response)	10	8 of 10 MW already available (remaining available summer 2006)
	Greenfield Energy Centre	1,005	2008
	Greenfield South Generation Project	280	2008
	St. Clair Generation Project	570	2008
Wind Generation projects resulting from Renewables II RFP	Wolfe Island Project	197.8*	2008
	Underwood Project (formerly Leader Wind Projects A and B)	199.7*	Early 2007
	Prince II Power Project	90*	2006
	Kingsbridge II Power Project	158.7*	Fall 2008
	Ripley Power Project	76*	Q4 2007
	Kruger Energy Port Alma Project	101.2*	Q4 2008
	Amaranth II Wind Project (formerly Melancthon II)	132*	2007
Hydroelectric generation project resulting from Renewables II RFP	Island Falls Project	Up to 20	2008
Nuclear generation projects underway with Bruce Power	Bruce Power Unit 1 Refurbishment	750	In 2009, with second unit six months later
	Bruce Power Unit 2 Refurbishment	750	
Ontario Power Generation hydroelectric generation	Mattagami Hydroelectric Generation	Up to 450	In-service dates ranging from September 2009 to September 2011
RFP Processes underway with the Ontario Power Authority	Northern York Region Demand Response RFP	3	Summer 2006
	GTA West Trafalgar RFP	600	Summer 2010
	Combined Heat and Power RFP	1,000	Summer 2010 to Summer 2013

TABLE 1: CONTINUED

SOURCE OF PROJECT	GENERATION AND DEMAND RESPONSE PROJECTS PLANNED OR UNDERWAY	INSTALLED CAPACITY (MW)	PLANNED IN-SERVICE DATES
Generation and Demand Response Procurement Processes under development	Renewables III RFP (facilities between 0.25 MW and 19.9 MW)	200*	2009
	Demand Response Program	250	2007
	Toronto Area Conservation and Demand Management	300	By 2010
	Low Income and Social Housing Program	100	10 MW end of 2006, 100 MW end of 2007
	Appliance Change-out, Efficient Lighting Initiative and other residential initiatives • Every kilowatt counts • Cool Savings Rebate	39	Summer 2006 (future target of 250 MW)
	Capacity Building Demand Response Program	125	Summer 2006 – Summer 2007
	Demand-Side Management Initiative	125	Summer 2006 – Summer 2007

* For capacity planning purposes, wind generation has a dependable capacity contribution of 10 per cent of the listed installed capacity of the project

[1] Amaranth Wind (formerly Melancthon Wind), Port Burwell (formerly Erie Shores Wind) and Kingsbridge Wind, which resulted from Renewables I RFP are currently in-service

[2] Eastview Landfill Gas facility, which resulted from the Renewables I RFP is currently in-service

[3] Glen Miller Hydroelectric facility, which resulted from the Renewables I RFP is currently in-service

[4] Greater Toronto Airports Authority units, which resulted from the Clean Energy Supply RFP are currently in-service

TABLE 2: RELIABILITY REQUIREMENTS FOR RETIRING COAL-FIRED GENERATION

RETIREMENT PROJECT	CAPACITY (MW)	REQUIREMENTS TO MAINTAIN RELIABILITY AND RETIRE COAL-FIRED GENERATION
Thunder Bay Units 2 and 3	306	Conversion of Unit 2 to gas-fired generation to be completed before conversion of Unit 3 is started
Atikokan	211	Conversion of Thunder Bay Units 2 and 3 to gas-fired generation
		Shunt capacitors in northwestern Ontario (transmission enhancement required to replace voltage control provided by Atikokan)
Lambton Units 1 to 4	1,972	Lambton switchyard re-configuration (transmission enhancement required to enable replacement generation to operate in the Sarnia area prior to shutdown of Lambton)
		Additional supply is required to meet overall adequacy requirements (see Table 1 for a list of supply projects)
		Retain each unit on reserve pending demonstrated reliable operation of replacement generation over two peak periods
Nanticoke Units 1 to 8	3,945	Additional supply is required to meet overall adequacy requirements (see Table 1 for a list of supply projects)
		Retain each unit on reserve pending demonstrated reliable operation of replacement generation over two peak periods
		Sufficient new supply located in the Western GTA and Central Toronto to alleviate transformer overloading in these areas and to reduce the need for voltage control from Nanticoke
		Staged conversion of several Nanticoke units to synchronous condenser operation is required to ensure sufficient reactive capability for the system. This is required to enable return-to-service of Bruce Power Units 1 and 2 and retire the Nanticoke units as coal fired generators. The number of synchronous condensers required is dependent on the amount and location of replacement generation in the area, the transmission enhancements out of Bruce, and other technical factors.

