18-MONTH OUTLOOK

From September 2013 to February 2015

ieso
Power to Ontario. On Demand.

An Assessment of the Reliability and Operability of the Ontario Electricity System

Executive Summary

Over the next 18 months, the province will continue to see the addition of considerable quantities of new electricity supply – including wind, solar, hydro and biomass. The IESO and market participants are well-positioned to manage this reconfigured supply mix, with the implementation of several new tools and processes.

The latest of these efforts, wind dispatch, is scheduled to take effect on September 11, 2013. Wind dispatch will provide increased flexibility from available variable generation resources allowing the IESO to operate the system more efficiently. Initially, it will apply to 1,725 MW of transmission-connected wind resources already in place as well as a further 3,026 MW of transmission-connected wind and 280 MW of transmission-connected solar expected to come into service over the 18-month period. All these new transmission-connected wind, solar, hydro and biomass projects are anticipated to provide approximately 9.6 terawatt-hours (TWh) in annual energy output. Total wind and solar generation connected both to the transmission and distribution networks in Ontario is expected to exceed 7,400 MW and provide approximately 16.2 TWh of annual energy.

Ten new grid-connected solar projects, amounting to a total capacity of 280 MW are expected to connect within the outlook period. This capacity will complement the anticipated 1,700 MW of embedded solar capacity that will be in service during the outlook period.

New renewables sources also include new hydro and biomass: a third unit at Little Long is expected in service by Q4 2013 with more units from the Lower Mattagami Expansion project to follow in Q1 2015; and the conversion of Atikokan generating station to biomass is underway with the unit expected to be back in service by Q3 2014.

To support these levels of new supply, the IESO's Resource Integration Initiative (RII), has addressed three key elements – forecast, visibility and dispatch of wind and solar resources. In addition to the wind dispatch, the IESO will also start publishing a forecast for embedded solar and wind embedded generation in fall 2013.

The shutdown of the province's coal fleet will be complete during the outlook period. The remaining generating units at Lambton and Nanticoke are scheduled to stop burning coal by the end of 2013, in line with government policy. The coal-fired Thunder Bay units are slated to cease burning coal by the end of 2014. As indicated in previous outlooks, Ontario will have an adequate supply of electricity to meet consumers' needs.

Energy demand is forecast to decrease by 0.5% in 2013. Demand response, conservation and growth in embedded generation capacity which reduces the bulk power system demand will outweigh the increased electrical demand from modest economic and population growth. Even as the economy improves in 2014, electricity energy demand will show a slight decline due to above mentioned factors.

Demand response, conservation and embedded generation will also put downward pressure on peak demands. With the majority of the distribution-connected resources being solar, the impact on peaks will be concentrated in the summer. Price impacts like time-of-use rates and the Global Adjustment Allocation will continue to exert downward pressure on peak demands.

Combined, these factors will lead to a decline in summer peaks. These factors are less prevalent in winter so, a slight increase in winter peaks is expected. The following table summarizes the forecasted seasonal peak demand numbers.

Season	Normal Weather Peak (MW)	Extreme Weather Peak (MW)
Winter 2013-14	22,282	23,340
Summer 2014	22,834	24,851
Winter 2014-15	22,234	23,220

Ontario will continue to experience an increase in volume, frequency and duration of surplus baseload generation (SBG) conditions with declining wholesale demand for electricity and significant quantities of baseload generation on the system. However, the vast majority of SBG is managed through normal market mechanisms such as managing exports and nuclear maneuvering. The IESO will gain another tool to help manage SBG as grid connected wind becomes a dispatchable resource in Q3 2013.

Conclusions & Observations

The following conclusions and observations are based on the results of this assessment.

Demand Forecast

- Ontario's energy demand is expected to decline in 2013 by 0.5%. Growth in embedded generation capacity and on-going conservation initiatives reduce the need for bulk power system electricity. Since, 2012 was a leap year, the additional day bumped energy demand growth by 0.3% in 2012 and thus, the 2013 demand forecast includes a corresponding 0.3% reduction in energy demand.
- The growth in embedded solar and wind capacity will put downward pressure on overall energy demand and summer peak demands from the bulk electric system. Combined with conservation, Global Adjustment impacts and time-of-use rates, summer peaks are expected to decline and winter peaks are expected to show a slight increase over the 18-month time horizon.
- Although high peak demands are likely under extreme weather conditions, they are not expected to pose any province-wide reliability concerns.

Resource Adequacy

- Reserve requirements are expected to be met for all weeks in all the weather scenarios.
- Lambton and Nanticoke coal generating units will be removed from the system by the end of 2013.
- The Lower Mattagami expansion project is expected to add more than 400 MW of hydro generation in northeast Ontario. The first phase of this project is the addition of a third unit at Little Long Generating Station with a 67 MW capacity, which is expected to be in service by Q4 2013.
- More than 3,800 megawatts (MW) of grid-connected renewable capacity will be added to the grid throughout this outlook period, including 280 MW of solar capacity.
- The IESO is working with the OPA on alternatives to ensure adequate supply to serve the anticipated load in the northwest.

Transmission Adequacy

Ontario's transmission system is expected to reliably supply the demand under the normal and extreme weather conditions forecast for this Outlook period**.**

- Several local area supply improvement projects are underway and will be placed in service during the timeframe of this Outlook. These projects, shown in Appendix B, will help relieve loadings of existing transmission stations and provide additional supply capacity for future load growth. The IESO, OPA, Ontario's transmitters and affected distributors are reviewing system needs and considering solutions under the Regional Planning Process established by the Ontario Energy Board (OEB).

- To help control voltages in northwestern Ontario, Hydro One will be installing new reactors. The new reactors at Marathon are scheduled to in service by Q4 2013 and those at Dryden are scheduled for Q4 2014.
- The IESO, Hydro One and OPA are also considering long term solutions to help control high voltages in southern Ontario during low demand periods.
- To improve the transmission capability into the Guelph area, Hydro One will be proceeding with the Guelph Area Transmission Refurbishment project to reinforce the supply into Guelph-Cedar Transformer Station (TS), with an expected completion date in Q2 2016.
- In the Cambridge area, a second 230/115 kV autotransformer at Preston TS and associated switching and reactive facilities are planned for 2016. This will provide additional capacity to meet forecast demand growth and help meet the IESO's load restoration criteria following a contingency on the main supply line. Studies will continue to assess the need for additional measures to address longer term needs in the area.
- Transmission enhancements at Manby TS, which include 230 kV switchyard reconfiguration and breaker upgrades are planned for Q4 2014. Hydro One has also planned to upgrade 115 kV breakers at Hearn and Leaside by Q4 2014. These upgrades will help manage long-term load supply in the south-western GTA.
- A new station, Copeland TS (formerly Bremner TS), is planned to be in service in downtown Toronto in Q1 2015. The new station will meet the short and mid-term need for additional capacity in the area and facilitate refurbishment of facilities at John TS.
- In the eastern portion of the GTA, the new Clarington TS is scheduled to be in service by spring 2017. This facility will provide 500/230 kV transformation and 230 kV switching facilities to maintain supply reliability beyond Pickering end-of-life. Clarington TS will also improve reliability to loads in the Pickering, Ajax, Whitby, Oshawa and Clarington areas.

