18-MONTH OUTLOOK

From March 2013 to August 2014

ieso
Power to Ontario. On Demand.

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

Executive Summary

The next 18 months will see the transition to renewable resources continue at a significant rate, as several thousand megawatts (MW) of grid-connected wind, solar and biomass projects are integrated into normal operations. Preparations for these changes began several years ago, and are now starting to yield results in the areas of forecasting and visibility. The next element – dispatch of grid-connected renewable resources – is planned to be in place within the forecast period, and will give the IESO a necessary tool to help manage the system efficiently and reliably.

Ontario will continue to have adequate generation and transmission capability to meet consumers' needs over the next 18 months. Throughout that period, the IESO is expecting more than 3,200 MW of transmission grid-connected renewable capacity to be added to the power system, including Ontario's first two transmission grid-connected solar projects, located in Haldimand County and Elgin County. The annual energy expected from the addition of these renewable resources is approximately 10.9 terawatt-hours (TWh). During the summer of 2014, Ontario will see its largest influx of wind generation projects with over 1,000 MW of installed capacity integrated onto the grid over the three-month period. By August 2014, the total wind and solar generation connected to the transmission and distribution networks in Ontario will reach approximately 6,800 MW and provide approximately 14.9 TWh of annual energy.

Progress continues to be made in removing coal-fired generation from the supply mix in Ontario in line with government policy. The remaining generating units at Lambton and Nanticoke are scheduled to stop burning coal by the end of 2013 and the conversion of Atikokan generating station from a coal-fired unit to biomass is underway, with the unit expected to be in service by the third quarter of 2014.

Ontario continues to experience growth in both embedded generation capacity and participation in conservation initiatives. Conservation reduces end-use consumption while embedded generation simply offsets it, both leading to a reduction in the wholesale demand measured by the IESO. These two factors combined will more than offset any demand increases from population growth and economic expansion, leading to an overall decline in electricity consumption as measured at the wholesale level. Energy demand is forecast to decrease by 0.6% in 2013 after the 0.4% increase seen in 2012.

The growth in embedded solar capacity over the forecast horizon will have a significant impact on summer peak demands by effectively reducing demand for grid-supplied energy during those sunny days. Time-of-use rates and the Global Adjustment Allocation will add to this downward pressure on the summer peaks. Winter peaks, by contrast, will show a slight increase since they occur in the evening and will not be affected by embedded solar generation. They are also unlikely to be among the year's high-five demand days and, therefore, not affected by the Global Adjustment consumption response. The following table summarizes the forecasted seasonal peak demand numbers.

Season	Normal Weather Peak (MW)	Extreme Weather Peak (MW)
Summer 2013	23,275	25,430
Winter 2013-14	22,128	23,361
Summer 2014	22,700	24,717

With declining wholesale demand for electricity and significant quantities of baseload generation on the system, Ontario will continue to experience surplus baseload generation (SBG) conditions. The inclusion of wind resources in the dispatch process and the increasing volume of nuclear manoeuvering during the outlook period should help alleviate some of these SBG conditions; however, some events may need to be managed through control actions, such as import curtailments.

Conclusions & Observations

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

Demand Forecast

- Energy demand will show a slight decline in 2013. Increased demand attributable to economic expansion will be more than offset by reductions from conservation initiatives and increased production from embedded generation. As well, 2012 was a leap year and the additional day bumps demand growth by 0.3% in 2012 and has a corresponding -0.3% growth impact on 2013.
- Summer peaks will decline over the forecast due to the growth in embedded solar capacity. The actions of Class A customers in response to the Global Adjustment Allocation also put significant downward pressure on summer peaks.
- Winter peaks will show a slight increase over the forecast. Neither solar generation nor the Global Adjustment impacts the winter peaks. The main downward pressure on winter peaks will stem from gains in lighting efficiency.
- Minimum demands will only show small increases over the forecast period.

Resource Adequacy

- Reserve requirements are expected to be met for all weeks in all weather scenarios.
- Lambton and Nanticoke coal generating units will be removed from the grid by the end of 2013.
- Atikokan G1 has been removed from the grid and has begun the process of conversion to biomass. The biomass unit is expected to be in service by the third quarter of 2014.
- Approximately 3,200 megawatts (MW) of transmission grid-connected renewable capacity will be added to the power system throughout this outlook period, including the first two solar projects.
- During the summer of 2014, Ontario will see its largest influx of wind generation projects with over 1,000 MW of installed capacity expected to be integrated onto the grid over the three-month period.
- Decisions around the possible Pickering unit retirements and associated transmission upgrades are required within the timeframe of this Outlook to ensure supply adequacy continues beyond 2014.

