

**Approved by the RCC December 3, 2013**



**IESO 2013 Interim Review  
of  
Resource Adequacy**

**Covering the Ontario Area  
for the period 2014 to 2017**

**November 11, 2013**

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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 2013 Interim Review of Resource Adequacy (Interim Review) covers the study period from 2014 through 2017, and highlights changes since the 2012 Comprehensive Review of Resource Adequacy (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).

The IESO determines Ontario's level of reliability using the General Electric Multi-Area Reliability Simulation (GE-MARS) program.

This Interim Review identifies changes in assumptions from the 2012 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 2012 Comprehensive Review.

This 2013 Interim Review concludes that Ontario will be able to meet the NPCC resource adequacy criterion that limits the loss of load expectation (LOLE) to no more than 0.1 days/year for all years within the study period (2014 to 2017).

Under median demand growth, NPCC criterion is achieved for all forecast years using only existing, contract committed, and government directed resources, without the need for Emergency Operating Procedures (EOPs), additional resources or imports. For 2015, however, the timing of potential overlapping station outages scheduled for the spring had to be adjusted to satisfy the NPCC criterion. The resource situation for spring 2015 will be resolved in time for the next issue of IESO's quarterly 18-Month Outlook scheduled for release in late November or early December 2013. Generator owners are expected to have firmed up their outage plans at that time.

Under the high demand growth scenario, use of EOPs is required in 2015 while the use of EOPs and imports of 475 MW and 1,200 MW are required for 2016 and 2017 respectively, to meet the NPCC criterion. The estimated amount of imports required to satisfy the NPCC criterion fall well within the range of tie-benefits assessed by the NPCC in its 'Review of Interconnection Assistance Reliability Benefits' study<sup>1</sup> conducted in 2011.

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<sup>1</sup>[https://www.npcc.org/Library/Interconnections%20Assistance%20Reliability%20Benefits/RCC Approved CP-8 Tie Benefit Report June 1 2011.pdf](https://www.npcc.org/Library/Interconnections%20Assistance%20Reliability%20Benefits/RCC%20Approved%20CP-8%20Tie%20Benefit%20Report%20June%201%202011.pdf)

## 2 INTRODUCTION

The information presented in this 2013 Interim Review of resource adequacy covers the forecast period from 2014 through 2017.

The previous Comprehensive Review was submitted at the November 2012 meeting of the Reliability Coordinating Committee. Comparisons between this Interim Review and the IESO's 2012 Comprehensive Review are included in this report.

## 3 ASSUMPTION CHANGES

### 3.1 Demand Forecast

Tables 3.1 and 3.2 show a comparison between the peak demand forecasts for the 2012 Comprehensive Review and the 2013 Interim Review under median and high demand growth scenarios respectively.

The 2013 median growth peak demand forecast is very similar to the 2012 forecast with slightly lower peaks in 2014-2015 and slightly higher peaks in 2016-17. The 2013 forecast is based on an updated economic outlook, new demographic projections, updated embedded generation figures and the inclusion of 2012 actuals. The relative similarity between the two forecasts shows that the underlying drivers and themes have remained fairly consistent from last year's forecast to this year's.

Table 3.1 Demand Forecast Comparison – Median Demand Growth

Year	Normal Weather Annual Peak		
	Median Demand Growth [MW]		
	2012 Comp. Review	2013 Interim Review	Difference
2014	23,079	22,937	-142
2015	22,859	22,851	-8
2016	22,640	22,801	161
2017	22,471	22,549	78
<b>Growth Rate (%)</b>	-0.9%	-0.6%	

The 2013 high demand growth scenario projects a higher growth rate compared to the 2012 high demand growth forecast. For last year's forecast, the two scenarios had peaks that ran more-or-less parallel over the forecast and gave rise to very similar growth rates. This year, the two scenarios' peak demands start off fairly close in 2014 then diverge through time. This gives the high demand growth scenario a higher growth rate.

The growth profile is being shaped and driven by three key components.

First, with 2014 just six months off, the potential for a dramatic shift in 2014 peak demand is unlikely even under the most optimistic economic forecasts. Economic growth is hampered by high debt loads, high unemployment and weak consumer confidence, all of which required a fair amount of time to improve and will continue to mitigate growth over the front end of the forecast. However, the latter part of the forecast will see much stronger demand growth as economic expansion picks up, along with demand from the development of mineral resources in Northern Ontario.

