18-MONTH OUTLOOK

From March 2014 to August 2015

ieso
Power to Ontario. On Demand.

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

Executive Summary

The outlook for the reliability of Ontario's electricity system remains positive in the near term.

Over the next year and a half, the Independent Electricity System Operator (IESO) anticipates adequate resources to meet demand. That includes an adequate supply cushion for the summer of 2014.

The forecast period calls for approximately 3,100 megawatts (MW) of new generation to come online, most of it transmission-connected renewable generation. At the same time, the province recently retired nearly 2,000 MW of generation when the remaining units at Nanticoke Generating Station, a coal facility, ceased operation in December 2013. The last 300 MW of coal-fired generation, produced at the Thunder Bay coal facility, will be removed from service in 2014, with half that capacity being converted to biomass fuel.

This transition has occurred without impacting reliability, a fact largely due to adaptations made by the IESO and its market partners in anticipation of the changes. Those new capabilities include dispatch for all grid-connected wind and, soon, solar resources.

Variable generators are responding well to the new dispatch mechanism, which in turn is helping IESO operators balance fluctuations in supply and demand.

Better, more comprehensive information is another key to understanding and adjusting to changes in Ontario's electricity infrastructure and supply mix. The IESO control room is benefitting from two other renewable integration renewable integration initiatives, including real-time and forecast output from distribution-connected resources and enhanced forecasting for grid-connected facilities.

In the planned scenario, under normal weather, the reserve margin is adequate. Planned generator outages in the second quarter of 2015 are currently impacting the supply outlook for that period. If necessary, re-scheduling of planned outages will address this.

The IESO also continues to evolve its energy modelling which now captures a broader spectrum of factors, including transmission constraints and operating characteristics of various resources to produce reliability projections.

Other initiatives are scheduled for implementation within the timeframe of this report. They include a redesigned outage management protocol, which aims to give both additional flexibility and certainty to market participants when it comes to scheduling. New demand forecasting capabilities will be implemented as well.

Demand on the bulk electricity system is predicted to remain flat in the near-term, as economic and population growth is mitigated by expanded embedded generation, pricing factors, demand response initiatives and conservation. While embedded generation production does

not reduce end-use consumption, it reduces the need for grid-supplied energy. As such, embedded solar generation in particular is expected to contribute to lower summer peaks.

Season	Normal Weather Peak (MW)	Extreme Weather Peak (MW)
Summer 2014	23,025	24,958
Winter 2014-15	22,186	23,123
Summer 2015	22,808	24,675

Conclusions & Observations

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

Demand Forecast

- Ontario's grid supplied energy demand will remain flat in 2014. Growth in embedded solar and wind capacity and on-going conservation initiatives reduce the need for bulk power system electricity.
- The growth in embedded solar and wind capacity will also put downward pressure on peak demands on the bulk electric system. Combined with conservation, Global Adjustment impacts and time-of-use rates, summer peaks are expected to face greater downward pressure than winter peaks.
- High peak demands under extreme weather conditions are not expected to pose any province-wide reliability concerns.

Resource Adequacy

- Under the planned scenario, reserve requirements are expected to be met for the entire duration of this Outlook during normal weather. However, the planning reserve is below the requirement for five weeks under the extreme weather scenarios largely due to the overlapping planned outages scheduled for 2015 Q2.
- For the firm scenario, reserve is below the requirement for two weeks under the normal weather scenario and for seven weeks under the extreme weather scenario. The firm scenario excludes any new generating facilities planned to come into service beyond the first three months of the report period, hence the shortfall is more pronounced than in planned scenarios.

	Normal Weather Scenario	Extreme Weather Scenario
Planned Scenario	• There are no weeks when reserve is lower than required	• There are five weeks when reserve is lower than required (May 2015 – June 2015)
Firm Scenario	• There are two weeks when reserve is lower than required (June 2015)	• There are seven weeks when reserve is lower than required (May 2015 – July 2015)

- Coal generating units at Nanticoke Generating Station ceased operation in December 2013.
- The first phase of the Lower Mattagami expansion project is the addition of a third unit at Little Long Generating Station with a 67 MW capacity. This generating unit is expected to be in service in Q1 2014.
- More than 3,100 MW of grid-connected renewable capacity will be added throughout this outlook period, including 280 MW of solar capacity.