	Normal Weather Scenario	Extreme Weather Scenario
Planned Scenario	• There are no weeks when reserve is lower than required	• There are no weeks when reserve is lower than required
Firm Scenario	• There are no weeks when reserve is lower than required	• There are no weeks when reserve is lower than required

Transmission Adequacy

- With the planned system enhancements and scheduled maintenance outages, Ontario's 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, the IESO, OPA, Hydro One and affected distributors are considering long-term options to meet the IESO's load restoration criteria in York Region, the Ottawa area, and in the area supplying Woodbridge TS, Vaughan #3 TS and Kleinburg TS.
- Some area loads experienced modest growth requiring additional investments in local area transmission systems. 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.
- To manage the special requirements of the Northwest, Hydro One, the OPA and the IESO are currently looking at short- and long-term solutions to maintain an acceptable voltage profile and supply adequacy.
- 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 the second quarter of 2016.
- In the Cambridge area, to help meet the IESO's load restoration criteria following a contingency, a second 230/115 kV autotransformer is expected to be installed at Preston TS by 2015. Longer-term solutions to fully address meeting restoration criteria are being developed.
- The OPA and Hydro One are developing transmission enhancement solutions to manage long-term load supply in the south-western GTA
- In the eastern portion of the GTA, a new Clarington TS that provides 500/230 kV transformation and 230 kV switching facilities, along with additional reactive capability at Clarington and Cherrywood is scheduled to be in-service as soon as spring 2015 to maintain supply reliability beyond Pickering end-of-life. Clarington TS will also improve restoration

capability to the loads in the Pickering, Ajax, Whitby, Oshawa and Clarington areas following transmission outages.

Operability

- The IESO is continuing with plans to move to an economic dispatch of renewable resources. The first stages - forecasting and visibility of renewable resources - have begun yielding results and the next piece – dispatch of grid-connected renewable resources – is expected to be in place within the forecast period. This will give the IESO one more tool to help manage the system efficiently and reliably.
- The conditions for surplus baseload generation are expected to grow in 2013 and 2014. The inclusion of wind resources in the dispatch process and the increasing volume of nuclear manoeuvering during the outlook period should help alleviate some of these SBG conditions.
- As Ontario's coal-fired generation is shut down over the next year, its associated flexibility, such as quick ramping and operating reserve, will be lost. Therefore, future supply options, demand response programs, and storage solutions should also possess this flexibility to help facilitate the management of maintenance outages, provide effective ramp capability, supply operating reserve and even provide regulation, when necessary.

- **Caution and Disclaimer**

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1 Introduction

This Outlook covers the 18-month period from March 2013 to August 2014 and supersedes the last Outlook released in November 2012.

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:

- Toll Free: 1-888-448-7777
- Tel: 905-403-6900
- Fax: 905-403-6921
- 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 November 2012. The demand forecast has been updated to reflect the most recent economic projections and data. Actual weather and demand data for December 2012 and January 2013 have been included in the tables.

2.2 Updates to Resources

Atikokan G1 (211 MW) has been shut down and its capacity removed from Ontario's installed capacity, shown in Table 4.1. When the conversion of Atikokan to biomass is completed in 2014, the capacity of the unit will be added back into the table. Lambton and Nanticoke will be shut down by the end of 2013.

Crystal Falls Generating Station (8 MW) is deregistered from the IESO-controlled grid and operates as an embedded generator.

Ontario's first two transmission grid-connected solar projects are expected to come in-service during the outlook period. Monthly solar capacity contribution values[1] are used to forecast the capacity contributions at the time of weekday peak from this solar project. The value used in the spring months is 67%, in the summer months is 48% and in fall and winter months is 0%. In summer, the peak demand hour mostly coincides with the higher production from the solar panels, whereas in winter the peak demand hour occurs after sunset.

A reduction to the expected output from gas-fired facilities under extreme summer weather has been incorporated into the firm and planned extreme weather scenarios based on historical summer derates.

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 February 13, 2012.

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 January 2, 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 IOMS. This Outlook is based on submitted generation outage plans as of October 23, 2012.

- End of Section -

[1] The solar capacity contribution values used in this Outlook are based on preliminary assessments and may be refined as more data becomes available and analysis is updated in upcoming months.

3 Demand Forecast

The IESO is responsible for forecasting electricity demand on the IESO-controlled grid (ICG). Embedded generation, by definition, is not part of the ICG and, in fact, its output works to offset the need for grid-supplied electricity.

