



**IESO 2011 Interim Review  
of  
Resource Adequacy**

**Covering the Ontario Area  
for the period 2012 to 2014**

**October 19, 2011**

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## 1 EXECUTIVE SUMMARY

The Independent Electricity System Operator (IESO) submits this assessment of resource adequacy for the Ontario Area to comply with the Reliability Assessment Program established by the Northeast Power Coordinating Council (NPCC). This 2011 Interim Review of Resource Adequacy covers the study period from 2012 through 2014, and highlights changes since the 2009 Comprehensive Review. The guidelines for the review are specified in Appendix D of the NPCC Regional Reliability Reference Directory #1, *“Guidelines for Area Review of Resource Adequacy”* (Original document: December 1, 2009).

This Interim Review identifies changes in assumptions from the 2009 Comprehensive Review, including changes to facilities and system conditions, generation resources availability, load forecast, and the impact of these changes on the overall reliability of the Ontario electricity system. The assessment makes comparisons with the 2009 Comprehensive Review.

The 2011 Interim Review reports that Ontario will be able to meet the NPCC resource adequacy criterion that requires a loss of load expectation (LOLE) of no more than 0.1 days/year for all years from 2012 to 2014. For all forecast years under median demand growth, NPCC criterion is achieved using only existing, contract committed, and government directed resources, without the need for Emergency Operating Procedures (EOPs), additional resources, or imports. Under the high demand growth scenario, use of EOPs is required in the 2012 and 2014 forecast years to satisfy the NPCC criterion.

## 2 INTRODUCTION

The information presented in this 2011 Interim Review of resource adequacy covers the forecast period from 2012 through 2014.

The previous Comprehensive Review was submitted at the September 2009 meeting of the Reliability Coordinating Committee. Comparisons between this review and the September 2009, *“IESO 2009 Comprehensive Review of Ontario Resource Adequacy”* review, are included in this report.

## 3 ASSUMPTION CHANGES

### 3.1 Demand Forecast

Tables 3.1 and 3.2 show comparisons between the peak demand forecasts for the 2009 Comprehensive Review and the 2011 Interim Review under median and high demand growth scenarios respectively.

Under median growth, peak demands are slightly higher across all years resulting in a negligible change in average annual growth rate. The peak demands have increased as higher actuals have led to a higher starting point compared to the previous forecast. However, as in the previous forecast the impact of increased off-grid generation driven

by Ontario’s feed-in tariff (FIT) program (see Section 3.3) and expected conservation targets lead peak demands to decline over time.

Table 3.1 Demand Forecast Comparison – Median Demand Growth

Year	Normal Weather Annual Peak		
	Median Demand Growth [MW]		
	2009 Comp. Review	2011 Interim Review	Difference
2012	23,541	23,804	263
2013	23,092	23,421	329
2014	22,932	23,155	223
Growth Rate (%)	-1.3%	-1.4%	-0.1%

The 2011 Interim Review high growth scenario is lower than the same scenario in the 2009 Comprehensive Review. On-going debt concerns both in Europe and the U.S. have cast a pall on the long term growth prospects for Ontario. Previous high growth forecasts assumed a recovery surpassing pre-recession levels. However, at this time even the most optimistic forecast cannot envision that type of rebound over the forecast horizon. As such, the high growth forecast has been revised downward.

Table 3.2 Demand Forecast Comparison – High Demand Growth

Year	Normal Weather Annual Peak		
	High Demand Growth [MW]		
	2009 Comp. Review	2011 Interim Review	Difference
2012	24,907	24,123	-784
2013	25,234	24,215	-1,019
2014	25,563	24,440	-1,123
Growth Rate (%)	1.3%	0.7%	-0.7%

### 3.2 Resources Forecast

Table 3.3 shows the available capacity of supply resources at the time of the summer peak for the current 2011 Interim Review and the 2009 Comprehensive Review. This 2011 review assumes resource availability based on the latest available information regarding existing and future resources. Available resources include all existing units and projects under contract with the Ontario Power Authority (OPA), as well as units to be procured for contracts with the OPA as directed by the Ontario Ministry of Energy.

Table 3.3 Comparison of Available Resources Forecasts

Year	Available Resources [MW] at Time of Summer Peak (July)		
	2009 Comp. Review	2011 Interim Review	Difference
2012	31243	30353	-890
2013	32316	31012	-1303
2014	32739	29229	-3509

For the 2012 forecast year, available resources decrease by approximately 900 MW from what was included in the 2009 Comprehensive Review. The primary source of this decrease is 700 MW of demand-side management capacity that shifted from the committed capacity, to the planned capacity category. Planned capacity is not normally counted as an available resource in NPCC reviews of resource adequacy. The remaining capacity difference in 2012 is the result of small decreases in thermal and hydro capacity due to project delays, updated availability capacity assumptions, and planned outages over the summer peak. This decrease in capacity is partially offset by increases in wind and solar capacity that are expected to connect under Ontario’s feed-in-tariff (FIT) program for renewable generation (see Section 3.3).