Transmission Adequacy

Ontario's transmission system is expected to be able to reliably supply the demand under both 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 in accordance with the Regional Planning Process established by the Ontario Energy Board (OEB).
- To help control voltages in northwestern Ontario, two shunt reactors were installed at Marathon Transformer Station (TS) in December, 2013 and new shunt reactors at Dryden TS are scheduled to be in service by the end of 2014.
- High voltages in southern Ontario continue to occur, especially during periods of light load. High voltages become more acute during these periods when shunt reactors are unavailable. While the IESO and Hydro One are currently managing this situation with day-to-day operating procedures, planning work for the installation of new voltage controls devices has been initiated.
- 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 of Q2 2016.
- In the Cambridge area, a second 230/115 kV autotransformer at Preston TS and associated switching and reactive facilities are planned for 2017. 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.
- Following the re-termination of one of the 230 kV connections to Horner TS at the end of Q2-2014, the load supply capability of the Richview TS to Manby TS corridor will be adequate in the short term. To ensure that load security will continue to be maintained for the long-term, the IESO is working with the OPA, Hydro One and Toronto Hydro to develop the Central Toronto Integrated Regional Resource Plan (IRRP), where solutions considering the full range of integrated demand and supply options are being developed for the area.
- Hydro One is in the process of upgrading 115 kV breakers at Hearn Switching Station (SS) and Leaside TS by Q4 2014. These upgrades will increase short-circuit interrupting capabilities and allow new generation to connect in the Manby and Leaside sectors.
- A new station, Copeland TS, is planned to be in service in downtown Toronto in Q2 2015. The new station will meet the short and mid-term need to facilitate refurbishment of facilities at John TS.
- Following receipt of environmental approvals, the development of Clarington TS is proceeding with a scheduled in-service date of fall-2017. This facility will provide 500/230

kV transformation and 230 kV switching facilities to maintain supply reliability beyond Pickering GS end-of-life. Clarington TS will also improve reliability to loads in the Pickering, Ajax, Whitby, Oshawa and Clarington areas.

Operability

- Renewable Integration Initiative (RII) tools, which were implemented in September 2013 have already yielded positive results and continue to provide operational flexibility. The integration of hourly centralized forecast into the IESO scheduling tools has enhanced visibility of renewable output and has been instrumental in avoiding shutdowns of nuclear generating units during SBG periods.
- Conditions for surplus baseload generation are likely to continue in 2014 and 2015. However, it is expected that SBG will be managed effectively via normal market mechanisms including export scheduling, nuclear maneuvering or shutdown and the dispatch of grid-connected renewable resources.

Caution and Disclaimer

The contents of these materials are for discussion and information purposes and are provided "as is" without representation or warranty of any kind, including without limitation, accuracy, completeness or fitness for any particular purpose. The Independent Electricity System Operator (IESO) assumes no responsibility to you or any third party for the consequences of any errors or omissions The IESO may revise these materials at any time in its sole discretion without notice to you. Although every effort will be made by the IESO to update these materials to incorporate any such revisions it is up to you to ensure you are using the most recent version.

Table of Contents

List of Tables

List of Figures

1 Introduction

This Outlook covers the 18-month period from March 2014 to August 2015 and supersedes the last Outlook released on December 12, 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/Pages/Participate/Reliability-Requirements/Forecasts-&-18-Month-Outlooks.aspx

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 December 2013. The demand forecast has been updated to reflect the most recent economic projections. Actual weather and demand data for January 2014 has been included in the tables.

2.2 Updates to Resources

Nanticoke Generating Station was shutdown ahead of schedule in December 2013 which has lowered Ontario's coal footprint by 1,985 MW.

The 18-month assessment uses planned generator outages submitted by market participants to the IESO's Integrated Outage Management System (IOMS) as of January 15, 2014. In addition, updates to available resources include the expected forced outage rates, seasonal generation derates and variable resource contribution as determined by market participants or calculated by the IESO based on actual experience.

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 15, 2014 were used.

2.4 Updates to Operability Outlook

The outlook for surplus baseload generation (SBG) conditions over the next 18 months uses the updated planned generator outages as well as estimated net exports determined based on previous experience. The generator outage plans are submitted by market participants to the IESO's IOMS. This Outlook is based on submitted generation outage plans as of January 15, 2014.