This demand forecast covers the period March 2013 to August 2014 and supersedes the previous forecast released in November 2012. Tables of supporting information are contained in the 2013 Q1 Outlook Tables spreadsheet.

Electricity demand will decrease in 2013. Conservation savings and embedded generation production are driving the reduction in demand, more than offsetting the growth from economic expansion and population growth.

The projected increase in embedded solar generation capacity will have a significant impact on summer peaks. As well, time-of-use rates, Global Adjustment changes and conservation further put downward pressure on summer peaks.

The following table shows 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)
Summer 2013	23,275	25,430
Winter 2013-14	22,128	23,361
Summer 2014	22,700	24,717
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	141.8	0.4%
2013 Energy (Forecast)	141.0	-0.6%

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)
10-Mar-13	20,635	21,524	343	2,886	08-Dec-13	20,780	22,089	615	2,844
17-Mar-13	19,606	20,472	394	2,824	15-Dec-13	21,343	22,182	434	2,885
24-Mar-13	19,339	20,296	509	2,776	22-Dec-13	21,453	22,360	523	2,911
31-Mar-13	18,672	19,584	472	2,622	29-Dec-13	19,366	20,585	693	2,673
07-Apr-13	18,492	19,955	434	2,655	05-Jan-14	20,628	21,502	464	2,839
14-Apr-13	17,961	18,912	411	2,594	12-Jan-14	22,128	23,361	681	3,052
21-Apr-13	17,495	18,603	325	2,526	19-Jan-14	21,588	22,713	658	2,998
28-Apr-13	17,263	18,279	347	2,518	26-Jan-14	21,714	22,713	594	3,010
05-May-13	17,101	20,005	379	2,464	02-Feb-14	21,791	22,643	515	3,045
12-May-13	17,760	20,630	560	2,478	09-Feb-14	21,140	22,427	671	2,996
19-May-13	17,593	20,217	684	2,441	16-Feb-14	20,729	22,230	572	2,911
26-May-13	19,025	22,699	682	2,417	23-Feb-14	20,500	22,091	519	2,877
02-Jun-13	19,101	22,081	1,150	2,495	02-Mar-14	21,062	22,017	439	2,945
09-Jun-13	19,521	23,128	1,239	2,574	09-Mar-14	20,101	21,458	475	2,856
16-Jun-13	20,541	24,120	1,238	2,646	16-Mar-14	19,086	20,626	592	2,765
23-Jun-13	21,186	24,621	690	2,665	23-Mar-14	18,490	19,807	554	2,660
30-Jun-13	22,559	24,593	816	2,781	30-Mar-14	18,570	20,328	512	2,687
07-Jul-13	22,628	24,309	709	2,684	06-Apr-14	17,920	19,845	502	2,628
14-Jul-13	23,275	25,430	941	2,816	13-Apr-14	17,651	19,221	407	2,550
21-Jul-13	23,068	24,616	827	2,821	20-Apr-14	17,196	17,965	432	2,459
28-Jul-13	22,623	24,302	864	2,765	27-Apr-14	17,063	17,842	467	2,458
04-Aug-13	22,596	24,812	988	2,784	04-May-14	17,577	19,702	657	2,461
11-Aug-13	22,418	25,223	871	2,768	11-May-14	17,713	20,013	789	2,439
18-Aug-13	21,700	24,399	896	2,726	18-May-14	18,586	22,034	786	2,466
25-Aug-13	21,580	23,997	758	2,712	25-May-14	18,982	22,154	1,277	2,419
01-Sep-13	21,516	23,756	1,175	2,723	01-Jun-14	19,002	22,387	1,371	2,499
08-Sep-13	20,468	22,941	1,401	2,596	08-Jun-14	19,926	23,444	1,370	2,613
15-Sep-13	19,523	22,403	1,180	2,508	15-Jun-14	20,972	23,857	794	2,657
22-Sep-13	19,300	21,138	559	2,533	22-Jun-14	22,426	24,108	931	2,740
29-Sep-13	18,814	19,831	721	2,531	29-Jun-14	22,279	24,376	793	2,743
06-Oct-13	17,816	18,356	475	2,486	06-Jul-14	22,476	24,138	1,053	2,689
13-Oct-13	17,609	17,870	672	2,472	13-Jul-14	22,700	24,717	851	2,773
20-Oct-13	17,535	18,000	777	2,473	20-Jul-14	22,639	23,968	975	2,722
27-Oct-13	18,409	18,619	524	2,559	27-Jul-14	21,903	24,191	1,104	2,805
03-Nov-13	18,356	18,664	425	2,554	03-Aug-14	22,383	24,441	981	2,780
10-Nov-13	19,344	19,400	377	2,611	10-Aug-14	21,641	24,632	1,013	2,647
17-Nov-13	19,444	20,081	471	2,666	17-Aug-14	20,848	23,716	864	2,657
24-Nov-13	19,966	20,487	647	2,733	24-Aug-14	21,524	23,379	1,302	2,695
01-Dec-13	20,338	20,999	490	2,767	31-Aug-14	20,521	22,735	1,543	2,601