Operability

- The IESO is approaching the completion of its Renewable Integration Initiative. This project has already yielded results, including the integration of the hourly centralized forecast into the IESO scheduling tools and enhanced visibility of renewable output within the IESO Control Room which will provide greater levels of awareness of system conditions.
- The dispatch of grid-connected renewable resources is planned to be in place by September 2013. A 5-minute forecast for transmission-connected, wind and solar generation, will be introduced into the real-time scheduling process and grid-connected wind and solar resources themselves will become fully dispatchable.
- The conditions for surplus baseload generation are likely to continue in 2013 and 2014. However, SBG is being managed effectively via normal market mechanisms including exports and nuclear maneuvering. The IESO will gain another tool to help manage SBG and increase operational efficiency grid-connected wind becomes a dispatchable resource in Q3 2013.

Caution and Disclaimer

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1 Introduction

This Outlook covers the 18-month period from September 2013 to February 2015 and supersedes the last Outlook released on May 24, 2013.

The purpose of the 18-Month Outlook is:

- To advise market participants of the resource and transmission reliability of the Ontario electricity system;
- To assess potentially adverse conditions that might be avoided through adjustment or coordination of maintenance plans for generation and transmission equipment; and
- To report on initiatives being put in place to improve reliability within the 18-month timeframe of this Outlook.

The contents of this Outlook focus on the assessment of resource and transmission adequacy. Additional supporting documents are located on the IESO website at http://www.ieso.ca/imoweb/monthsYears/monthsAhead.asp

This Outlook presents an assessment of resource and transmission adequacy based on the stated assumptions, using the described methodology. Readers may envision other possible scenarios, recognizing the uncertainties associated with various input assumptions, and are encouraged to use their own judgment in considering possible future scenarios.

Security and Adequacy Assessments are published on the IESO website on a weekly and daily basis, and progressively supersede information presented in this report.

Readers are invited to provide comments on this Outlook report or to give suggestions as to the content of future reports. To do so, please contact us at:

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- Tel: 905-403-6900
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- E-mail: customer.relations@ieso.ca.

- End of Section -

2 Updates to This Outlook

2.1 Updates to Demand Forecast

The demand forecast is based on actual demand, weather and economic data through to the end of May 2013. The demand forecast has been updated to reflect the most recent economic projections and data. Actual weather and demand data for June 2013 has been included in the tables.

2.2 Updates to Resources

Lambton and Nanticoke Generating Stations will be shut down by the end of 2013.

Minor adjustment to the installed capacity to some of the nuclear units resulted in a reduction of 51 MW. Comber Wind Limited Partnership project has completed the IESO Market Entry process and its generating capacity of 165.6 MW has been added to the installed resources.

Third hydroelectric unit at Little Long is expected in service by Q4 2013.

Ten grid-connected solar projects are expected to come in-service during the outlook period, adding a total of 280 MW to Ontario's supply mix.

The assessment uses planned generator outages as submitted by market participants to the IESO's Integrated Outage Management System (IOMS). This Outlook is based on submitted generation outage plans as of July 17, 2013.

2.3 Updates to Transmission Outlook

The list of transmission projects, planned transmission outages and actual experience with forced transmission outages have been updated from the previous 18-Month Outlook. For this Outlook, transmission outage plans submitted to the IOMS as of July17, 2013 were used.

2.4 Updates to Operability Outlook

The outlook for surplus baseload generation (SBG) conditions over the next 18 months uses planned generator outages as submitted by market participants to the IESO's IOMS. This Outlook is based on submitted generation outage plans as of July 17, 2013.

- End of Section -

3 Demand Forecast

The IESO is responsible for forecasting electricity demand on the IESO-controlled grid. This demand forecast covers the period September 2013 to February 2015 and supersedes the previous forecast released on May 24, 2013. Tables of supporting information are contained in the 2013 Q3 Outlook Tables spreadsheet.

Energy demand is forecast to decrease by 0.5% in 2013. This reduction is the combination of a number of effects. Increased embedded generation production, conservation initiatives and the impact of the loss of a day compared to 2012 being a leap year, all act to reduce the growth rate of grid supplied electricity. For 2014, demand will continue to face downward pressure from these factors. However, the downward pressure is expected to lessen and the economy is predicted to show stronger growth, leading energy demand to show only a slight decline of 0.1%.

Summer peak demands will face downward pressure from a number of factors. The growth in embedded solar capacity, conservation initiatives, time of use rates and the Global Adjustment Allocation will have a significant impact on the grid supplied summer peak. Contributions from distribution-connected solar resources will supplant grid-supplied electricity. Conservation reduces the overall need for electricity and price impacts lead electricity customers to shift their usage to off-peak periods. Combined these impacts will act to reduce summer peaks going forward. Conversely, these factors are weaker or absent during the winter peak periods. The winter peak occurs after sundown so it is not impacted by embedded solar. Unlike the summer peak which is primarily electric air conditioner load and impacted by changes to air conditioner efficiency, the winter peak load is a mix of end-uses, with the greatest conservation impacts coming from lighting efficiency gains. The price impacts are also muted as the Global Adjustment Allocation has only applied to summer peaks so far. Winter peaks will show a slight increase over the forecast.

The following tables show the seasonal peaks and annual energy demand over the forecast horizon of the Outlook.

Table 3.1 Forecast Summary

Season	Normal Weather Peak (MW)	Extreme Weather Peak (MW)
Winter 2013-14	22,282	23,340
Summer 2014	22,834	24,851
Winter 2014-15	22,234	23,220
Year	**Normal Weather Energy (TWh)**	**% Growth in Energy**
2006 Energy	152.3	-1.9%
2007 Energy	151.6	-0.5%
2008 Energy	148.9	-1.8%
2009 Energy	140.4	-5.7%
2010 Energy	142.1	1.2%
2011 Energy	141.2	-0.6%
2012 Energy	141.9	0.4%
2013 Energy (Forecast)	141.1	-0.5%
2014 Energy (Forecast)	141.0	-0.1%