- 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 March 2014 to August 2015 and supersedes the previous forecast released in December 2013. Tables of supporting information are contained in the 2014 Q1 Outlook Tables spreadsheet.

Electricity demand is being shaped by a number of factors – economic expansion, population growth, conservation initiatives, embedded generation capacity growth, time of use rates and the Global Adjustment Allocation. How each of these factors impacts electricity consumption varies by season and time.

Grid supplied energy demand is forecast to remain flat in 2014 after a decline of 0.6% in 2013. Economic expansion and population growth lead to increased demand for electricity. At the same time, conservation and increasing embedded generation output offset the need for grid supplied electricity by reducing end-use consumption and by generating electricity on the distribution system. For 2014 these opposing forces are roughly equal and result in no growth in electricity demand for 2014.

Peak demands are subject to the same forces though the impacts vary. Summer peaks are significantly impacted by the growth in embedded generation capacity and pricing impacts (Global Adjustment Allocation and Time of Use rates). The majority of embedded generation is provided from solar powered facilities which have high output levels during the summer peak period and virtually no output during the winter peak. Over the shoulder periods the timing of the peak hour and sunset are moving so the impact of embedded solar can vary. With the five highest peaks occurring during the summer months the Global Adjustment Allocation has a significant impact on the summer peak and none to date on the winter peaks. These impacts combined with conservation savings will see the summer peaks decline over the forecast horizon. Winter peaks are largely subject to downward pressure from conservation as embedded generation and price impacts are more muted during the winter. Though winter peaks will not face the same downward pressure as summer peaks, they still are expected to decline over the forecast period.

Minimum demands are also impacted by these major forces shaping electricity demand. Weather is very impactful during the winter, but otherwise the main drivers are the level of economic activity via industrial loads and embedded wind. With a relatively small share of the embedded generation being wind powered, economic growth will lead minimum demand levels to experience a small 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)
Summer 2014	23,025	24,958
Winter 2014-15	22,186	23,123
Summer 2015	22,808	24,675
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	141.3	0.1%
2013 Energy	140.5	-0.6%
2014 Energy (Forecast)	140.4	0.0%
2015 Energy (Forecast)	139.7	-0.5%

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)
09-Mar-14	19,906	21,265	531	2,848	07-Dec-14	20,848	21,917	409	2,876
16-Mar-14	18,890	20,430	649	2,756	14-Dec-14	20,663	21,898	555	2,876
23-Mar-14	18,298	19,613	611	2,650	21-Dec-14	20,957	22,162	690	2,916
30-Mar-14	18,376	20,132	569	2,677	28-Dec-14	20,094	21,090	362	2,739
06-Apr-14	17,649	19,573	567	2,608	04-Jan-15	20,287	21,315	528	2,820
13-Apr-14	17,381	18,950	471	2,528	11-Jan-15	22,186	23,123	570	3,018
20-Apr-14	16,925	17,693	496	2,436	18-Jan-15	21,534	22,375	547	2,967
27-Apr-14	16,817	17,570	531	2,435	25-Jan-15	21,630	22,318	483	2,970
04-May-14	17,504	19,429	721	2,443	01-Feb-15	21,641	22,319	404	3,006
11-May-14	17,600	19,800	849	2,424	08-Feb-15	20,921	21,972	734	2,960
18-May-14	18,475	21,821	845	2,452	15-Feb-15	20,383	21,761	635	2,878
25-May-14	18,870	21,941	1,175	2,404	22-Feb-15	20,058	21,662	581	2,833
01-Jun-14	18,964	22,175	1,330	2,488	01-Mar-15	20,643	21,648	501	2,914
08-Jun-14	19,883	23,301	1,292	2,625	08-Mar-15	19,776	20,533	531	2,829
15-Jun-14	20,829	23,714	1,055	2,669	15-Mar-15	18,752	19,677	649	2,745
22-Jun-14	21,684	23,966	835	2,753	22-Mar-15	18,171	18,859	611	2,642
29-Jun-14	22,435	24,234	754	2,756	29-Mar-15	18,209	19,343	569	2,646
06-Jul-14	22,667	24,079	1,016	2,690	05-Apr-15	17,929	18,627	567	2,560
13-Jul-14	23,025	24,958	814	2,773	12-Apr-15	17,436	18,371	471	2,518
20-Jul-14	22,889	23,910	838	2,721	19-Apr-15	16,672	17,045	496	2,477
27-Jul-14	22,243	24,131	1,035	2,804	26-Apr-15	16,552	16,949	531	2,452
03-Aug-14	22,226	24,383	841	2,804	03-May-15	17,378	19,707	721	2,431
10-Aug-14	21,483	24,574	958	2,703	10-May-15	17,429	20,029	849	2,409
17-Aug-14	21,387	23,956	985	2,713	17-May-15	18,307	21,556	845	2,434
24-Aug-14	21,364	23,620	1,362	2,751	24-May-15	18,702	21,660	1,175	2,386
31-Aug-14	20,263	22,976	1,413	2,657	31-May-15	19,217	21,418	1,330	2,437
07-Sep-14	19,103	22,483	1,370	2,471	07-Jun-15	19,604	23,156	1,292	2,615
14-Sep-14	18,884	21,130	680	2,472	14-Jun-15	20,773	23,560	1,055	2,649
21-Sep-14	18,729	19,847	781	2,533	21-Jun-15	21,549	23,920	835	2,693
28-Sep-14	17,855	18,107	420	2,482	28-Jun-15	22,338	24,067	754	2,759
05-Oct-14	16,927	17,551	554	2,461	05-Jul-15	22,483	23,844	1,016	2,715
12-Oct-14	17,168	17,660	786	2,490	12-Jul-15	22,808	24,675	814	2,779
19-Oct-14	17,890	18,277	507	2,474	19-Jul-15	22,633	23,801	838	2,674
26-Oct-14	17,873	18,294	392	2,542	26-Jul-15	22,136	24,052	1,035	2,784
02-Nov-14	18,461	18,854	318	2,597	02-Aug-15	22,072	24,225	841	2,777
09-Nov-14	18,759	19,498	416	2,640	09-Aug-15	21,400	24,462	958	2,730
16-Nov-14	19,328	19,977	601	2,704	16-Aug-15	21,327	23,932	985	2,724
23-Nov-14	19,809	20,559	342	2,756	23-Aug-15	21,274	23,521	1,362	2,741
30-Nov-14	20,320	21,464	607	2,806	30-Aug-15	20,098	22,833	1,413	2,637