3.1 Actual Weather and Demand

Since the last forecast the actual demand and weather data for November, December and January have been recorded.

November

- November's weather was very close to normal. Demand for the month was 11.5 TWh (11.7 TWh weather-corrected) an increase over the previous November. The monthly peak was 20,144 MW and occurred on November 30th, which was the coldest day of the month. This peak day was very close to normal so the weather-corrected peak was very similar at 20,180 MW.
- Wholesale customers' consumption increased by 8.1% over the previous November.

December

- December was milder than normal. The cold temperatures experienced during the month occurred during the holiday period later in the month so their impact was muted. Energy demand for the month was 12.1 TWh (12.4 TWh weather-corrected). The peak day did not occur on the coldest day, which was Boxing Day. The 20,382 MW peak occurred earlier in the month under slightly milder conditions (20,614 MW weather-corrected).
- Wholesale customers' consumption ended the year on strong growth of 6.4% over the previous December. For 2012 wholesale customers' consumption rose by 3.9% over 2011, a significant improvement over the 0.5% decline from 2010 to 2011. This is still 17.0% below the pre-recessionary consumption levels seen in 2008.

January

- The weather for January was milder than normal overall though the colder peak days were close to normal. Actual energy demand for the month was 12.9 TWh (13.2 TWh weather-corrected) which is an increase over the previous January. The actual peak for the month was 22,610 MW and occurred on January 24th which was not the coldest day of the month but was part of the same cold snap. The weather-corrected peak was 22,808 MW. The peaks were higher than the previous January's.
- Wholesale customers' consumption showed strong year over year growth by posting a 7.3% increase over the previous January. Other than a small decline in September, wholesale consumption has seen positive growth since January 2012. Growth for the past 12 months has been 4.7%.

For 2012, weather-corrected monthly demand compared to the previous year was up in seven of the 12 months. February actually showed a year-over-year increase but after adjusting for the extra leap year day, demand was down. Not surprisingly, overall weather-corrected demand was up only 0.4% over 2011. Once again adjusting for the additional leap year day, demand showed only a 0.1% increase over the previous year. On a positive note the last six months were stronger than the first six.

The 2013 Q1 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 economic outlook has not changed much over the past few Outlooks as the main themes remain the same. Weak economic growth, sovereign debt issues and high unemployment continue to dog the world economy. As stated in previous Outlooks there are no quick fixes for the situation as both debt and unemployment will be a drag on growth. As such, the current

situation is expected to persist over the forecast horizon, leading to very modest economic growth.

- Table 3.3.4 of the 2013 Q1 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 Q1 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. The Global Adjustment has an impact on summer peaks.

- 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 February 13, 2013

Fuel Type	Total Installed Capacity (MW)	Forecast Capability at Summer Peak* (MW)	Number of Stations	Change in Installed Capacity (MW)	Change in Stations
Nuclear	12,998	11,325	5	0	0
Hydroelectric	7,939	5,656	70	-8	-1
Coal	3,293	3,176	3	0	0
Oil / Gas	9,987	8,883	29	0	0
Wind	1,511	203	12	0	0
Biomass / Landfill Gas	122	90	6	0	0
Total	35,850	29,334	125	-8	-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 project's commercial in-service date.