Table 3.2 Weekly Energy and Peak Demand

Week Ending	Normal Peak (MW)	Extreme Peak (MW)	Load Forecast Uncertainty (MW)	Normal Energy Demand (GWh)	Week Ending	Normal Peak (MW)	Extreme Peak (MW)	Load Forecast Uncertainty (MW)	Normal Energy Demand (GWh)
08-Sep-13	20,513	22,986	1,464	2,635	08-Jun-14	19,836	23,154	1,292	2,589
15-Sep-13	19,568	22,448	1,243	2,545	15-Jun-14	20,682	23,567	1,055	2,633
22-Sep-13	19,345	21,183	622	2,570	22-Jun-14	21,536	23,819	835	2,717
29-Sep-13	18,859	19,876	784	2,568	29-Jun-14	22,289	24,086	754	2,720
06-Oct-13	17,795	18,402	537	2,514	06-Jul-14	22,511	23,973	1,016	2,683
13-Oct-13	17,589	17,850	733	2,498	13-Jul-14	22,834	24,851	814	2,771
20-Oct-13	17,514	17,980	839	2,499	20-Jul-14	22,674	23,803	838	2,720
27-Oct-13	18,388	18,599	585	2,587	27-Jul-14	22,037	24,025	1,035	2,803
03-Nov-13	18,335	18,644	487	2,594	03-Aug-14	22,018	24,275	841	2,811
10-Nov-13	19,332	19,588	437	2,669	10-Aug-14	21,507	24,598	958	2,720
17-Nov-13	19,432	20,269	532	2,724	17-Aug-14	21,514	23,981	985	2,731
24-Nov-13	19,954	20,675	708	2,793	24-Aug-14	21,490	23,645	1,362	2,769
01-Dec-13	20,326	21,188	550	2,826	31-Aug-14	20,386	23,001	1,413	2,674
08-Dec-13	20,721	22,231	677	2,899	07-Sep-14	19,045	22,425	1,370	2,462
15-Dec-13	21,284	22,324	496	2,940	14-Sep-14	18,825	21,072	680	2,462
22-Dec-13	21,395	22,502	585	2,966	21-Sep-14	18,670	19,787	781	2,524
29-Dec-13	19,308	20,727	755	2,725	28-Sep-14	17,797	17,847	420	2,472
05-Jan-14	20,782	21,481	353	2,865	05-Oct-14	17,117	17,491	554	2,483
12-Jan-14	22,282	23,340	570	3,073	12-Oct-14	17,374	17,666	786	2,525
19-Jan-14	21,742	22,692	547	3,018	19-Oct-14	18,096	18,283	507	2,509
26-Jan-14	21,868	22,692	483	3,031	26-Oct-14	18,081	18,298	392	2,576
02-Feb-14	21,945	22,621	404	3,063	02-Nov-14	18,669	18,860	318	2,631
09-Feb-14	21,036	22,324	734	3,005	09-Nov-14	18,959	19,698	416	2,673
16-Feb-14	20,626	22,127	635	2,919	16-Nov-14	19,526	20,175	601	2,738
23-Feb-14	20,397	21,987	581	2,885	23-Nov-14	20,005	20,757	342	2,790
02-Mar-14	20,959	21,914	501	2,954	30-Nov-14	20,517	21,662	607	2,840
09-Mar-14	20,014	21,371	531	2,866	07-Dec-14	21,062	22,033	409	2,911
16-Mar-14	18,999	20,539	649	2,775	14-Dec-14	20,877	22,009	555	2,912
23-Mar-14	18,403	19,720	611	2,668	21-Dec-14	21,171	22,277	690	2,952
30-Mar-14	18,483	20,241	569	2,696	28-Dec-14	20,306	21,203	362	2,774
06-Apr-14	17,741	19,566	567	2,610	04-Jan-15	20,352	21,428	528	2,824
13-Apr-14	17,472	18,943	471	2,527	11-Jan-15	22,234	23,220	570	3,026
20-Apr-14	17,018	17,687	496	2,435	18-Jan-15	21,680	22,474	547	2,975
27-Apr-14	16,910	17,564	531	2,434	25-Jan-15	21,777	22,414	483	2,978
04-May-14	17,498	19,423	721	2,437	01-Feb-15	21,838	22,417	404	3,012
11-May-14	17,527	19,726	849	2,414	08-Feb-15	20,967	22,120	734	2,960
18-May-14	18,400	21,748	845	2,442	15-Feb-15	20,631	21,907	635	2,880
25-May-14	18,796	21,868	1,175	2,394	22-Feb-15	20,304	21,807	581	2,835
01-Jun-14	18,891	22,101	1,330	2,474	01-Mar-15	20,888	21,794	501	2,913

3.1 Actual Weather and Demand

Since the last forecast the actual demand and weather data for May and June have been recorded.

May

- The weather for May was warmer than normal. Demand for the month was 10.8 TWh (10.7 TWh weather-corrected). This is a decrease compared to the previous May. The monthly peak was 20,488 MW and occurred on May 31st, which was the hottest day of the month. The weather corrected peak was much lower at 18,498 MW. Both the actual and weather corrected peak were lower than the previous May.

- Wholesale customers' consumption decreased by 1.1% over the previous May. This was the first year over year decrease since September 2012.

June

- June's weather was cooler than normal. Both the average and peak temperatures were milder than normal. Energy demand for the month was 11.2 TWh (both actual and weather-corrected) which was lower than a year earlier. The peak did occur on the hottest day of the month June 24th. The peak (22,662 MW) and weather corrected peak (22,324 MW) were both lower than the previous June.
- Wholesale customers' consumption increased, as compared to the previous two months to record a 2.1% rise over the previous June.

For the first six months of 2013 actual demand was up 0.1% over the same period in 2012. The weather corrected figures show a 0.5% decline. Wholesale consumers' consumption has increased by 2.8% over the same period in 2012.

The 2013 Q3 Outlook Tables spreadsheet has several tables with historical data. They are:

- Table 3.3.1 Weekly Weather and Demand History Since Market Opening
- Table 3.3.2 Monthly Weather and Demand History Since Market Opening
- Table 3.3.3 Monthly Demand Data by Market Participant Role.

3.2 Forecast Drivers

Economic Outlook

The main themes of the global economic outlook have not changed much since the last outlook. High debt loads, high unemployment rates and weak economic growth are the stories for most of the western economies. On the plus side there seems to be improvement as debt loads have been decreasing, the U.S. is showing signs of stronger growth and consumer confidence has been improving. As well, the general fiscal policy that has been facilitating low borrowing costs appears to be the norm for the foreseeable future.

Ontario's economy, and industrial electricity consumption, will be driven by stronger U.S. growth and the global demand for commodities.

- Table 3.3.4 of the 2013 Q3 Outlook Tables has the economic assumptions for the demand forecast.

Weather Scenarios

The IESO uses weather scenarios to produce demand forecasts. These scenarios include Normal and Extreme weather, along with a measure of uncertainty in demand due to weather volatility. This measure is called Load Forecast Uncertainty.

- Table 3.3.5 of the 2013 Q3 Outlook Tables has the weekly weather data for the forecast period.

Conservation, Demand Management and Pricing

Conservation will continue to grow throughout the forecast. The demand forecast is decremented for the impacts of conservation and embedded generation.

Other demand measures such as dispatchable loads, demand response programs, and contracted loads are not decremented from the demand forecast but instead are treated as resources in the assessment. Therefore the effects of demand measures are added back into the demand history and the forecast is produced prior to these impacts. That total demand measure capacity is discounted – based on historical and contract data – to reflect the reliably available capacity.

The impact of time of use rates and the Global Adjustment allocation are factored into the demand forecasts.

- End of Section -

4 Resource Adequacy Assessment

This section provides an assessment of the adequacy of resources to meet the forecast demand. When reserves are below required levels, with potentially adverse effects on the reliability of the grid, the IESO has the authority to reject outages based on their order of precedence. Conversely, an opportunity exists for additional outages when reserves are above required levels. These actions address shortages and may help to reduce surpluses of reserves.

The existing installed generating capacity is summarized in Table 4.1. This excludes capacity that is commissioning.