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 was colder than normal at the end of the month. Overall, Ontario's energy demand for the month was 11.6 TWh (11.7 TWh weather corrected). These were the highest November energy values post-recession. The monthly peak was 20,615 MW (21,267 MW weather corrected) and occurred on November 28th, which was not the

coldest day of the month. The coldest temperatures fell on the weekend prior which reduced the weathers impact. The peak was the highest post-recession peak for November.

- Wholesale customers' consumption increased by 3.0% over the previous November. Growth was led by the mining sector, followed by pulp & paper and chemicals.

December

- December was colder than normal. The monthly Ontario energy demand was 12.8 TWh (12.5 TWh weather corrected) and would have been slightly higher without the ice storm impacts. The peak did not occur on the coldest day as those temperatures landed on a weekend. The peak was 22,556 MW (22,047 MW weather corrected). All values – peaks and energy demand – were higher than a year previous.
- Wholesale customers' consumption increased by 4.5% over the previous December with growth coming from the mining and iron & steel sectors.

January

- The weather for January was colder than normal with the peak demand occurring on the third coldest day of the month. The peak temperatures were not significantly colder than normal however, the number of cold days were much higher than normal. The actual peak for the month was 22,774 MW (22,119 MW weather corrected). The actual is fairly consistent with the experience since 2009 though the weather corrected value is on the low side. The monthly Ontario energy demand was 13.6 TWh (13.3 TWh weather corrected) both of which were the highest since January 2009.
- Wholesale customers' consumption increased for the fifth consecutive month. Their consumption rose 0.1% compared to the last January.

Overall, energy demand for the three months from November to January was up 4.2% compared with the same three months one year prior. Most of the increase was due to the colder than normal weather, but after adjusting for the cold weather demand for the three months will still up 0.8%.

For the three months wholesale customers' consumption posted a healthy 2.5% increase over the same months a year prior. The increased industrial load helps explain some of the overall growth for this time period.