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)
Comber Wind Limited Partnership	West	Wind			Commercial Operation	166	166
Pointe Aux Roches Wind	West	Wind			Commercial Operation	49	49
Summerhaven Wind Energy Centre	Southwest	Wind	2013-Q1		Construction	125	125
Conestogo Wind Energy Centre 1	Southwest	Wind	2013-Q1		pre-NTP	69	69
Thunder Bay Condensing Turbine Project	Northwest	Biomass	2013-Q1		Commissioning	40	40
McLean's Mountain Wind Farm	Northeast	Wind	2013-Q2		NTP	60	60
Incremental capacity at Sir Adam Beck with the third Niagara tunnel	Niagara	Water	2013-Q3		Construction		30
Leamington Pollution Control Plant	West	Oil	2013-Q4		Construction		2
Becker Cogeneration Plant	Northwest	Biomass	2013-Q4		Construction		8
Lambton Coal Shutdown	West	Coal	2013-Q4			-1,016	-1,016
Nanticoke Coal Shutdown	Southwest	Coal	2013-Q4			-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
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		Pre-NTP		105
Haldimand Solar Project	Southwest	Solar	2014-Q1		Pre-NTP		100
Haldimand Wind Project	Southwest	Wind	2014-Q1		Pre-NTP		150
South Kent Wind Project	West	Wind	2014-Q1		Pre-NTP		270
New Third Unit at Little Long	Northeast	Water	2014-Q2		Pre-NTP		71
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-Q2		Pre-NTP		40
Bornish Wind Energy Centre	Southwest	Wind	2014-Q2		Pre-NTP		74
Grand Bend Wind Farm	Southwest	Wind	2014-Q2		Pre-NTP		100
Grand Valley Wind Farms (Phase 3)	Southwest	Wind	2014-Q2		Pre-NTP		40
East Lake St. Clair Wind	West	Wind	2014-Q2		NTP		99
Erieau Wind	West	Wind	2014-Q2		Construction		99
Gunn's Hill Wind Farm	West	Wind	2014-Q2		Pre-NTP		25
Silvercreek Solar Park	West	Solar	2014-Q2		Pre-NTP		10
Cedar Point Wind Power Project Phase II	Southwest	Wind	2014-Q2		Pre-NTP		100
Adelaide Wind Energy Centre	Southwest	Wind	2014-Q2		Pre-NTP		60
Bluewater Wind Energy Centre	Southwest	Wind	2014-Q2		Pre-NTP		60
Goshen Wind Energy Centre	Southwest	Wind	2014-Q2		Pre-NTP		102
Jericho Wind Energy Centre	Southwest	Wind	2014-Q2		Pre-NTP		150
Atikokan conversion to biomass	Northwest	Biomass	2014-Q3		Construction		205
White Pines Wind Farm	East	Wind	2014-Q3		Pre-NTP		60
Total						**-2,493**	**257**

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 Table 4.3 and Table 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 those 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 a high probability of proceeding as scheduled.

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 2012. 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, which can be found in the Methodology to Perform Long Term Assessments, are used at the time of weekday peak, while total energy contribution is assumed to be 29% of installed wind capacity.

Table 4.3 Summary of Scenario Assumptions for Resources

		Planned Scenario	Firm Scenario
Over the 18-Month Period	Total Existing Installed Resource Capacity (MW)	35,850	
	New Generation and Capacity Changes (MW)	All Projects	Generator shutdowns or retirements, Commissioning Generators and Generators starting in the first 3 months
		257	-2,493

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

Table 4.4 Summary of Scenario Assumptions for Demand

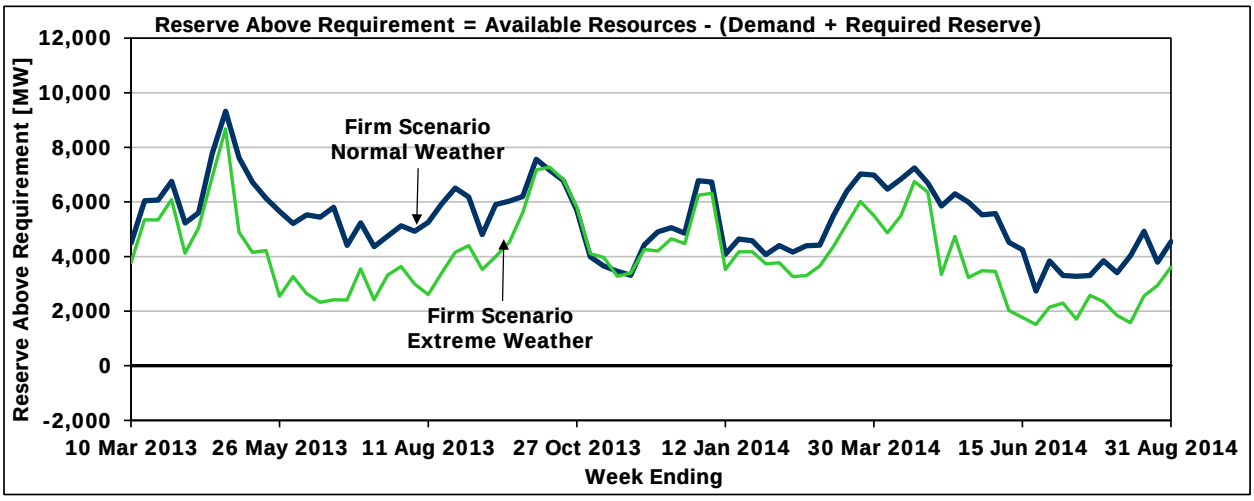
		Planned Scenario	Firm Scenario
2013 Summer Peak vs. 2012 Summer Peak	Growth in Conservation at Peak (MW)	57	
	Growth in Embedded Generation Capacity at Peak (MW)	530	
	Demand Measures Effective Capacity at Peak (MW)	Exisiting + Incremental	Existing
		694	588
	Ontario Demand at Peak (MW)	23,275	