Table 4.1 Existing Generation Resources as of July 17, 2013

Fuel Type	Total Installed Capacity (MW)	Forecast Capability at Winter Peak* (MW)	Number of Stations	Change in Installed Capacity (MW)	Change in Stations
Nuclear	12,947	12,908	5	-51	0
Hydroelectric	7,939	6,089	70	0	0
Coal	3,293	153	3	0	0
Oil / Gas	9,987	9,326	29	0	0
Wind	1,725	576	14	166	1
Biomass / Landfill Gas	122	92	6	0	0
Total	36,013	29,144	127	115	1

* Actual Capability may be less as a result of transmission constraints

4.1 Committed and Contracted Generation Resources

All generation projects that are scheduled to come into service, be upgraded, or be shut down within the Outlook period are summarized in Table 4.2. This includes both the generation projects in the IESO's Connection Assessment and Approval Process (CAA) that are under construction and the projects contracted by the OPA. Details regarding the IESO's CAA process and the status of these projects can be found on the IESO's website at http://www.ieso.ca/imoweb/connassess/ca.asp under Application Status.

The estimated effective date in Table 4.2 indicates the date on which additional capacity is assumed to be available to meet Ontario demand or when existing capacity will be shut down. For projects that are under contract, the estimated effective date is the best estimate of the date when the contract requires the additional capacity to be available. If a project is delayed the estimated effective date will be the best estimate of the commercial in-service date for the project.

Table 4.2 Committed and Contracted Generation Resources

Project Name	Zone	Fuel Type	Estimated Effective Date	Change	Project Status	Capacity Considered	
						Firm (MW)	Planned (MW)
Thunder Bay Condensing Turbine Project	Northwest	Biomass	0		Commercial Operation	40	40
East Lake St. Clair Wind	West	Wind	0		Commercial Operation	99	99
Erieau Wind	West	Wind	2013-Q3		Commissioning	99	99
Summerhaven Wind Energy Centre	Southwest	Wind	2013-Q3		Commissioning	125	125
Conestogo Wind Energy Centre 1	Southwest	Wind	2013-Q3		Pre-NTP	69	69
McLean's Mountain Wind Farm	Northeast	Wind	2013-Q4		NTP	60	60
Becker Cogeneration Plant	Northwest	Biomass	2013-Q4		Construction	8	8
New Third Unit at Little Long	Northeast	Water	2013-Q4		Construction	67	67
Lambton Coal Shutdown	West	Coal	2013-Q4		0	-1,016	-1,016
Nanticoke Coal Shutdown	Southwest	Coal	2013-Q4		0	-1,985	-1,985
Bow Lake Phase 1	Northeast	Wind	2014-Q1		pre-NTP		20
Dufferin Wind Farm	Southwest	Wind	2014-Q1		Pre-NTP		100
Twin Falls	Northeast	Water	2014-Q1		Construction		5
Niagara Region Wind Farm	Southwest	Wind	2014-Q1		Pre-NTP		230
Nigig Power Corporation	Essa	Wind	2014-Q1		Pre-NTP		300
Port Dover and Nanticoke Wind Project	Southwest	Wind	2014-Q1		NTP		104
Haldimand Solar Project	Southwest	Solar	2014-Q1		NTP		100
Haldimand Wind Project	Southwest	Wind	2014-Q1		NTP		149
South Kent Wind Project	West	Wind	2014-Q1		NTP		270
Leamington Pollution Control Plant	West	Oil	2014-Q2		0		2
Amherst Island Wind Project	East	Wind	2014-Q2		Pre-NTP		75
Goulais Wind Farm	Northeast	Wind	2014-Q2		pre-NTP		25
Bow Lake Phase 2	Northeast	Wind	2014-Q2		pre-NTP		40
Adelaide Wind Power Project	West	Wind	2014-Q3		Pre-NTP		40
Bornish Wind Energy Centre	Southwest	Wind	2014-Q3		Pre-NTP		74
Grand Bend Wind Farm	Southwest	Wind	2014-Q3		Pre-NTP		100
Grand Valley Wind Farms (Phase 3)	Southwest	Wind	2014-Q3		Pre-NTP		40
Gunn's Hill Wind Farm	West	Wind	2014-Q3		Pre-NTP		25
Silvercreek Solar Park	West	Solar	2014-Q3		Pre-NTP		10
Cedar Point Wind Power Project Phase II	Southwest	Wind	2014-Q3		Pre-NTP		100
Adelaide Wind Energy Centre	Southwest	Wind	2014-Q3		Pre-NTP		60
Bluewater Wind Energy Centre	Southwest	Wind	2014-Q3		Pre-NTP		60
Goshen Wind Energy Centre	Southwest	Wind	2014-Q3		Pre-NTP		102
Jericho Wind Energy Centre	Southwest	Wind	2014-Q3		Pre-NTP		150
Gitchi Animki Bezhig Generating Station	Northwest	Water	2014-Q3		NTP		9
Gitchi Animki Niizh Generating Station	Northwest	Water	2014-Q3		NTP		10
Atikokan conversion to biomass	Northwest	Biomass	2014-Q3		Construction		205
White Pines Wind Farm	East	Wind	2014-Q3		Pre-NTP		60
Liskeard 1	Northeast	Solar	2014-Q3		NTP		10
Liskeard 3	Northeast	Solar	2014-Q3		NTP		10
Liskeard 4	Northeast	Solar	2014-Q3		NTP		10
Northland Power Solar Abitibi	Northeast	Solar	2014-Q3		Pre-NTP		10
Northland Power Solar Empire	Northeast	Solar	2014-Q3		Pre-NTP		10
Northland Power Solar Long Lake	Northeast	Solar	2014-Q3		Pre-NTP		10
Northland Power Solar Martin's Meadows	Northeast	Solar	2014-Q3		Pre-NTP		10
Thunder Bay Coal Shutdown	Northwest	Coal	2014-Q4		0	-306	-306
Armow Wind Project	Southwest	Wind	2014-Q4		pre-NTP		180
K2 Wind Project	Southwest	Wind	2014-Q4		pre-NTP		270
Kingston Solar Project	East	Solar	2014-Q4		pre-NTP		100
Peeshoo Project	Northeast	Water	2015-Q1		Pre-NTP		7
Wahpeestan Project	Northeast	Water	2015-Q1		Pre-NTP		7
Wapoose Project	Northeast	Water	2015-Q1		Pre-NTP		7
Neeskah Project	Northeast	Water	2015-Q1		Pre-NTP		7
New Third Unit at Harmon	Northeast	Water	2015-Q1		Construction		78
New Third Unit at Kipling	Northeast	Water	2015-Q1		Construction		78
Trout Lake River Hydroelectric Project	Northwest	Water	2015-Q1		Pre-NTP		4
Total						**-2,740**	**530**

Notes on Table 4.2:

1. The total may not add up due to rounding. Total does not include in-service facilities.
2. Project status provides an indication of the project progress. The milestones used are:
    a. Connection Assessment - the project is undergoing an IESO system impact assessment
    b. Approvals & Permits - the proponent is acquiring major approvals and permits required to start construction (e.g. environmental assessment, municipal approvals etc.)
    c. Construction - the project is under construction

d. Commissioning - the project is undergoing commissioning tests with the IESO
e. Pre-NTP/NTP - Feed-in Tariff (FIT) projects are categorized as Notice to Proceed (NTP) or pre-NTP. OPA issues NTP when the project proponent provides necessary approvals and permits, finance plan, Domestic Content Plan and documentation on impact assessment required by the Transmission System Code or the Distribution System Code.
f. Commercial Operation – the project has achieved commercial operation under OPA criteria.