The 2014 Q1 Outlook Tables spreadsheet contains 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

Recent economic developments bode well for the Ontario economy. The strengthening U.S. economy will benefit Ontario in two ways. First, growing U.S. demand will translate into more exports. Secondly, a stronger U.S. economy has buoyed the U.S. dollar. A lower Canadian dollar will improve the competitive position of Ontario's energy intensive export industries. Should the Canadian dollar stabilize and remain below the 90 cent mark for the duration of 2014, the positive impacts will take hold in 2015.

Although the economic outlook looks much better than it did last year, there are still abundant global risks. Debt loads, emerging market instability and U.S. politics regarding the fiscal cliff could sidetrack economic growth in 2014. Domestically, the risk of disinflation remains a concern with the Bank of Canada.

- The risks aside, Ontario's economy should see improved growth in 2014 and 2015. Table 3.3.4 of the 2014 Q1 Outlook Tables presents 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 2014 Q1 Outlook Tables presents the weekly weather data for the forecast period.

Conservation, Demand Management and Pricing

Conservation will continue to grow throughout the forecast period. 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 resource capacity.

The impact of time of use rates and the Global Adjustment Allocation are factored into the demand forecast as they have a negative impact on peak demands.

- 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 will reject outages based on their order of precedence. Conversely, an opportunity exists for additional outages when reserves are above required levels.

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 January 15, 2014

Fuel Type	Total Installed Capacity (MW)	Forecast Capability at Summer Peak (MW)	Number of Stations	Change in Installed Capacity (MW)	Change in Stations
Nuclear	12,947	12,872	5	0	0
Hydroelectric	7,939	5,718	70	0	0
Coal	306	0	1	-1,985	-1
Oil / Gas	9,920	8,718	29	0	0
Wind	1,725	235	14	0	0
Biomass / Landfill Gas	124	84	7	0	0
Total	32,961	27,627	126	-1,985	-1

4.1 Assessments Assumptions

4.1.1 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/Pages/Participate/Connection-Assessments/default.aspx 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. This data is accurate as of January 15, 2014. 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			Commercial Operation	40	40
East Lake St. Clair Wind	West	Wind			Commercial Operation	99	99
Summerhaven Wind Energy Centre	Southwest	Wind			Commercial Operation	125	125
Erieau Wind	West	Wind			Commercial Operation	99	99
Becker Cogeneration Plant	Northwest	Biomass	2014-Q1		Construction	8	8
New Third Unit at Little Long	Northeast	Water	2014-Q1		Commissioning	67	67
Port Dover and Nanticoke Wind Project	Southwest	Wind	2014-Q1		Commissioning	104	104
New Third Unit at Harmon	Northeast	Water	2014-Q2		Construction	78	78
Bornish Wind Energy Centre	Southwest	Wind	2014-Q3		NTP		74
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		NTP		60
Jericho Wind Energy Centre	Southwest	Wind	2014-Q3		Pre-NTP		150
Atikokan conversion to biomass	Northwest	Biomass	2014-Q3		Construction		205
White Pines Wind Farm	East	Wind	2014-Q3		Pre-NTP		60
Thunder Bay Unit 3 Shutdown	Northwest	Coal	2014-Q3			-153	-153
Northland Power Solar Abitibi	Northeast	Solar	2014-Q3		NTP		10
Northland Power Solar Empire	Northeast	Solar	2014-Q3		NTP		10
Northland Power Solar Long Lake	Northeast	Solar	2014-Q3		NTP		10
Northland Power Solar Martin's Meadows	Northeast	Solar	2014-Q3		NTP		10
Goshen Wind Energy Centre	Southwest	Wind	2014-Q3		Pre-NTP		102
South Kent Wind Project	West	Wind	2014-Q3		Construction		270
Haldimand Wind Project	Southwest	Wind	2014-Q4		Construction		149
Leamington Pollution Control Plant	West	Oil	2014-Q4				2
Thunder Bay Unit 2 Shutdown	Northwest	Coal	2014-Q4			-153	-153
Adelaide Wind Power Project	West	Wind	2014-Q4		Pre-NTP		40
Bluewater Wind Energy Centre	Southwest	Wind	2014-Q4		NTP		60
Grand Valley Wind Farms (Phase 3)	Southwest	Wind	2014-Q4		Pre-NTP		40
McLean's Mountain Wind Farm	Northeast	Wind	2014-Q4		Construction		60
Kingston Solar Project	East	Solar	2014-Q4		pre-NTP		100
Liskeard 1	Northeast	Solar	2014-Q4		NTP		10
Liskeard 3	Northeast	Solar	2014-Q4		NTP		10
Liskeard 4	Northeast	Solar	2014-Q4		NTP		10
Armow Wind Project	Southwest	Wind	2014-Q4		pre-NTP		180
New Unit at Smoky Falls	Northeast	Water	2014-Q4		Construction		89
Twin Falls	Northeast	Water	2014-Q4		Construction		5
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
Thunder Bay Unit 3 conversion to biomass	Northwest	Biomass	2015-Q1				153
New Third Unit at Kipling	Northeast	Water	2015-Q1		Construction		78
Trout Lake River Hydroelectric Project	Northwest	Water	2015-Q1		Pre-NTP		4
Second New Unit at Smoky Falls	Northeast	Water	2015-Q1		Construction		89
Decommission the existing Smoky Falls Units	Northeast	Water	2015			-52	-52
Dufferin Wind Farm	Southwest	Wind	2015-Q1		NTP		100
Third New Unit at Smoky Falls	Northeast	Water	2015-Q2		Construction		89
Goulais Wind Farm	Northeast	Wind	2015-Q2		pre-NTP		25
Gitchi Animki Bezhig Generating Station	Northwest	Water	2015-Q2		Construction		9
Gitchi Animki Niizh Generating Station	Northwest	Water	2015-Q2		Construction		10
Niagara Region Wind Farm	Southwest	Wind	2015-Q2		Pre-NTP		230
Bow Lake Phase 1	Northeast	Wind	2015-Q2		pre-NTP		20
Haldimand Solar Project	Southwest	Solar	2015-Q2		NTP		100
K2 Wind Project	Southwest	Wind	2015-Q2		pre-NTP		270
High Falls Hydropower Development	Northwest	Water	2015-Q2		Pre-NTP		5
Namewaminikan Waterpower Project	Northwest	Water	2015-Q2		NTP		10
Total						**262**	**3,306**