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 470 MW of wind and 40 MW of biomass capacity, as well as the removal of 3,000 MW of coal generation.

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

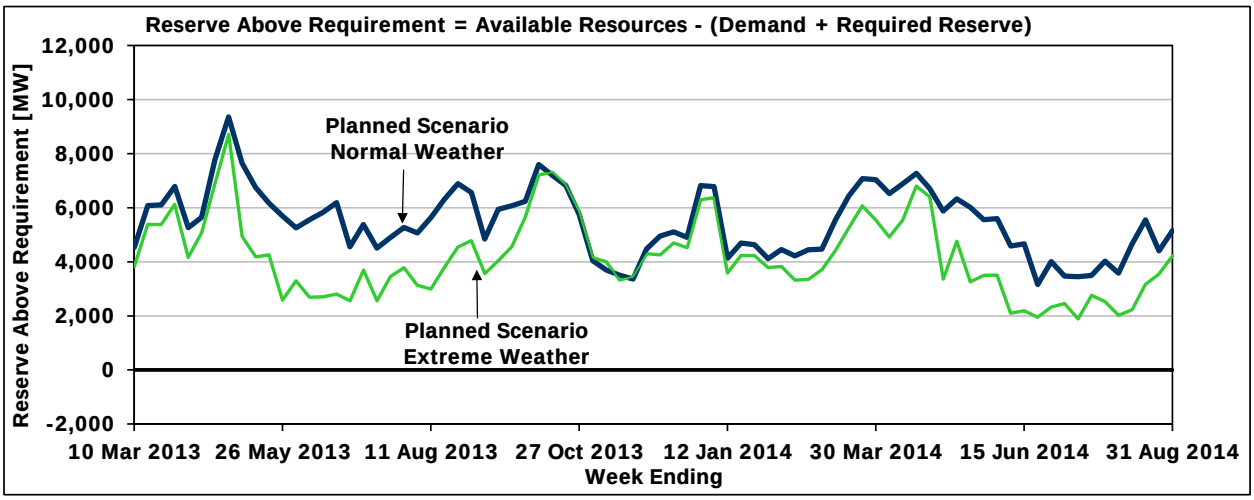


4.4 Planned Scenario with Normal and Extreme Weather

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 approximately 2,750 MW of grid-connected renewables added to the system.

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 4.4 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 Q1 Outlook Tables Appendix A, Table A7.

Table 4.5 Summary of Available Resources

Notes	Description	Summer Peak 2013		Winter Peak 2014		Summer Peak 2014	
		Firm Scenario	Planned Scenario	Firm Scenario	Planned Scenario	Firm Scenario	Planned Scenario
1	Installed Resources (MW)	36,358	36,388	33,357	33,397	33,357	35,470
2	Total Reductions in Resources (MW)	5,996	5,986	4,884	4,875	5,227	7,309
3	Demand Measures (MW)	588	694	779	784	588	732
4	Available Resources (MW)	30,950	31,097	29,252	29,306	28,718	28,892