4.2 Summary of Scenario Assumptions

In order to assess future resource adequacy, the IESO must make assumptions on the amount of available resources. The Outlook considers two scenarios: a Firm Scenario and a Planned Scenario as compared in Tables 4.3 and 4.4.

Both scenarios' starting point is the existing installed resources shown in Table 4.1. The Planned Scenario assumes that all resources that are scheduled to come into service are available over the study period while the Firm Scenario only assumes resources, scheduled to come into service over the first three months and generators that have started commissioning. Both scenarios recognize that resources that are in service are not available during times for which the generator has submitted planned outages. Also considered for both scenarios are generator-planned shutdowns or retirements which have high certainty of happening in the future. The Firm and Planned Scenarios also differ in their assumptions regarding the amount of demand measures.

The generation capability assumptions are as follows:

- The hydroelectric capability (including energy and operating reserve) for the duration of this outlook is typically based on median historical values during weekday peak demand hours from May 2002 to March 2013. Adjustments may be made, periodically, when outage or water conditions drive expectations of higher or lower output that varies from median values by more than 500 MW. Manual adjustments to affected months have been made during this outlook period to account for specific scheduled hydroelectric outages and low water conditions.
- Thermal generators' capacity and energy contributions are based on market participant submissions, including planned outages, expected forced outage rates and seasonal deratings.
- For wind generation the monthly Wind Capacity Contribution (WCC) values are used at the time of weekday peak, while annual energy contribution is assumed to be 29% of installed wind capacity. For solar generation, the monthly Solar Capacity Contribution (SCC) values are used at the time of weekday peak. For annual solar energy contribution however, 14% output of installed capacity is assumed. The specifics on wind and solar values can be found in the Methodology to Perform Long Term Assessments.

Table 4.3 Summary of Scenario Assumptions for Resources

		Planned Scenario	Firm Scenario
Over the 18-Month Period	Total Existing Installed Resource Capacity (MW)	36,013	
	New Generation and Capacity Changes (MW)	All Projects	Generator shutdowns or retirements, Commissioning Generators and Generators starting in the first 3 months
		530	-2,740

The Firm and Planned Scenarios also differ in their assumptions regarding the amount of demand measures.

Table 4.4 Summary of Scenario Assumptions for Normal Weather Demand

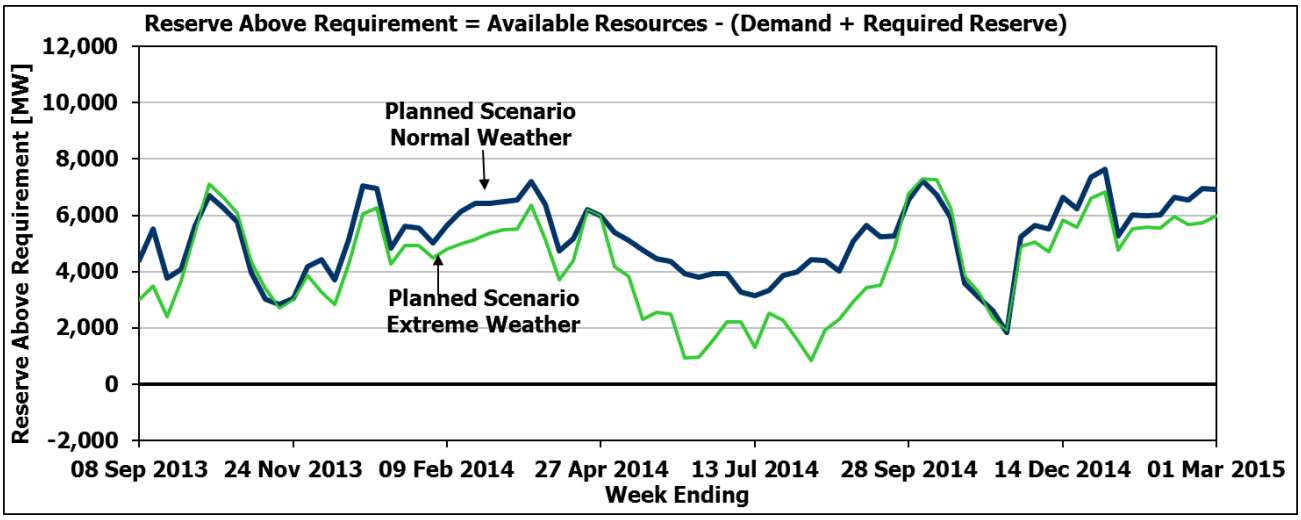
		Planned Scenario	Firm Scenario
2013 Summer Peak vs. 2012 Summer Peak	Growth in Conservation at Peak (MW)	57	
	Growth in Embedded Generation Capacity at Peak (MW)	530	
	Demand Measures Effective Capacity at Peak (MW)	Exisiting + Incremental	Existing
		512	512
	Ontario Demand at Peak (MW)	22,282	

4.3 Firm Scenario with Normal and Extreme Weather

The firm scenario incorporates capacity coming in service in the first three months of the Outlook period and generation being removed from service during the 18 months. This will include the addition of about 452 MW of wind, 48 MW of biomass and 67 MW of hydroelectric capacity.

Reserve Above Requirement levels, which represent the difference between Available Resources and Required Resources, are shown in Figure 4.1.

Figure 4.1 Reserve Above Requirement: Firm Scenario with Normal vs. Extreme Weather

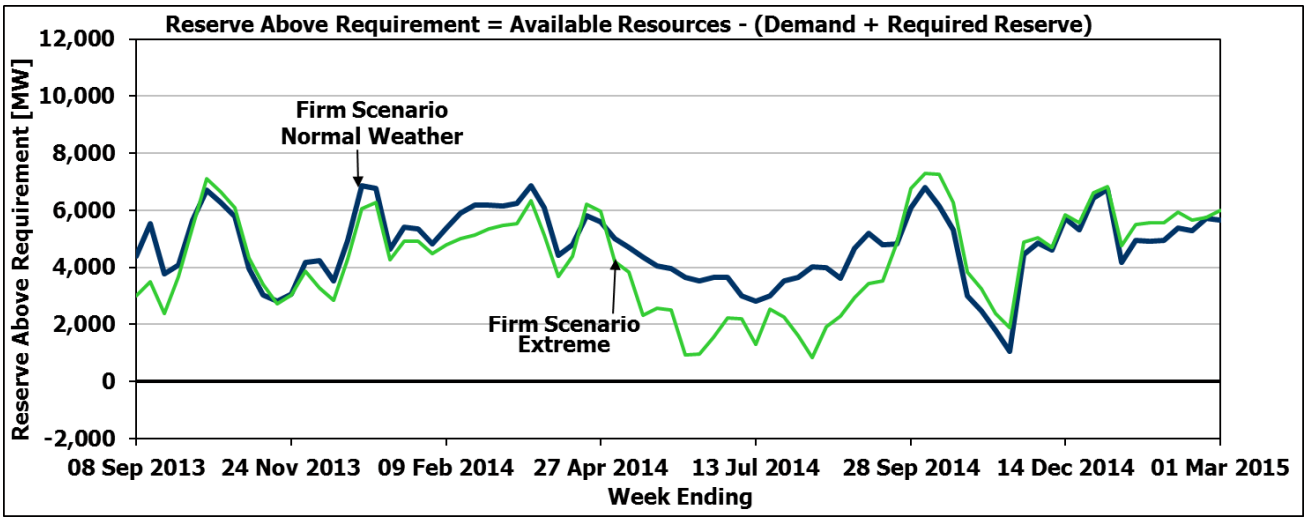


4.4 Planned Scenario with Normal and Extreme Weather

The planned scenario incorporates all capacity coming in service and being removed from service over the Outlook period. This will include the capacity changes in the firm scenario as well as more than 3,800 MW of grid-connected renewables added to the system. The removal of coal-fired facilities results in a considerable but acceptable reduction in resources.