Second, conservation and price impacts will continue to mitigate peak demands over the first two years of the forecast. Both established conservation programs and price increases have some momentum to them and will continue to put downward pressure on peaks over 2014-15. Beyond that time, the existing conservation programs will garner diminished savings and prices will stabilize leading to higher peak demand growth.

Last, the embedded solar generation capacity will continue to grow over the next two years as that generation has already been contracted. That increased capacity will act to mitigate some of the growth in summer peaks. By mid-2015 all the contracted generation will be in commercial operation and embedded generation will not have any incremental impact on peak demands past 2015.

Combined, these factors work to keep peak demands lower in the 2014 to 2015 time-frame and allow the peaks to increase in 2016-17.

Table 3.2 Demand Forecast Comparison – High Demand Growth

Year	Normal Weather Annual Peak		
	High Demand Growth [MW]		
	2012 Comp. Review	2013 Interim Review	Difference
2014	24,217	23,166	-1,051
2015	24,395	23,766	-629
2016	24,614	24,443	-171
2017	23,980	24,804	824
<b>Growth Rate (%)</b>	-0.33%	2.30%	

### 3.2 Resources Forecast

Table 3.3 compares the available capacity of supply resources at the time of the summer peak for the current 2013 Interim Review with the 2012 Comprehensive Review. This 2013 review assumes resource availability based on the latest available information regarding existing and future resources. Available resources include all existing units,

committed projects under contract with the Ontario Power Authority (OPA), as well as capacity to be contracted by the OPA as directed by the Ontario Ministry of Energy. Units slated for shutdown have been removed from available resources.

Table 3.3 Comparison of Available Resources Forecasts

Year	Available Resources [MW] at Time of Summer Peak (July)		
	2012 Comp. Review	2013 Interim Review	Difference
<b>2014</b>	30,688	28,965	-1,722
<b>2015</b>	30,385	28,916	-1,468
<b>2016</b>	29,858	28,995	-862
<b>2017</b>	28,087	27,299	-788

For the 2014 forecast year, the available resources decrease by about 1,700 MW from what was included in the 2012 Comprehensive Review. The differences are primarily due to a reduction of 960 MW of coal-fired generation and a 680 MW reduction in demand response resources compared to last year's planning assumptions.

The last six coal-fired units, two units at Lambton and four units at Nanticoke generating stations, in southern Ontario will be shut down by end of 2013. One unit at Thunder Bay is currently not contracted in the Ontario market and is shutdown. The second unit is expected to be removed from service no later than the end of 2014.

Further changes resulted from:

- A downward revision of available demand response resources by 680 MW in 2015 and 750 MW in 2016 and 2017.
- A revised in-service date of one gas-fired generation project with a capacity of about 300 MW originally schedule for 2015 onwards. This project is now expected to be in service by fall 2017.
- A reduction of about 300 MW in 2016 and 2017 related to the conversion of two coal-fired units to gas previously assumed in the 2012 Comprehensive Review, but now omitted from this Interim Review. Since various options are being evaluated for the adequacy of the transmission zone where these units are located, a decision on the conversion of the subject units is still pending.

The remaining differences in resources are from small changes in hydroelectric, wind, solar and biomass resource assumptions. Some project attrition in wind and solar is expected.

### **3.3 Ontario Electricity Sector Changes**

In November 2010 the provincial government released the Ontario Long-Term Energy Plan (LTEP) specifying the target for large scale development of non-hydro renewable energy projects and implementation of conservation. The renewable resources target for wind, solar and bioenergy is 10,700 MW by 2018, to be integrated into the grid through transmission expansion while maximizing the use of the existing system. Ontario will grow its clean energy resource portfolio through the continuation of programs like the Feed-in Tariff (FIT) and micro-FIT.

In July 2013 Ontario launched a review of the LTEP, which will include province-wide consultations on a variety of topics including the province's mix of energy sources such as wind, solar and nuclear, and conservation. The consultations are to continue till September and the updated LTEP is planned to be released in the fall of 2013.

The FIT program has resulted in a significant increase in the amount of renewable generation capacity expected to come online over the 2014-2017 timeframe. 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. The expected capacity contribution at summer peak for wind resources is 13.6% of installed capacity. For solar resources, the expected summer peak capacity contribution is 34% of installed capacity.

Assumptions related to amounts and types of renewable resources used in the Interim Review are provided by the OPA. The OPA is the provincial agency responsible for long term planning of the electricity system and for contracting electricity resources.