SUPPLY TO CENTRAL TORONTO AND THE WESTERN GREATER TORONTO AREA

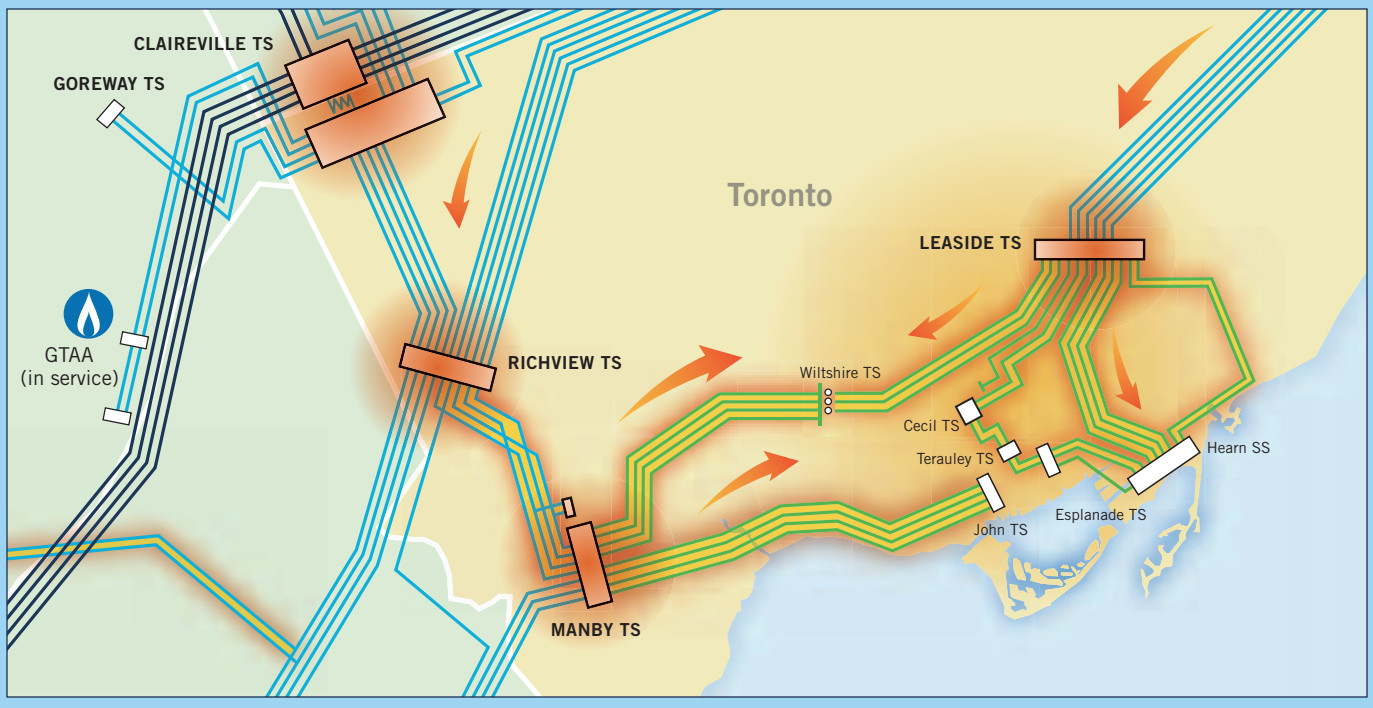
The urgent need for new supply and transmission facilities in the GTA, including central Toronto, has been identified in previous IESO Reliability Outlooks.

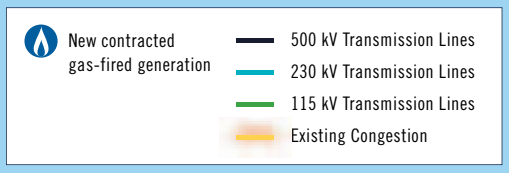
Central Toronto's electricity requirements are met through supply generated outside the city and delivered through two main transmission paths. The loading of the system is reaching the point where there is no longer the required redundancy available to reliably meet demand under peak conditions. These concerns were prominent at times during the summer of 2005 when the transmission system serving central Toronto was at or near capacity. Similar conditions are expected to prevail in the upcoming summer if periods of high demand are again experienced.

Secure supply to Canada's largest city requires local generation supply as well as transmission. Previous analysis concluded that at least 250 MW of new supply is required in the downtown Toronto sector by the summer of 2008, and an additional 250 MW by 2010. A third transmission path into Toronto is required in the next decade.