Reserve Above Requirement levels, which represent the difference between Available Resources and Required Resources, are shown in Figure 4.2.

Figure 4.2 Reserve Above Requirement: Planned Scenario with Normal vs. Extreme Weather



4.5 Comparison of Resource Scenarios

Table 4.5 shows a snapshot of the forecast available resources, under the two scenarios, at the time of the summer and winter peak demands during the Outlook. The monthly forecast of energy production capability, as provided by market participants, is included in the 2013 Q3 Outlook Tables Appendix A, Table A7.

Table 4.5 Summary of Available Resources

Notes	Description	Winter Peak 2014		Summer Peak 2014		Winter Peak 2015	
		Firm Scenario	Planned Scenario	Firm Scenario	Planned Scenario	Firm Scenario	Planned Scenario
1	Installed Resources (MW)	33,579	33,579	33,579	35,387	33,273	36,357
2	Total Reductions in Resources (MW)	4,237	4,040	5,732	7,195	4,500	6,513
3	Demand Measures (MW)	512	512	502	502	577	577
4	Available Resources (MW)	29,855	30,052	28,349	28,694	29,350	30,422

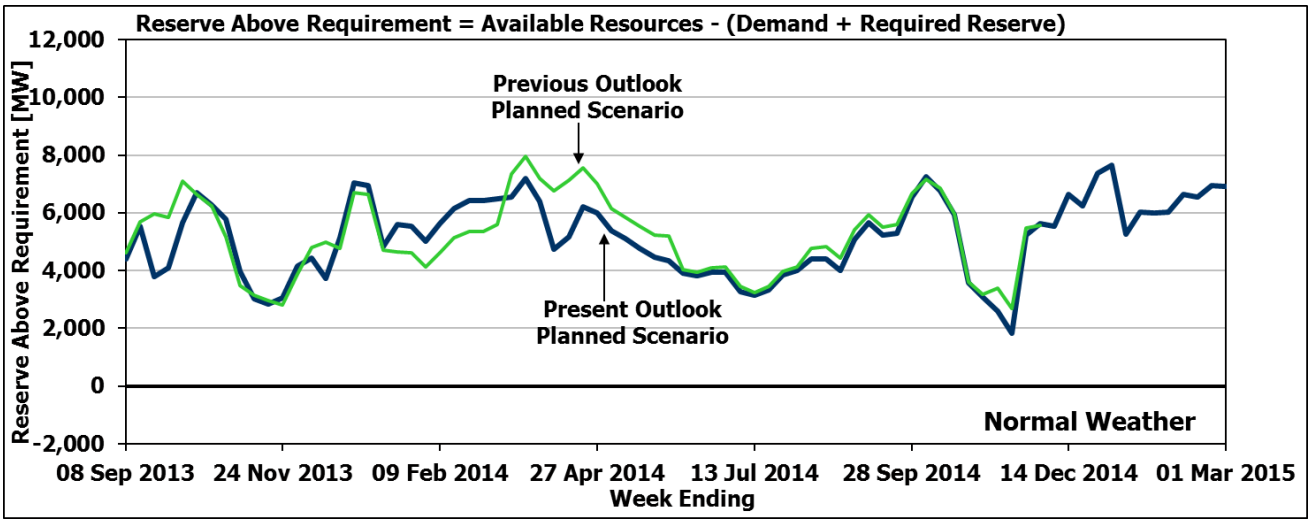
Notes on Table 4.5:

1. Installed Resources: This is the total generation capacity assumed to be installed at the time of the summer and winter peaks.
2. Total Reductions in Resources: Represent the sum of deratings, planned outages, limitations due to transmission constraints, generation constraints due to transmission outages/limitations and allowance for capability levels below rated installed capacity.
3. Demand Measures: The amount of demand available to be reduced.
4. Available Resources: Equals Installed Resources (line 1) minus Total Reductions in Resources (line 2) plus Demand Measures (line 3).

Comparison of the Current and Previous Weekly Adequacy Assessments for the Planned Normal Weather Scenario

Figure 4.3 provides a comparison between the forecast Reserve Above Requirement values in the present Outlook and the forecast Reserve Above Requirement values in the previous Outlook published on May 24, 2013. The difference is mainly due to the changes to outages and changes in the demand forecast.

Figure 4.3 Reserve Above Requirement: Planned Scenario with Present Outlook vs. Previous Outlook



Resource adequacy assumptions and risks are discussed in detail in the "Methodology to Perform Long Term Assessments" (IESO_REP_0266).

- End of Section -

5 Transmission Reliability Assessment

This section provides an assessment of the reliability of the Ontario transmission system for the Outlook period. The transmission reliability assessment has three key objectives:

- Identify all major transmission and load supply projects that are planned for completion during the Outlook period and identify their reliability benefits;
- Forecast any reduction in transmission capacity brought about by specific transmission outages. For a major transmission interface or interconnection, the reduction in transmission capacity due to an outage condition can be expressed as a change in its base flow limit;
- Identify equipment outages that could require contingency planning by market participants and/or by the IESO. Planned transmission outages are reviewed in conjunction with major planned resource outages and the scheduled completion of new generation and transmission projects to identify reliability risks.

5.1 Transmission and Load Supply Projects

The IESO requires transmitters to provide information on the transmission projects that are planned for completion within the 18-month period. Construction of several transmission reinforcements is expected to be completed during this Outlook period. Major transmission and load supply projects planned to be in service are shown in Appendix B. Projects that are already in service or whose completion is planned beyond the period of this Outlook are not shown. The list includes only the transmission projects that represent major modifications or are considered to significantly improve system reliability. Minor transmission equipment replacements or refurbishments are not shown.

Some area loads have experienced modest growth requiring additional investments in new load supply stations and reinforcements of local area transmission. Several local area supply improvement projects are underway and will be placed in service during the timeframe of this Outlook. These projects help relieve loadings on existing transmission infrastructure and provide additional supply capacity for future load growth.

5.2 Transmission Outages

The IESO's assessment of the transmission outage plans is shown in Appendix C, Tables C1 to C10. The methodology used to assess the transmission outage plans is described in the IESO document titled "Methodology to Perform Long Term Assessments" (IESO_REP_0266).This Outlook contains transmission outage plans submitted to the IESO as of July 17, 2013.