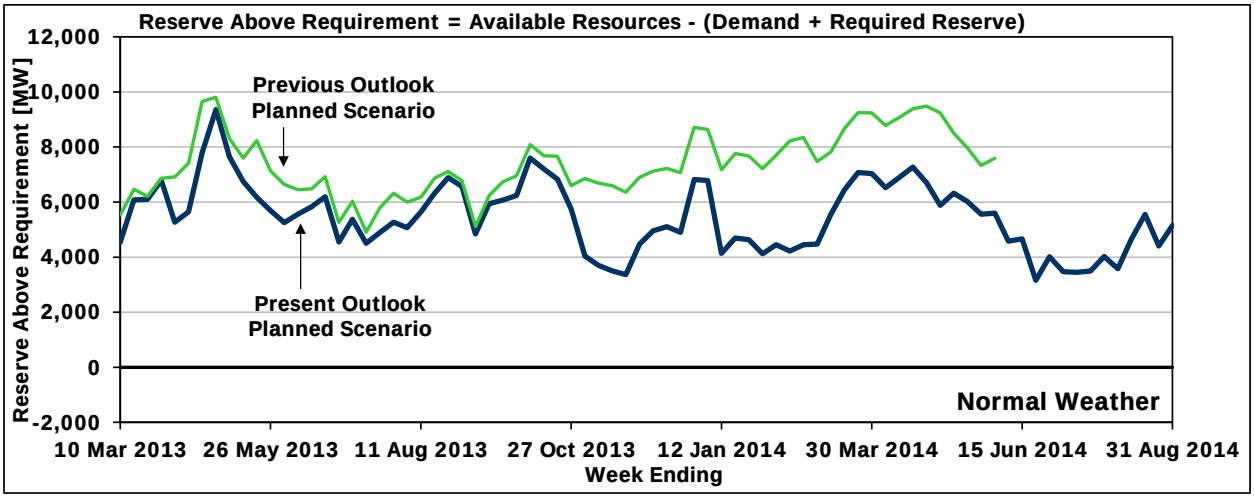
Notes on Table 4.4:

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 November 23, 2012. 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 January 2, 2013.

5.3 Transmission System Adequacy

The IESO assesses transmission adequacy on the basis of conformance to established criteria, planned system enhancements and known transmission outages. This process is also described in IESO_REP_0266. Zonal assessments are presented in the sections which follow. Overall, the

Ontario transmission system is expected to supply the demand under the normal weather conditions forecast for the Outlook period.

As a result of localized load increases, several parts of the province have been identified as having limited capability of existing transmission infrastructure to meet the IESO's load restoration criteria following a permanent transmission contingency. The IESO, OPA and Hydro One are considering long-term options to address these situations. Areas where activities are underway include York Region, the Ottawa area, and the area supplying Woodbridge TS, Vaughan #3 TS and Kleinburg TS.

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. The OPA and Hydro One are developing transmission enhancement solutions to manage long-term load supply in the south-western GTA

For the short term, day-to-day operating procedures are available to manage the forecasted transmission loading during periods of high demand.

In the eastern part of the GTA, a new Clarington TS, that provides 500/230 kV transformation and 230 kV switching facilities, along with additional reactive capability at Clarington and Cherrywood is scheduled to be in-service as soon as spring 2015 to maintain supply reliability beyond the Pickering station's end-of-life. Clarington TS will also improve restoration capability to loads in the Pickering, Ajax, Whitby, Oshawa and Clarington areas following transmission outages.

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 for more flexibility during day-to-day operation.

Transmission transfer capability in Toronto and 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 115kV 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 the second quarter of 2016. Additionally, a second 230/115 kV autotransformer is expected to be installed at Preston TS in order to help improve the capability of existing transmission infrastructure in the Cambridge area to meet the IESO's load restoration criteria following a contingency. Longer-term solutions to fully address compliance with restoration criteria are being developed.

Transmission transfer capability in Southwest and 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. Until the project is in service, the supply needs in Southern Ontario will continue to be met through the existing 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 second quarter of 2014 and will allow for the incorporation of additional generation in the area.

Transmission transfer capability in Niagara and 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 2013 and will improve the reliability of the 115 kV system supplying the Ottawa area, while enabling the incorporation of generation in the Ottawa area.

Transmission transfer capability in the East and Ottawa zones is 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 bottled 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 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

To further improve the north south transfer capability Hydro One is going to install one shunt capacitor at Pinard TS, planned to go in service by the end of 2014. Hydro One is expected to finish transmission work related to the Lower Mattagami generation expansion project by the second quarter of 2013.

Managing grid voltages in the Northwest has always required special attention. With significantly lower demands over 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 east-west transfers.

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 and Dryden by 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 and the IESO, OPA, Hydro One, local distributors, customers and First Nations are developing a regional planning study that will account for elements of the Ontario Long-Term Energy Plan and recent expansion plans of customers in the area.