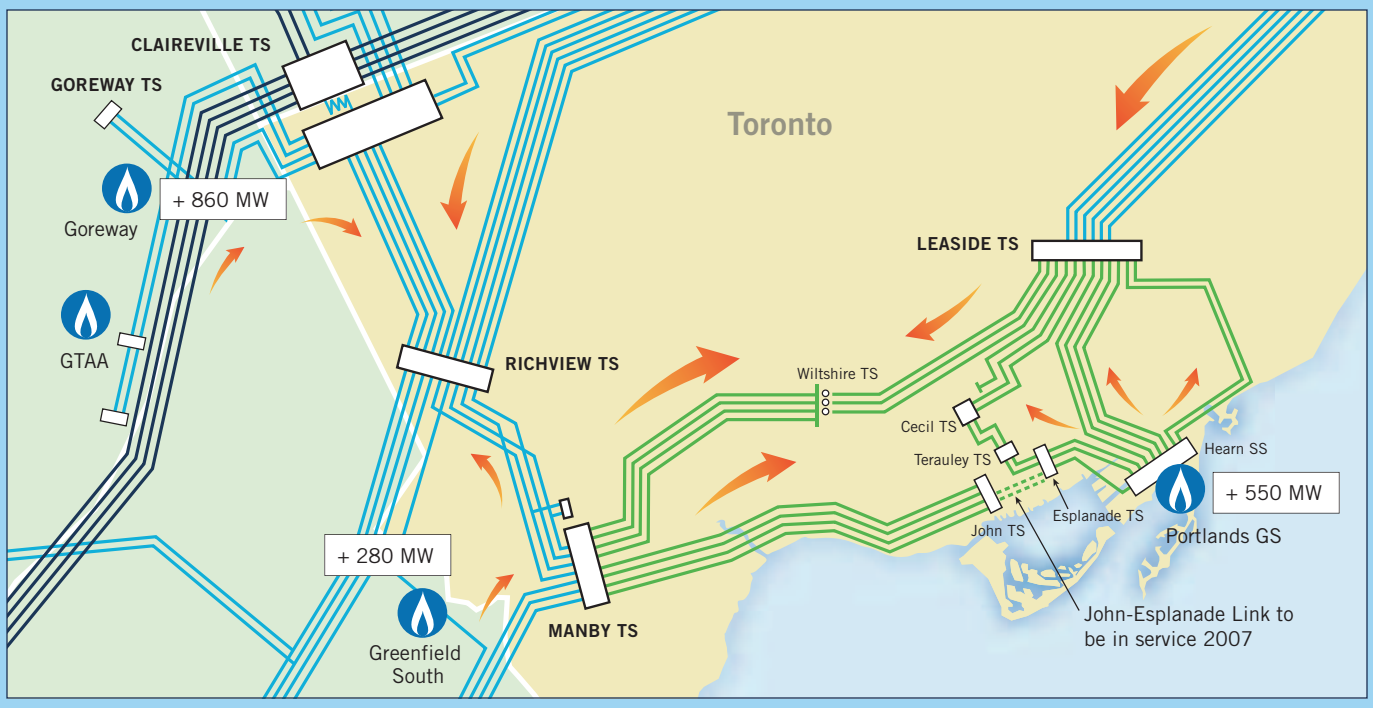
Since the previous Outlook, the Ontario government has directed the OPA to negotiate with the Portlands Energy Centre to deliver 550 MW of new supply to satisfy the timeline described above for central Toronto. Construction is set to begin in July with a phased-in service beginning June 1, 2008 and the project completely installed by the spring of 2009.

CENTRAL TORONTO AND WESTERN GTA – EXISTING POWER FLOWS





NEW PROJECTS TO EASE CONGESTION



Portlands, Goreway, Greenfield South and John TS–Esplanade TS link to address near-term overloading concerns.

Portlands Energy Centre plans to operate a 350 MW simple cycle plant from June 1 to September 30, 2008, remove it from service and return it as a 550 MW combined cycle plant with an in-service date scheduled for spring, 2009. Portlands Energy Centre has also committed to the delivery of a 250 MW temporary generation facility to meet the needs in the summer of 2008 if it is unable to complete construction of the simple cycle plant by June 1 of that year.

The government has also directed the OPA to seek up to 300 MW of demand side initiatives in Toronto by 2010.

Completion of the John Transformer Station (TS) to Esplanade TS link by Hydro One will also enhance reliability to central Toronto by increasing the capability to transfer some loads from their normal supply east of the city, to an alternate supply from the west, and vice versa.

These actions are expected to reduce the loading of the transmission facilities serving the area and address central Toronto's electricity supply needs into the next decade. The new facilities buy some time, but do not remove the long-term need for a third transmission supply to the central core of the city.

Western Greater Toronto Area

Plans are also underway to address supply concerns in the western part of the GTA. The most notable areas of concern were the very high loadings of auto-transformers that deliver power from generation outside the area into the local transmission grid serving the GTA. Also of concern was the amount of load supplied by a single double-circuit transmission line connecting Trafalgar TS and Richview TS and serving loads in Mississauga and Brampton.

These issues are being addressed through a variety of procurement directives and transmission enhancements. The government has directed the OPA to negotiate with the Goreway Station project to deliver 860 MW of gas-fired generation near Claireville TS in Brampton, with a substantial portion available by the summer of 2007. This procurement is expected to relieve and help control the loading of the autotransformers at Claireville TS, a major supply point into the northwest of Toronto.

The OPA was also directed to seek new generation in the GTA west of Toronto, and has since issued an RFP for 500-600 MW in the vicinity of Trafalgar TS, to attain commercial operation by June 2010. This procurement is expected to relieve and help control the loading of the auto-transformers at Trafalgar TS, another major supply point into the GTA near the Mississauga-Oakville border.

In addition, Hydro One has begun work to restore the capability of the transformers at Trafalgar TS and address the loading concerns that were evident in the summer of 2005. This will provide an increase in transfer capability that is expected to be sufficient until the RFP generation is available.

Enhancing the capability of the transmission system in the GTA west of Toronto is still a priority. This area is expected to have higher-than-average load growth, and will require new stations to keep pace with the load growth and to relieve the loading on existing stations. In addition, one of the Richview to Trafalgar double-circuit lines currently supplies more load than the IESO Deliverability Guidelines allow and requires relief as soon as is practical. Transmission options are currently under investigation as part of the OPA's Integrated Power System Plan.