5.3 Transmission System Adequacy

The IESO assesses transmission adequacy using the methodology described in IESO_REP_0266 on the basis of conformance to established criteria, planned system enhancements and known transmission outages. Zonal assessments are presented in the following sections. Overall, the Ontario transmission system is expected to supply the demand under the normal and extreme weather conditions forecast for the Outlook period.

As a result of localized load increases, several areas in the province have been identified as having limited capability of existing transmission infrastructure. The IESO, OPA and Hydro

One are considering long-term options to address these situations under the Regional Planning Process established by the OEB.

5.3.1 Toronto and Surrounding Area

The Greater Toronto Area (GTA) electricity supply is expected to be adequate to meet the normal weather-forecasted demand. Hydro One is working to change the 230 kV switchyard configuration at Manby TS by the end of Q2 2014. This transmission enhancement solution will help manage the long-term load supply in the southwestern GTA. For the short term, day-to-day operating procedures are available to manage the forecasted transmission loading during periods of high demand.

Hydro One is continuing with the work of replacing 115 kV breakers at Hearn TS, Manby TS and Leaside TS. The new equipment is expected to be in service by the end of 2014 and will allow incorporation of additional distribution-connected generation in the Toronto 115 kV area.

Clarington TS is scheduled to be in service by spring of 2017. This new station will increase the 500 to 230 kV autotransformer capacity in the eastern part of the GTA. This increased capacity will be required in advance of the shutdown of Pickering NGS, to maintain a reliable supply to the loads in the Pickering, Ajax, Whitby, Oshawa and Clarington areas.

These loads are currently supplied from four very long 230 kV circuits that extend from Cherrywood TS through to eastern Ontario. Since there is only a very limited capability to supply these loads from the remote eastern terminal stations of these circuits, the stations cannot be supplied for loss of supply from Cherrywood TS. To address this, the affected circuits are planned to be connected into Clarington TS and once in service, it will able to provide a full, alternative source of supply to these loads and significantly improve the area reliability.

Some load from John TS will be transferred to a new station, Copeland TS (formerly Bremner TS), planned to be in service in Q1 2015. The new station will meet the short and mid-term need for additional capacity in the area and facilitate refurbishment of facilities at John TS.

High voltages in southern Ontario are being experienced more frequently during periods of light load. High voltages become more acute during these periods if shunt reactors are also unavailable due to either repair or maintenance activities. The IESO is working with Hydro One and the OPA to develop options for managing this situation.

Transmission transfer capability in Toronto and its vicinity is expected to be sufficient to supply load in this area with a margin to allow for planned outages.

5.3.2 Bruce and Southwest Zones

In the Guelph area, the existing 115 kV transmission facilities are operating close to capacity and have limited margin to accommodate additional load. To improve the transmission capability into the Guelph area, Hydro One will be proceeding with the Guelph Area Transmission Refurbishment project to reinforce the supply into Guelph-Cedar TS, with an expected completion date in Q2 2016. As part of this project two in-line breakers will be installed at Inverhaugh SS that will allow the 230 kV system between Detweiler TS and Orangeville TS to be sectionalized. This will improve the restoration capability and reduce restoration times to the loads in the Waterloo, Guelph and Fergus areas.

In the Cambridge area, load growth is forecast to exceed the system capability over the next couple of years. Furthermore, with limited capability to restore loads in the Cambridge area, the system currently does not satisfy the IESO's load restoration criteria. In coordination with the Guelph Area Transmission Refurbishment project, a second 230/115 kV autotransformer at Preston TS and associated switching and reactive facilities are planned for 2016 to address these near- and-medium term needs. This incremental investment would provide additional capacity to meet load growth in the Cambridge area, and would help meet the IESO's load restoration criteria by reducing the interruption time for the affected customers in the area following a major transmission outage. Studies will continue to assess the need for additional measures to address longer term needs in the area.

Two new 500 kV switching stations, Evergreen and Ashfield, are planned to be in service by the end of 2014, to accommodate 384 MW and 270 MW of wind generation respectively along the Bruce to Longwood corridor.

Transmission transfer capability in the southwest zone and its vicinity is expected to be sufficient to supply load in this area with a margin to allow for planned outages.

5.3.3 Niagara Zone

The completion date for transmission reinforcements from the Niagara region into the Hamilton-Burlington area continues to be delayed. Completion of this project will increase the transfer capability from the Niagara region to the rest of the Ontario system. Hydro One is working to replace existing 115 kV breakers at Allanburg TS. The new equipment is expected to be in service by the end of Q3 2014 and will allow for the incorporation of additional generation in the area.

Transmission transfer capability in Niagara and its vicinity is expected to be sufficient to supply load in this area with a margin to allow for planned outages.

5.3.4 East Zone and Ottawa Zone

Hydro One is working to replace existing 115 kV breakers at Hawthorne TS. The new equipment is expected to be in service by the end of Q2 2014 and will improve the reliability of the 115 kV system supplying the Ottawa area, while enabling the incorporation of generation in the Ottawa area. New load supply transformer stations, Terry Fox MTS and Orleans TS, are expected to be in service by the end of 2013 and by the end of Q2 2014 respectively to address load growth in the area.

A joint regional planning study performed by the IESO, OPA, Hydro One and affected distributors is currently underway to assess supply and reliability needs in the Ottawa area and potential alternatives to address these needs.

With increasing load west of Hawthorne TS, the capability of the transmission facilities between Hawthorne TS and Merivale TS is expected to be exceeded, particularly during periods of high imports from Quebec. Possible options for reinforcing this interface are being assessed. With the exception of this interface, the transmission transfer capability of the remaining facilities in

the East and Ottawa zones are expected to be sufficient to supply load in this area with a margin to allow for planned outages.

5.3.5 West Zone

Transmission constraints in this zone may restrict resources in southwestern Ontario. This is evident in the constrained generation amounts shown for the Bruce and West zones in Tables A3 and A6.

Hydro One is planning to uprate two 230 kV circuits from Lambton TS to Longwood TS. This upgrade is expected to be in service by the end of 2014 and will increase the transfer capability into the London area.

Transmission transfer capability in the West zone is expected to be sufficient to supply load in this area with a margin to allow for planned outages.

5.3.6 Northeast and Northwest Zones

Hydro One is expected to finish transmission work related to the Lower Mattagami generation expansion project by the end of Q4 2013.

Managing grid voltages in the northwest has always required special attention. With significantly lower demand in the past few years, it has become increasingly difficult to maintain an acceptable voltage profile without compromising the reliability of supply, in particular during times of low westbound power transfers into the zone.

There were occasions in the northwest area when normal dispatch actions have been exhausted, and exceptional voltage control measures, including the temporary removal of one or more transmission circuits from service, were implemented to maintain grid voltages within acceptable ranges. These operational measures reduced the grid's ability to withstand disturbances and impacted customers' supply reliability.

To reduce and eventually eliminate the dependence on the operational measures described above, additional reactive compensation is required for voltage control in this zone. Hydro One is working on the installation of new shunt reactors at Marathon by the end of 2013 and new shunt reactors at Dryden by the end of 2014 in an effort to resolve this problem.

Some loads in the north of Dryden to Pickle Lake area experienced significant growth over the last few years and recently indicated their intention to expand operations. The transmission circuits in the area are currently operating close to their capability. The IESO, OPA, Hydro One, local distributors, customers and First Nations are working on a joint regional planning study that will provide inputs to Ontario Long-Term Energy Plan in order to address recent expansion plans of customers in the area.