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 but has not met all the commissioning requirements of the IESO.

4.1.2 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. The Firm Scenario only assumes resources, scheduled to come into service over the first three months of the report period as well as generators that have started commissioning are available. The Firm and Planned Scenarios also differ in their assumptions regarding the amount of demand measures. Both scenarios recognize that resources 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 generation capability assumptions are as follows:

- The hydroelectric capability for the duration of this outlook is typically based on median historical values (including energy and operating reserve) 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.
- Thermal generators' capacity and energy contributions are based on market participant submissions, including planned outages, expected forced outage rates and seasonal deratings.
- Non-utility Generators (NUGs), whose contracts have expired but which continue to operate and provide forecasts are included in both planned and firm scenarios. NUGs, whose contracts are expiring during the Outlook period, are excluded from the Firm scenario after their contract expiry date. These NUGs are included as part of the planned scenario if they have provided forecast data. Former NUGs, which subsequently reach a

contract with the OPA or register with the IESO as a dispatchable facility will be added to both scenarios.

- 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)	32,961	
	New Generation and Capacity Changes (MW)	All Projects	Generator shutdowns or retirements, Commissioning Generators and Generators starting in the first 3 months
		3,306	262

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

		2014 Summer Peak	2015 Summer Peak
Seasonal Peak Comparison	Growth in Conservation at Peak (MW)	170	
	Growth in Embedded Generation Capacity at Peak (MW)	230	
	Demand Measures Effective Capacity at Peak (MW)	503	568

Notes on Table 4.4:

1. Conservation and embedded generation impacts are included in the peak demand forecast.
2. Demand Measures capacity is included in the Resource Capacity.

4.2 Capacity Adequacy Assessment

The capacity adequacy assessment accounts for zonal transmission constraints imposed by planned transmission outages. The planned outages occurring during this Outlook period have been assessed as of January 15, 2014.