Bruce A Turbine Hall
Photo: Bruce Power

TRANSMISSION REQUIREMENTS

The sustained high demands of summer 2005 heightened concerns about transmission loading in many areas of the province – particularly along the lines and stations serving the GTA. While the system is expected to meet the coming summer demand, further transmission enhancements are needed to relieve existing bottlenecks and reduce overloading.

Where new generation is being contemplated or planned, transmission enhancements will also be required in order to connect new generation to the grid and deliver distant generation toward the Toronto area. The need for a third transmission path into Toronto and the transmission requirements for the west part of the GTA are outlined in the previous section.

Another effective, and in some cases preferred, way to address congestion is to build local generation facilities close to areas of growing demand. Conservation and demand response or demand side initiatives can also relieve the flows on transmission infrastructure if there is sufficient generation to provide voltage control. These initiatives can supplement current transmission plans where load growth is forecast to exceed the adequacy of the existing transmission system.

Capability to Deliver Increased Bruce Generation

Enhancements to the transmission system to carry power from the Bruce Peninsula are critical to support planned and future increases to generation capacity in the Bruce area.

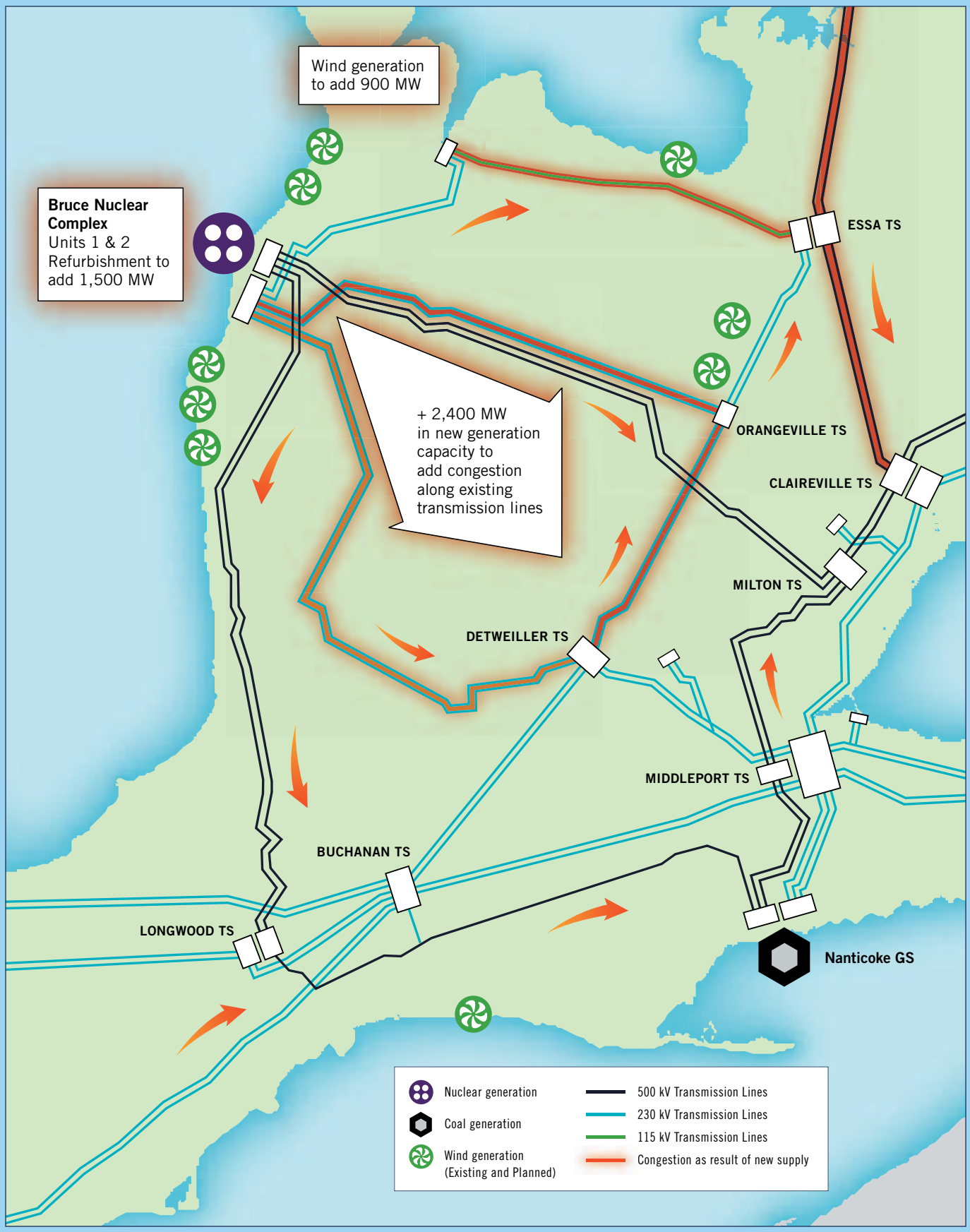
The OPA agreement with Bruce Power to refurbish and return to service two Bruce A units, combined with the contracted wind power in the Bruce area, will result in approximately 2,400 MW of additional capacity in the area. In addition, the Bruce peninsula is emerging as a preferred location to site future renewable wind capacity.