In 2013, an additional 200 MW of demand-side management capacity is shifted to the planned capacity category. All coal-fired generation in Ontario will be phased out by the end of 2014. Changes to planning assumptions regarding the phase out of coal-fired generation results in a 400 MW decrease in coal capacity in the 2013 forecast year. These decreases are again partially offset by further increases in wind and solar capacity under the FIT program. This, in addition to the 2012 differences, results in a decrease of 1,300 MW available capacity when compared to the 2009 Comprehensive Review.

In 2014, all the factors described above again contribute to the approximate 3,500 MW decrease in available capacity from the 2009 Comprehensive Review. Contributing to this decrease is a 300 MW reduction in hydro capacity as a result of changes to project in-service dates. In addition, changes to planning assumptions with regard to the phase out of coal-fired generation results in a 2,000 MW decrease in available resources in 2014 when compared to the 2009 Comprehensive Review. This decrease is expected to be offset by the conversion of three coal-fired units in Ontario’s Northwest transmission zone to biomass or natural gas fuelled generation. These conversions are scheduled to occur in late 2013 and 2014.

### 3.3 Ontario Electricity Sector Changes

In September 2009 the provincial government passed the Green Energy and Green Economy Act (GEGEA) providing a comprehensive framework for developing renewable energy generation. This framework includes a feed-in tariff (FIT) program

and provisions that will facilitate the implementation of the necessary transmission and distribution infrastructure to support those renewable projects.

The FIT program has resulted in a significant increase in the amount of renewable generation capacity expected to come online over the 2012-2014 timeframe and beyond. Wind and solar generation is expected to comprise the bulk of this new renewable capacity, with significant amounts expected to connect directly to the distribution system<sup>1</sup>. The expected capacity contribution at summer peak for wind resources is 13.4% of installed capacity. For solar resources, the expected summer peak capacity contribution is 40% of installed capacity.

Assumptions related to amounts and types of renewable resources used in the Interim Review are from the Ontario Power Authority (OPA). The OPA is the long term electricity system planner for the province of Ontario.

### **3.4 Transfer Capabilities**

New series capacitors were installed in 2010 at Nobel Transmission Station (TS) on two 500 kV circuits to increase the transfer capability of the North-South Interface.

The construction of a new 176 km (110 mile) 500 kV double-circuit line from the Bruce Power complex to Milton Switching Station (SS) is in progress, with completion expected in December 2012, a one year delay to what was assumed in 2009 Comprehensive Review. This new line is required to accommodate the output of all eight generating units at the Bruce complex and the development of new renewable resources in southwestern Ontario.

### **3.5 Emergency Operating Procedures**

Emergency operating procedures (EOPs) are considered in the resource adequacy assessment if they are required to meet the Loss of Load Expectation (LOLE) criterion. Table 3.4 summarizes the assumptions regarding the load relief from EOPs used in this study, specifically in 2012 and 2014 under the High Growth demand scenario.

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<sup>1</sup> Generation connected directly to the distribution system (also called embedded generation) is treated as a decrement to demand, and therefore not included in the Available Resources table. For 2014, approximately 1,800 MW of embedded generation with an available capacity of 700 MW at the time of summer peak is assumed to be in-service.

Table 3.4 Emergency Operating Procedures Assumptions

EOP Action	Load relief (% of Demand or MW Value)
Public Appeals	1.0%
Disregard 30-minute Operating Reserve	540 MW
Disregard 10-minute Operating Reserve	1080 MW
Generator Stretch Capability	230 MW
3% Voltage Reduction (VR)	1.5%
5% VR (incremental to 3% VR)	1.1%

### 3.6 Fuel Supply Diversity

A diverse generation mix is critical for resource adequacy and market efficiency, through the provision of dispatch flexibility, reduced vulnerability to fuel supply contingencies and fuel price fluctuations.

With the addition of approximately 3,000 MW of gas-fired generation since 2009, the volume of gas consumed for electricity generation in Ontario is increasing. Ontario is well situated with respect to natural gas transmission and storage. Based on the input received from stakeholders, the IESO does not have any concern to meet the additional gas supply requirements.

## 4 RESOURCE ADEQUACY ASSESSMENT

### 4.1 Loss of Load Expectation (LOLE) Results

This assessment is based on engineering judgment, IESO assessments and NPCC joint interconnected studies.