The IESO is also working with Hydro One and OPG to accommodate the Atikokan coal shutdown and conversion project currently underway. 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 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

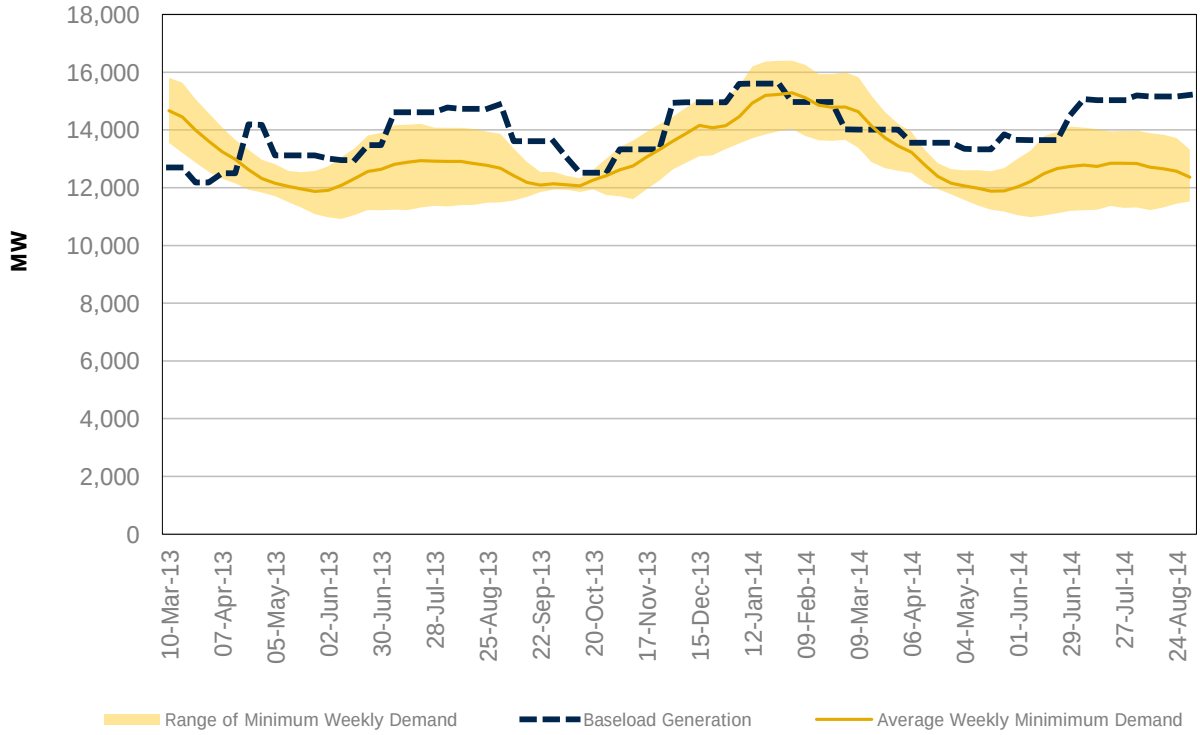
This section provides insight into any existing or emerging operability issues that could potentially impact system reliability.

Ontario's supply mix continues to evolve. The next 18 months will see the transition to renewable resources continue at a significant rate, as several thousand megawatts of grid-connected wind, solar and biomass projects are integrated into normal operations. Preparations for these changes began several years ago, and are now starting to yield results in the areas of forecasting and visibility. The next piece – dispatch of grid-connected renewable resources – is expected to be in place within the forecast period, and will give the IESO one more tool to help manage the system efficiently and reliably.

Over the next 18 months, Ontario expects to have sufficient electricity to meet its projected needs, with occurrences of surplus baseload generation (SBG) during the spring and summer of both 2013 and 2014. A number of factors like low demand, high baseload resources and high winds can combine to result in situations when output from baseload resources may exceed demand, making balancing generation and load more difficult. The inclusion of wind resources in the dispatch process and the increasing volume of nuclear manoeuvering will be valuable tools for the IESO to help manage SBG events.

The expected SBG for the next 18 months can be seen in Figure 6.1. 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. 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. New and upcoming tools such as economic dispatch of nuclear units and wind resources are not currently included in the baseload generation calculation; however, once these units have demonstrated their capabilities they may be incorporated.

Figure 6.1 Minimum Ontario Demand and Baseload Generation (Includes Net Export Assumption)



Progress continues to be made in removing coal-fired generation from the supply mix in Ontario in line with government policy. The remaining generating units at Lambton and Nanticoke are scheduled to stop burning coal by the end of 2013 and the conversion of Atikokan generating station from a coal-fired unit to biomass is underway, with the unit expected to be in service by the third quarter of 2014. As Ontario's coal-fired generation is shut down over the next year, its associated flexibility, such as quick ramping and operating reserve, will be lost. Therefore, future supply options, demand response programs, and storage solutions should also possess this flexibility to help facilitate the management of maintenance outages, provide effective ramp capability, supply operating reserve and even provide regulation when necessary.

- End of Document -