The exisiting transmission system is much less capable of accomodating additional supply at Bruce than it was in the past. A number of factors associated with the dynamic and changing nature of the system have contributed including;

- High load growth in the GTA, particularly in summer
- The shutdown of generation in the GTA (Pickering A and Lakeview)
- The addition of generation in southwest Ontario and increase in imports from Michigan

In recognizing these factors, a new 500 kV transmission line will be needed to reliably deliver the full capacity of new generation.

SOUTHWEST ONTARIO POWER FLOWS



After factoring in long-term maintenance on other units at Bruce, the full eight-unit capability is expected to be available by late 2011. Work must start on this new line as soon as possible. Given the typical approvals time and expected construction lead times, this project is at risk of being late.

Stopgap measures, such as the use of Special Protection Systems to automatically disconnect generation, and the installation of series compensation on 500 kV circuits in southern Ontario, are being considered for use in advance of the line being available.

During the interim period, the grid will also require enhanced voltage control capability. How this will be accomplished is dependent in large part on the number of Nanticoke units that are still operating, and the amount and location of replacement generation for those Nanticoke units that are shut down as part of the coal replacement plan.

North-South Transmission Needs

The northeastern part of the Ontario power grid is made up of multiple generating units, a few very large loads, many small loads, and a relatively sparse transmission system. Decreasing load in the north, coupled with the addition of new generation, has, over the years, increased the stress on the system's ability to deliver energy to major load centres in the south to a point that, even today, there are periods when significant congestion exists.

Expansion of the four existing hydroelectric generating stations on the Lower Mattagami River north of Kapuskasing could result in 450 MW of additional generation. Power flowing south from Hanmer TS in Sudbury to Essa TS in Barrie, is presently restricted to 1,400 MW. A series of transmission enhancements along all segments of the north to south lines will be required to address existing congestion and achieve full availability of the additional generation.

Niagara Transmission Expansion

The present Niagara transmission expansion project will add a new 230 kV double-circuit line between Allanburg TS, in the Niagara peninsula, and Middleport TS southwest of Hamilton. Hydro One has advised the IESO that the project, originally scheduled for June 2006, is now delayed due to unforeseen circumstances. Once in service it will increase the capability of the transmission system connecting the Niagara River generation at Queenston to the grid in the Hamilton area by about 800 MW. This enhancement will also permit increased imports from New York of at least 350 MW, and up to 800 MW depending on the load and generation dispatch in Ontario.

Michigan Phase-Angle Regulators

Phase angle regulators are in service on the Michigan-Ontario interconnection but are not available to regulate flows except in emergencies, pending agreement by the International Transmission Company in Michigan to permit full regulation.

The inability to regulate flows combined with limiting ratings on the equipment resulted in significant congestion of imports from the Michigan direction in summer 2005. For summer 2006, the IESO, the Midwest ISO, and International Transmission Company, have agreed on plans to temporarily increase the interface capability if regulating capability is still unavailable. Full regulating capability on the Michigan interface combined with increased import capability from the Niagara direction following completion of the Niagara expansion project, will provide a significant increase in the combined import capability from New York and Michigan.

Additional/Regional Transmission Requirements

A number of other transmission requirements are listed in the regional requirements table in this report. These needs have been identified for a variety of different reasons, which include:

Increasing load supply reliability
For example, new transformation capacity is needed in York Region to address the significant load growth currently being experienced in that area.

Connecting new generation
Enhancements at the Claireville Transformer Station in northwest Toronto will accommodate increased generation in the west GTA from the Goreway Station and other new generation projects.

Improving transfer capability from one part of the province to another
The installation of series capacitors at the Nobel Switching Station in Parry Sound would expand the transfer capability from Northern Ontario to the South.

Expanding import capability along the tie-lines with neighbouring jurisdictions
The installation of a Special Protection System this summer in Eastern Ontario will facilitate increased imports from Quebec and New York.

The complete table can be found on page 17.