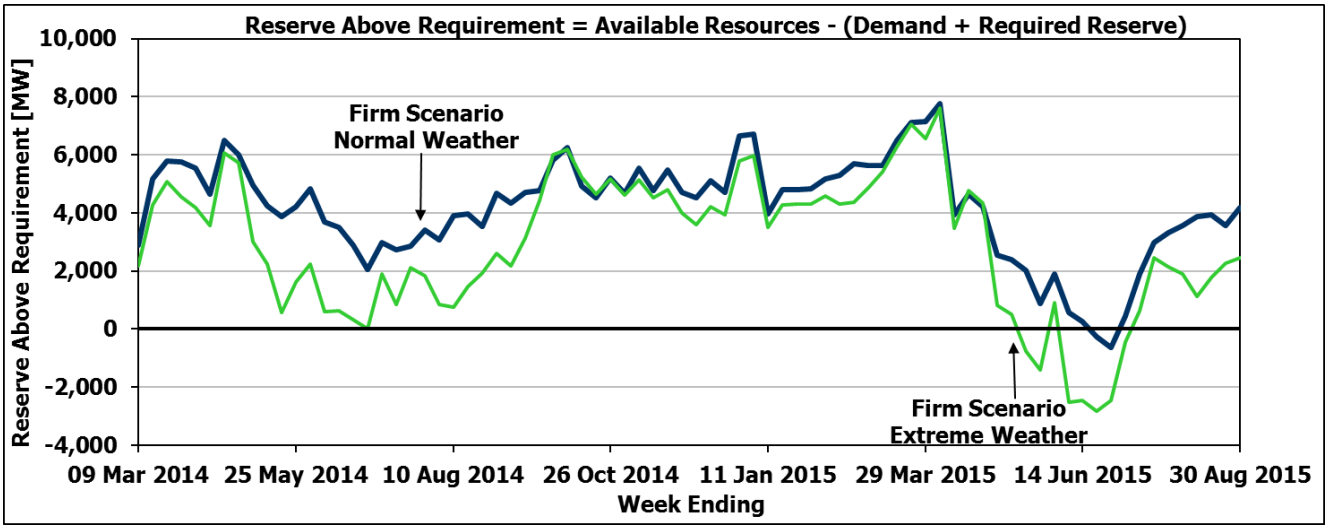
4.2.1 Firm Scenario with Normal and Extreme Weather

The firm scenario incorporates capacity coming in service in the first three months of the Outlook period, generation being commissioned and generation being removed from service

during the 18 months. This will include the addition of about 427 MW of wind, 48 MW of biomass and 67 MW of hydroelectric capacity.

Reserve Above Requirement (RAR) levels, which represent the difference between Available Resources and Required Resources, are shown in Figure 4.1. As can be seen, there are two weeks in June 2015 when reserve is lower than the requirement during normal weather. During extreme weather conditions, the reserve is lower than the requirement for seven weeks in summer of 2015. This shortfall is largely attributed to the outages scheduled for summer of 2015. Planned outages may need to be re-scheduled to meet the reserve requirement criteria, especially during extreme weather conditions.