### **3.4 Transfer Capabilities**

The new double-circuit 500 kV line from the Bruce Power nuclear complex to Milton Switching Station came into service in 2012. This line was built to accommodate the output of all eight generating units at the Bruce complex together with approximately 500 MW of existing wind generating capacity, as well as a further 1,200 MW of new renewable generating capacity that is forecasted for development within the area. With all eight Bruce nuclear generating units and new renewables, the combined generation in the Bruce area can reach 8,000 MW.

### **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 2016, 2017 and 2018 under the High Growth demand scenario.

Table 3.4 Emergency Operating Procedures Assumptions and their Aggregate Impact<sup>2</sup>

EOP Measure	EOP Demand Reduction	
	% of Demand	MW
Public Appeals	1.0	
No 30-minute OR		473
Generator Stretch Capability		228
No 10-minute OR		945
Voltage Reductions	2.1	
Total Impact	3.1	1,646
Less OR Requirement		-1,418
Net Impact in Analysis	3.1	228

### 3.6 Fuel Supply Diversity

A diverse generation mix is important for resource adequacy and market efficiency, because it provides 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 basis for concern about the ability to meet the additional gas supply requirements.

<sup>2</sup>Although 30-minute and 10-minute OR are included in this list of EOPs, the analysis does not impose a requirement to provide for OR since only loss of load events are being considered. Therefore, the net benefit of applying EOPs in the analysis excludes relaxation of OR 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.

MARS runs were performed based on the latest demand forecast and latest forecast of available resources as described in Section 3.0. Table 4.1 provides a summary of the LOLE results from these MARS runs for the different scenarios.

Table 4.1 LOLE Results from MARS Runs

Scenario	Demand Growth	EOPs	Additional Resources [MW]	LOLE [days/year]			
				2014	2015	2016	2017
1	Median	No	0	0.013	0.081	0.061	0.071
2	High	No	0	0.022	0.325	0.561	1.258
3	High	Yes	0 for 2015 475 for 2016 1,200 for 2017	-	0.096	0.098	0.097

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 four years. Some of the generator planned outages and potential station outages scheduled for the spring of 2015 had to be adjusted to satisfy the NPCC criterion. The resource situation for spring 2015 will be resolved in time for the next issue of IESO's quarterly 18-Month Outlook scheduled for release in late November or early December 2013. Generator owners are expected to have firmed up their outage plans at that time.

Under the high demand growth scenarios, the NPCC criterion is met with no EOPs for 2014. For 2015, EOPs are required to meet the criterion while for 2016 and 2017; additional resources are required in conjunction with EOPs. The amounts of additional resources required will be 475 MW for 2016 and 1,200 MW for 2017 respectively which can be achieved through imports from Ontario's neighbours as required, since 1,200 MW is typically well within the level of imports offered into the Ontario market during the summer months. In addition, the amount of imports required to meet NPCC criterion fall well within the range of tie-benefits assessed by the NPCC in its 'Review of Interconnection Assistance Reliability Benefits' study<sup>3</sup>. The IESO does monitor the supply/demand changes on an ongoing basis and advise the market of such changes

<sup>3</sup>[https://www.npcc.org/Library/Interconnections%20Assistance%20Reliability%20Benefits/RCC Approved CP-8 Tie Benefit Report June 1 2011.pdf](https://www.npcc.org/Library/Interconnections%20Assistance%20Reliability%20Benefits/RCC%20Approved%20CP-8%20Tie%20Benefit%20Report%20June%201%202011.pdf)

through the 18-Month Outlooks and updates to the Outlooks. The changes are subsequently presented to the NPCC in the annual resource adequacy review.

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

#### 4.2 Median Demand Growth LOLE Comparison – 2013 Interim vs. 2012 Comprehensive

Table 4.2 compares the LOLE results for the 2012 Comprehensive and 2013 Interim Reviews under the median demand growth scenario for 2014 to 2017. In general, LOLE values have increased in all four years of study, as a result of a higher demand forecast and lower available resources in the 2013 Interim.

Table 4.2 2012 Comprehensive vs. 2013 Interim LOLE Results

NPCC Review	Demand Growth	EOPs	Additional Resources [MW]	LOLE [days/year]			
				2014	2015	2016	2017
2012 Comprehensive	Median	No	0	0.006	0.041	0.001	0.001
2013 Interim	Median	No	0	0.013	0.081	0.061	0.071

#### 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 2013 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 2013 Interim Review demonstrates that Ontario will be able to meet the NPCC resource adequacy criterion that limits the LOLE value to no more than 0.1 days/year for all years from 2014 to 2017. 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, the use of EOPs is required in the 2015 forecast year and use of EOPs and additional resources are required in the 2016 and 2017 to satisfy the NPCC criterion.

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