NORTH-SOUTH ONTARIO POWER FLOWS

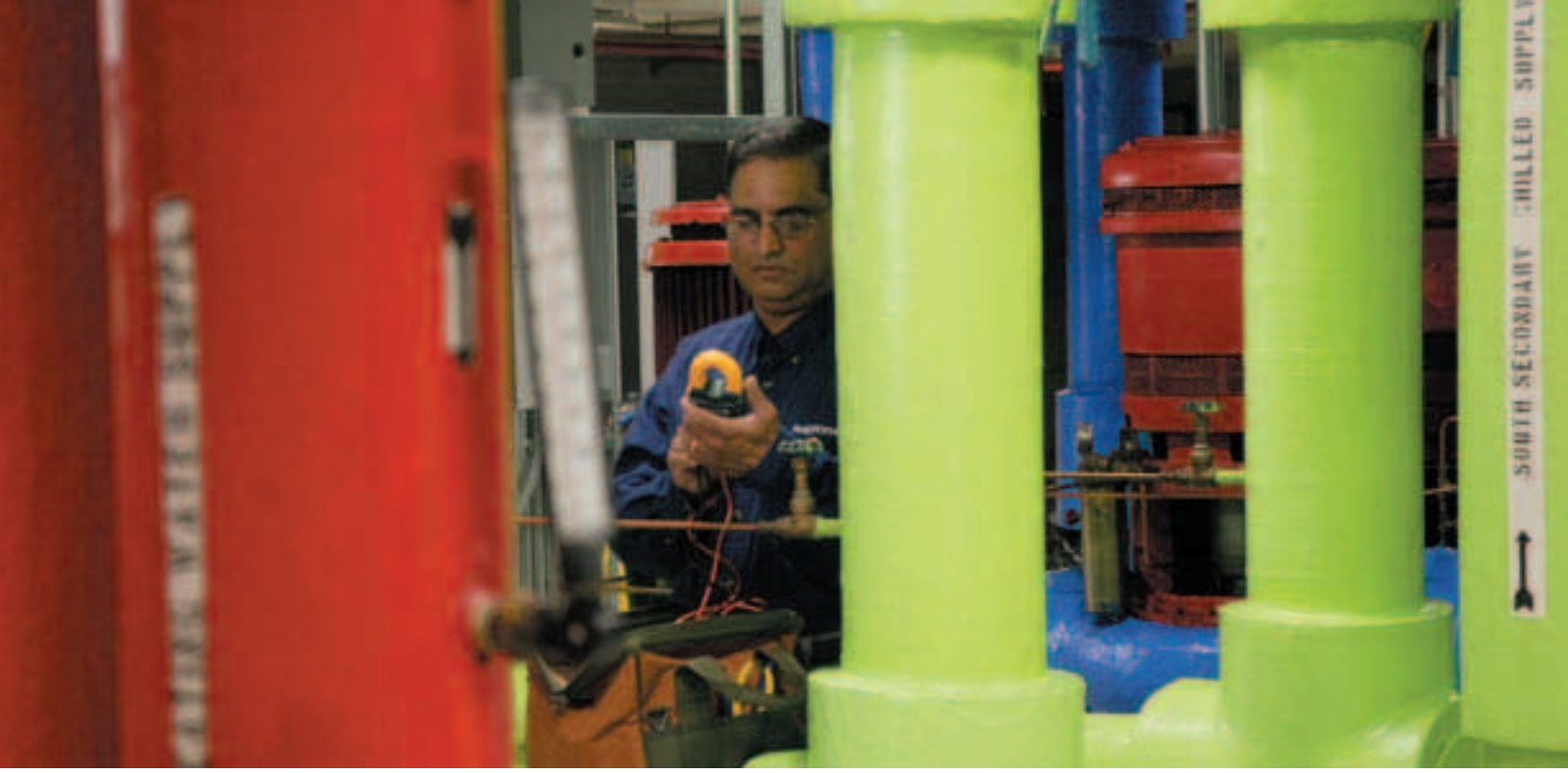
NOTES: Only generating facilities exceeding 20 MW of output are shown here. Not all 115 kV lines are depicted.

TABLE 3: REGIONAL REQUIREMENTS – PROJECTS CURRENTLY UNDER STUDY OR PROPOSED

AREA	RELIABILITY NEEDS IN THE AREA	EXPECTED/ REQUIRED BY	PROJECT(S) PROPOSED TO FULFILL REQUIREMENT
Central Toronto	Reduce transmission loading toward Central Toronto, and enhance supply to downtown	Summer 2008	Portlands Energy Centre
		Fall 2007	John-Esplanade link
		Spring 2008	Interchange terminations of circuits C3L and C17L at Leaside Transformer Station (TS)
GTA-West-GTA	Reduce loading at Claireville	Summer/Fall 2006	Correct short circuit limitations near Parkway TS to allow closed bus operation
	Accommodate higher short circuit levels at Claireville TS to allow increased West GTA generation	Spring 2008	Replace 230 kilovolt (kV) breakers and reconfigure line terminations to allow split bus operation
			Terminate V75R at Richview TS
	Improve supply for Vaughan and Richmond Hill loads and allow additional stations	Under Review	Install breakers in Claireville to Parkway corridor of circuits V71RP and V75P
	Reduce loading at Trafalgar TS	Summer 2006	Restore rating of Trafalgar transformer
		2010 or later	GTA West generation
	Improve voltage control in the west GTA	Spring 2007	Install additional shunt capacitors at Halton and Meadowvale TS
			Other GTA stations under review
		Under review	Investigate effectiveness and feasibility of capacitor at Hamilton Beach TS
	Improve supply to north Mississauga and Brampton loads	Spring 2009/ Under review	Establish Hurontario SS on circuits R19T and R21T
			Extend and connect circuits V72R and V73R from Cardiff TS
	Improve the reliability of Cherrywood TS	2008/2009	Add new 500 kV breakers and diameter positions at Cherrywood and Clairville TS
			Re-arrange 500 kV line terminations at Cherrywood TS
Newmarket - Aurora	Load growth taxing capability of existing circuits and local transformer station	2006-2008	York Region DR RFP (3 MW) and additional local generation and/or demand response
			New Holland Junction TS (OPA recommendation)
		2011 or later	Additional transformer station at Aurora or Gormley, depending on the procurement of generation
Kitchener- Waterloo-Cambridge-Guelph and Orangeville	Local transmission enhancements required to relieve overloads and improve voltages	Spring 2007	Single 230/115 kV auto-transformer at Cambridge-Preston TS
		Fall 2008 to 2011	New supply connection from the 500 kV system may be required to supply the growing load in the area
Burlington TS-Brantford-Woodstock	Loading on the auto-transformers near the maximum ratings	Spring 2006	Install over-current protections (planned for December 2007)
			Replace limiting connections and buswork to increase the limited-time thermal ratings (planned for June 2008)
	115 kV supply to Woodstock-Brant expected to be overloaded	Spring 2010	Re-enforce existing 115 kV supply
Barrie-Stayner	Improve reliability to local loads	Spring 2007	Re-terminate circuits M5E and E27 on to new busbar positions
		Under review	Replace existing Essa to Stayner 115 kV circuit with 230 kV double-circuit line
			Convert Stayner to 230 kV DESN
			Add 230/115 kV auto-transformer to supply Meaford TS
Bruce Complex	Ensure system has sufficient reactive capability to enable return-to-service of Bruce Power Units 1 and 2 and retire the Nanticoke units	Dependent on timetable for retiring Nanticoke	Staged conversion of several of the generating units at Nanticoke to synchronous condenser operation (number of synchronous condensers required depends on the amount of generation in the area and other technical factors)
			Investigate use of static var compensators (SVC) to reduce the required number of synchronous condensers
	Transmission enhancements required to allow increased power transfers to enable return-to-service of Bruce Power Units 1 and 2	Spring 2007 to Spring 2009	Additional shunt capacitors in southwestern Ontario (possible locations are Detweiler, Orangeville, Middleport, and Nanticoke)
		Spring 2009	Series capacitors on the 500 kV circuits associated with the Bruce Complex (this option is being re-considered)
	Transmission enhancements required to enable operation of 8 units at the Bruce complex	Spring 2009	Uprate sections of Bruce to Orangeville circuits to allow increased output from Bruce
		Late 2011	Additional 500 kV transmission line from Bruce towards Toronto