This 2011 Interim Review indicates that, for the future years in the study period horizon (2012 to 2014), there is a slightly higher forecast of peak demands in the median growth scenario and lower peak demands in the high growth scenario. In addition, there are fewer resources available at the time of summer peak compared to the 2009 Comprehensive Review. MARS runs were completed based on the latest demand forecast, and latest forecast of available resources. Table 4.1 provides a summary of the LOLE results from these MARS runs for two different scenarios.

Table 4.1 LOLE Results from MARS Runs

Scenario	Demand Growth	EOPs	Additional Resources [MW]	LOLE [days/year]		
				2012	2013	2014
1	Median	no	0	0.068	0.003	0.014
2	High	no	0	0.119	0.014	0.151
3	High	yes	0	0.021	-	0.030

Scenario 1 reflects median demand growth, available resources, and no emergency operating procedures (EOPs). Under this scenario, the NPCC resource adequacy criterion of 0.1 days per year LOLE is met in all years.

The 0.068 days/year LOLE in 2012 is notably higher than LOLEs in 2013 and 2014 for two main reasons. As described in Section 3.4, the new Bruce to Milton transmission line is expected to be in-service in December 2012, and is required to accommodate the output of all eight Bruce nuclear units in addition to new renewable generation. In 2012, without the new line in-service, approximately 800-1,600 MW of Bruce area generation is locked-in and unavailable to serve Ontario load. In the constraint on this capacity contributes to a higher LOLE in 2012. In addition, the load forecast for 2012 is approximately 400-600 MW higher than the 2013 and 2014 load forecasts respectively. This higher demand forecast, in combination with load forecast uncertainty also contributes to higher LOLE in 2012.

Scenarios 2 and 3 reflect the conditions required to meet NPCC criterion under the high demand growth scenario. Table 4.1 shows that NPCC criterion is also met under available resource conditions in 2013, and that EOPs are required to meet criterion in 2012 and 2014.

These results demonstrate that Ontario is expected to be compliant with the target LOLE of 0.1 days per year over the next three years.

#### 4.2 Median Demand Growth LOLE Comparison – 2011 Interim vs. 2009 Comprehensive

Table 4.2 compares the 2009 Comprehensive and 2011 Interim LOLE results under the median demand growth scenario for 2012 to 2014. In general, LOLE values increase in all three years of study, as a result of a higher demand forecast and lower available resources in the 2011 Interim Review.

Table 4.2 2009 Comprehensive vs. 2011 Interim LOLE Results

NPCC Review	Demand Growth	EOPs	Additional Resources [MW]	LOLE [days/year]		
				2012	2013	2014
2009 Comprehensive	Median	no	0	0.001	0.000	0.000
2011 Interim	Median	no	0	0.068	0.003	0.014



For the 2012 forecast year, LOLE increases significantly more than in 2013 and 2014, from 0.001 to 0.068 days/year. This is primarily due to the delay in the expected in-service date of the Bruce to Milton transmission project to December 2012, resulting in significant locked-in capacity in the area (as described in the Section 4.1). In 2013 and 2014, with the Bruce transmission project complete, LOLEs are only marginally higher in this year's Interim review when compared to the 2009 Comprehensive review.

### **4.3 Alleviating Factors and Contingency Mechanisms**

There are several study assumptions which may change in such a way that reserve levels in Ontario could be higher than presented in this 2011 Interim Review, including the amount of conservation or the amount of demand response, the amount of imports and the amount of generation that may be on planned outage.

The IESO will maintain grid reliability while facilitating an orderly reduction in emissions from coal-fired generators.

Every quarter, looking out nine months into the future, the IESO assesses the integrated generator and transmission outage plans of market participants. Periods where outages result in inadequate resource levels are identified to generators and transmitters. If market participants fail to proactively reschedule outages to mitigate concerns, the IESO may reject outages to ensure sufficient capacity is available to meet non-dispatchable demand.

The relief that can be expected from this measure can range from 0 MW to over 2,000 MW or more. Deviations from initial generator outage plans through outage rescheduling and rejection are not always desirable. This could stretch the ability of generator owners/operators to accommodate larger amounts of outages over shorter time periods and may increase forced outage occurrences. Operational experience so far indicates generator owners are usually able to adapt their outage plans.

## **5 CONCLUSIONS**

This 2011 Interim Review demonstrates that Ontario will be able to meet the NPCC resource adequacy criterion that requires a LOLE value of less than 0.1 days/year for all years from 2011 to 2014. For all forecast years under median demand growth, NPCC criterion is achieved using only existing, contract committed, and government directed resources, without the need for Emergency Operating Procedures (EOPs), additional resources, or imports. Under the high demand growth scenario, additional use of EOPs is required in the 2012 and 2014 forecast years to satisfy the NPCC criterion.

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