The IESO is also working with Hydro One and OPG to accommodate the project currently underway, to convert Atikokan from coal to biomass. Work includes completion of planned maintenance on other critical equipment to support the outage, and ensuring plans to manage high voltage situations are sufficient to cover the duration of the Atikokan outage.

The conversion of Atikokan to biomass in 2014 will alleviate some of the concerns regarding generation adequacy in the northwest. The IESO is working with the OPA on alternatives to ensure adequate supply to serve the anticipated load in the northwest.

Reduced load in the northeast has resulted in voltages in the Timmins area that are higher than normally permitted. To help reduce the increasing dependence on the generating facilities in the northeast to maintain voltages, Hydro One is allowing selected portions of the transmission system to operate at higher voltage levels.

Transmission transfer capability in the northeast and northwest zones is expected to be sufficient to supply load in this area with a margin to allow for planned outages.

- End of Section

6 Operability Assessment

This section highlights any existing or emerging operability issues that could potentially impact system reliability of Ontario's power system.

Over the next 18 months, Ontario continues to expand its renewable resource capacity. During the next 18 months, more than 3,800 MW of wind, solar, hydroelectric and biomass capacity are expected be connected to the transmission grid. By February 2015, the total wind and solar generation connected both to the transmission and distribution networks in Ontario are expected to exceed 7,400 MW.

Solar generation – which up until now has only been embedded within distribution networks – will soon include ten new projects connected to the transmission grid, amounting to a total capacity of 280 MW. This capacity will complement the anticipated 1,700 MW of embedded solar capacity that will be in service during the outlook period.

A number of the operational changes are needed to support these levels of new supply. IESO's Renewable Integration Initiative (RII) continues to move forward towards completion and will address three key elements – forecast, visibility and dispatch of renewable resources. RII initiatives have already yielded results, including the integration of the hourly centralized forecast into the IESO scheduling tools, enhanced visibility of renewable operations within the IESO Control Room which will provide greater levels of visibility and awareness of system conditions.

The dispatch of grid-connected wind and solar resources is planned to be in place within the forecast period. This initiative will provide the system operator with increased flexibility from available variable generation resources, contribute to increased reliability, and will allow the IESO to operate the system more efficiently.

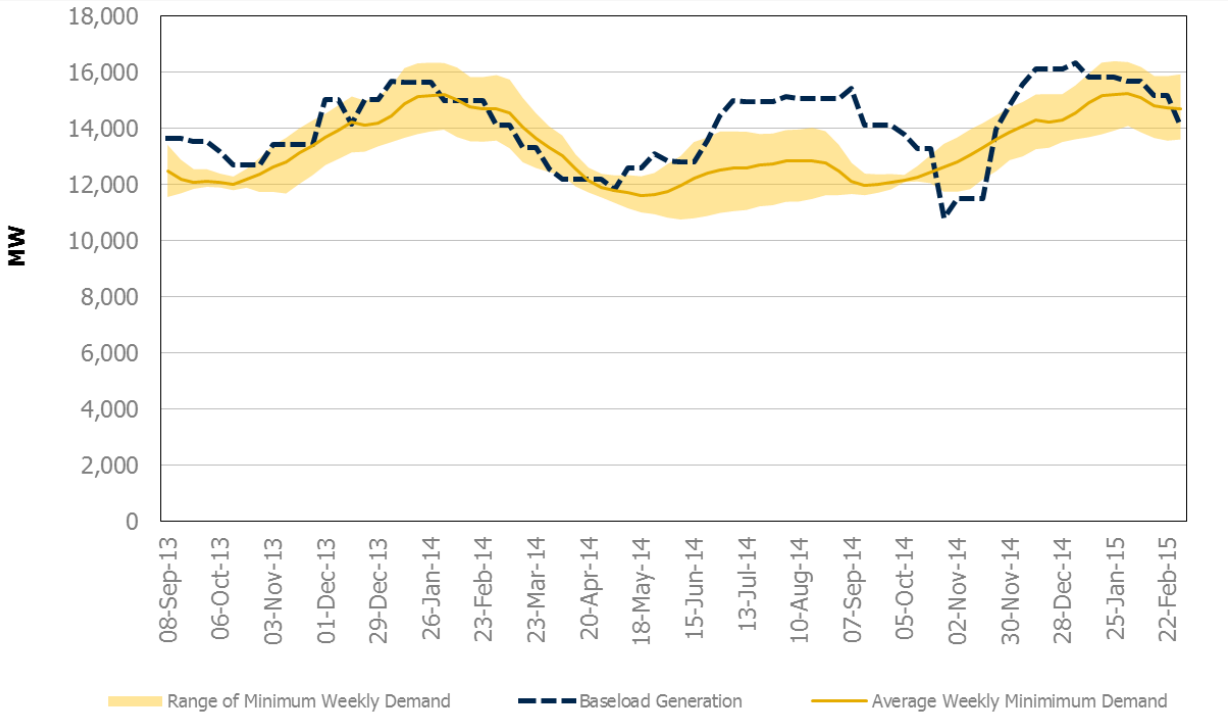
6.1 Surplus Baseload Generarion (SBG)

Baseload generation is made up of nuclear, run of the river hydroelectric and variable generation such as wind. SBG conditions occur when the amount of baseload generation exceeds Ontario demand. However, when the baseload supply is expected to exceed Ontario demand plus scheduled exports, the IESO typically balances the system via exports and nuclear curtailments scheduled through the IESO-administered markets. When transmission-connected variable generation becomes dispatchable in September 2013, additional flexibility will be available to manage SBG. These actions usually occur in the spring and fall, when the Ontario demand is lowest, and seldom occurs in extreme heat or extreme cold conditions when air conditioning or heating keeps the demand high. The correlation between Ontario demand and surplus baseload curtailments is negative, that is, when Ontario demand is low, the SBG and thus, actions to manage SBG typically increase.

The expected SBG for the next 18 months can be seen in Figure 6.1.1. The baseload generation assumptions include market participant-submitted minimum production data, the latest planned outage information, projected forced outage rates, in-service dates for new or

refurbished generation, and reliable export capability[1]. The expected contribution from self-scheduling and intermittent generation has also been updated to reflect the latest data. Output from commissioning units is explicitly excluded from this analysis due to uncertainty and the highly variable nature of commissioning schedules.

Figure 6.1.1 Minimum Ontario Demand and Baseload Generation (includes Net Export assumption)



Ontario will continue to experience an increase in volume, frequency and duration of SBG conditions with declining wholesale demand for electricity and significant quantities of baseload generation on the system. However, the vast majority of SBG is managed through normal market mechanisms including exports and nuclear maneuvering. The IESO will gain another tool to help manage SBG as grid connected wind becomes a dispatchable resource in Q3 2013.

- End of Document -

[1] Under conditions which allow Ontario's aggregate export capability to be higher than 2,800 MW, net exports assumption for each month is calculated annually. It considers the median of net exports for the subject month during non-peak hours with negative pricing. The median value of net export assumptions range from 800 MW to 2,100 MW, depending on the month.