TABLE 3: CONTINUED

AREA	RELIABILITY NEEDS IN THE AREA	EXPECTED/ REQUIRED BY	PROJECT(S) PROPOSED TO FULFILL REQUIREMENT
Sarnia-Windsor	Enhancements to enable additional generation in the area resulting from CES contracts	Fall 2007	Install bus tie reactors or reconfigure the terminations at Lambton SS to accommodate split bus operation to limit short circuit level
	Windsor area enhancements to address restrictions during high load conditions	December 2006 to Fall 2007	Re-terminate two of the connections at Essex TS
			Expand the existing Special Protection System so that additional post-contingency responses can be initiated
			Replace existing 115/27.6 kV DESN station at Essex TS
		Under review	Transfer the Tilbury load to a dedicated circuit from Lauzon TS
		Under review	Provide a 230 kV connection to enhance the load meeting capability in the Windsor-Leamington area
	Enable additional power transfer over the J5D Interconnection with Michigan	Under review	Assess the feasibility of uprating the 230 kV line to allow transfers from Michigan to Ontario over the J5D Interconnection to be increased by at least 200 MW
Niagara	Increase import capability on Queenston Flow West (QFW)	Originally scheduled June 2006 (delayed)	Install two new 230 kV circuits between Allanburg TS and Middleport TS and reinforce the 230 kV transmission facilities into Burlington TS
Eastern Ontario	Loading on St. Lawrence to Hinchinbrooke circuits limits Quebec and New York imports into Ontario	Summer 2006	Enhance existing Special Protection System to reduce generation in the event of a tower contingency to provide short-term relief
		Under review	Uprate the circuits as a long-term solution
	Ottawa Area Load Growth	Under review	Add shunt capacitors as required
			1,250 MW Ontario-Quebec high voltage direct current (HVdc) connection is under review and would affect the solution or alter requirements
	Enhance the supply to loads in the Oshawa and Belleville Areas	Under review	Relief of the 230 kV transmission east from Cherrywood is required to avoid overloads
			Investigate a connection to the 500 kV system
Northeastern Ontario	To reduce the use of Load Rejection and more effectively use the Special Protection Systems	October 2006	Enhancements to existing generation rejection scheme in the northeast
			Additional breaker at Porcupine
			Additional shunt reactors at Porcupine and/or Pinard TS
	To expand the north to south transfer capability and reduce restrictions on northern resources	September 2009	Install series capacitors at Nobel SS to increase north to south transfer capability
	Transmission enhancements to enable Mattagami expansion	September 2009	Provide increased transfer capability and voltage control north of Sudbury to accommodate the increased generating capacity
			Effectiveness of combinations of series capacitors, SVCs and shunt capacitors to be investigated
	Existing 115 kV switchgear at Abitibi Canyon GS is at end-of-life	Spring 2009	New switchgear should be consolidated at a new 115 kV busbar at Pinard TS
			Arrangement would also provide a suitable location for a future 230/115 kV auto-transformer to reinforce the existing connection between the local 230 kV and 115 kV systems
Northwestern Ontario	Improve voltage control	Fall 2006/ Spring 2007	Repair existing capacitor at Fort Frances
			Install new shunt capacitor to coincide with retirement of Atikokan
	Increase import capability from Manitoba to 400 MW	Under review	Accommodate new transformers and expanded 230 kV bus at Whiteshell
			Enhance voltage control with SVCs at Fort Frances TS, Mackenzie TS and Marathon TS and shunt capacitors at Dryden TS
	Strengthen north-south capability in Sault Ste. Marie area	Summer 2006	Rebuild one existing 110kV Anjigami (Wawa) to Sault Ste. Marie circuit to 230 kV
			Provide connection point for Prince Park wind farm for Q3 2006



Onsite water chiller defers energy use for air conditioning to off-peak hours. Photo taken at property managed by Northam Realty Advisors Ltd.

CONSERVATION AND DEMAND MANAGEMENT

Conservation and demand management are taking an increasing role in addressing part of the province's reliability needs.

Programs offered through the IESO, the Conservation Bureau of the OPA, as well as local utilities are encouraging businesses and homeowners not only to better manage their overall electricity use, but also to become more aware of demand peaks and shift their use to other times of the day. Actions such as these work to support the provincial government's target for a five per cent reduction in peak demand by 2007.

From a reliability point of view, one of the key benefits of conservation and demand side initiatives is the potential speed and cost effectiveness with which they can be implemented, particularly in load areas where transmission is overloaded. This benefit applies to many areas within the province but is not unlimited. Areas which already have a surplus of generation may not achieve the same benefits and the contribution of these measures to supply adequacy may be substantially reduced.

The IESO has included a number of conservation and demand management in its analysis based on forecast in-service dates, targeted quantities and potentials for delays or delivery below targets. Some elements of conservation are difficult to quantify both on a planning basis and, historically, in measuring the success of the initiatives. Other aspects of demand response are much easier to quantify and measure. While there is a greater emphasis on programs which have a higher potential for verification, as these programs become further developed, the IESO will work with the OPA and the participants who are implementing the programs to refine the expected contribution to Ontario's resource adequacy.

The implementation of the provincial government's Smart Meter Initiative, supported by comprehensive information and education efforts, will improve the ability of Ontario electricity customers to better manage their electricity costs and enhance the reliability of the power system during peak periods. The government has set a target of 800,000 smart meters operational in 2007 with smart meters installed and operational in all remaining homes and businesses by 2010.

CONCLUSIONS AND RECOMMENDATIONS

- The provincial government has directed the OPA to initiate a number of projects to add capacity or reduce demand in Ontario. While progress is being made in addressing a number of reliability issues, experiences with recent summer weather-related impacts on the supply demand picture have added to the challenges being faced to maintain reliability of the power system.
- Based on recent experiences of the weather impact on demand and supply, the IESO revised the planning assumptions particularly for summer peak demands and forecast hydroelectric energy. The resulting 2,500 to 3,000 MW increase to forecast resource requirements better reflects the resources needed to reliably serve Ontario's electricity consumers. The changes will help better prepare for occasions like last summer when the power system was strained because of high demands and lower than forecast hydroelectric production and lead to better capacity planning decisions to ensure that the transition period for shutting down coal-fired generation can be successfully managed.
- The Ontario government's coal replacement schedule will require significant delays as a result of the revised planning assumptions and expected delays for replacement generation and transmission initiatives. This Reliability Outlook reinforces the need to have the Nanticoke and Lambton coal-fired units operate for a prolonged period of time beyond the announced shutdown dates. This action is required to maintain reliability of the power system.
- Concerns expressed in the February 2006 Reliability Outlook regarding the urgent need for new generating and transmission facilities serving central Toronto are being addressed. The Ontario government's direction to the OPA to negotiate with the Portlands Energy Centre to deliver 550 MW of new supply, combined with up to 300 MW of demand side initiatives and the Hydro One upgrade of the transmission from the John TS to the Esplanade TS, are expected to reduce the loading of the transmission facilities serving the area and address central Toronto's electricity supply needs into the next decade.
- Transmission enhancements are required in several areas of the province to address existing bottlenecks and potential overloading and to connect new generation to the grid. The IESO has also identified the growing role that conservation and demand management can play in reducing the flows on the transmission infrastructure.
- Experience since the release of the last Reliability Outlook continues to highlight the significant schedule risks inherent in Ontario approvals processes for new generation and transmission. The IESO has been working with other entities to identify necessary changes and progress is required to address concerns that several of the projects identified above are at risk of not being in service in time under the current regulatory process. Early action is recommended to implement an expedited, but thorough and time-bound regulatory approvals process to facilitate the timely implementation of new generation and transmission projects required for reliability purposes.

THE ONTARIO RELIABILITY OUTLOOK IS ISSUED SEMI-ANNUALLY BY THE INDEPENDENT ELECTRICITY SYSTEM OPERATOR (IESO) TO REPORT ON PROGRESS OF THE INTER-RELATED GENERATION, TRANSMISSION AND DEMAND MANAGEMENT PROJECTS UNDERWAY TO MEET FUTURE RELIABILITY REQUIREMENTS.

ieso
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The Independent Electricity System Operator (IESO) manages the province's power system so that Ontarians receive power when and where they need it. It does this by balancing demand for electricity against available supply through the wholesale market and directing the flow of electricity across the transmission system.