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

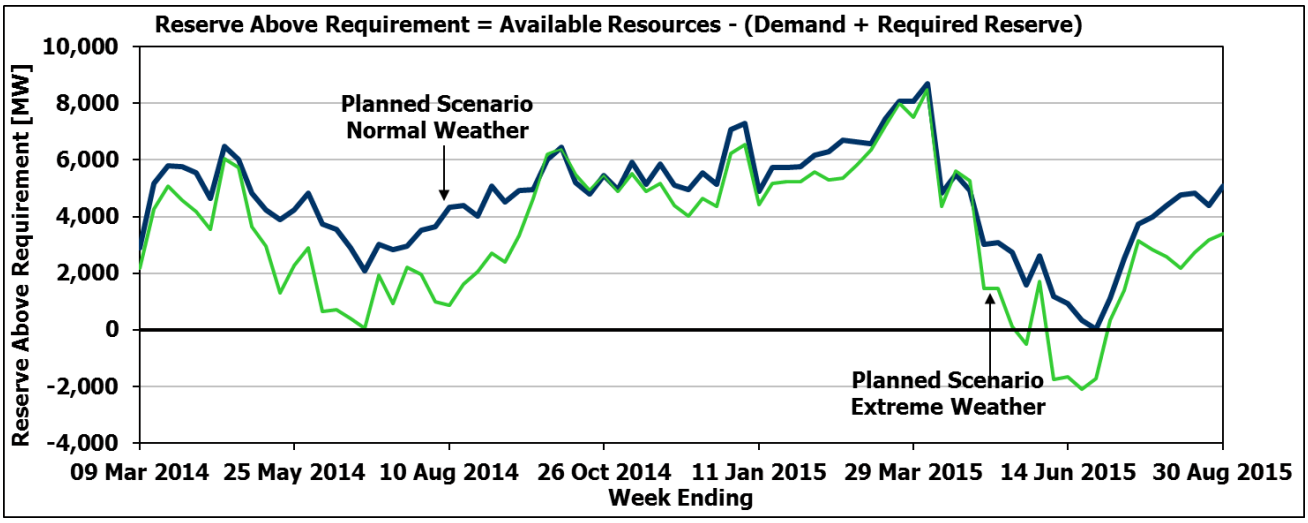


4.2.2 Planned Scenario with Normal and Extreme Weather

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 3,100 MW of grid-connected renewable resources 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. As can be seen, the reserve is lower than the requirement for five weeks in summer of 2015 under extreme weather conditions. This shortfall is largely attributed to the planned outages scheduled for summer of 2015. Planned outages may need to be rescheduled for Ontario to meet its reserve requirement criteria, especially during extreme weather conditions.

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



4.2.3 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.

Table 4.5: Summary of Available Resources

Notes	Description	Summer Peak 2014		Winter Peak 2015		Summer Peak 2015	
		Firm Scenario	Planned Scenario	Firm Scenario	Planned Scenario	Firm Scenario	Planned Scenario
1	Installed Resources (MW)	33,581	33,765	33,275	35,100	33,223	36,267
2	Total Reductions in Resources (MW)	5,641	5,732	4,729	5,694	6,352	8,816
3	Demand Measures (MW)	503	503	496	561	503	568
4	Available Resources (MW)	28,444	28,536	29,042	29,967	27,375	28,019

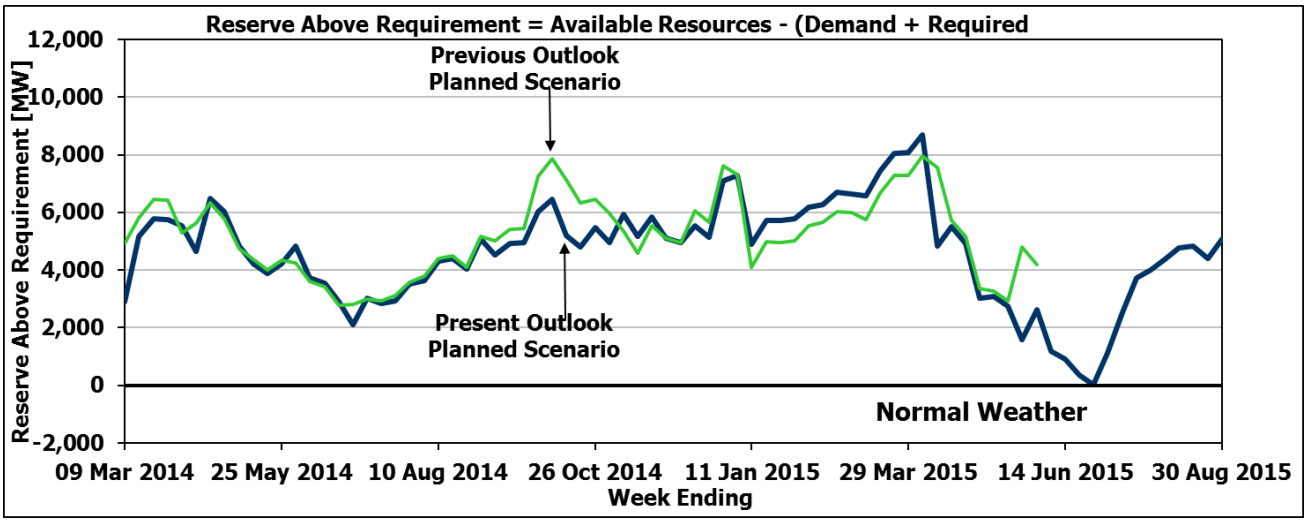
Notes on Table 4.5:

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 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 December 12, 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".

4.3 Energy Adequacy Assessment

This section provides an assessment of energy adequacy, the purpose of which is to determine whether Ontario has sufficient supply to meet its energy demands and to highlight any potential concerns associated with energy adequacy within the period covered under this 18-Month Outlook.

4.3.1 Summary of Energy Adequacy Assumptions

In order to achieve results consistent with the capacity adequacy assessments, the energy adequacy assessment is performed using the same set of assumptions pertaining to resources expected to be available over the next 18 months. Refer to Table 4.1 for the summary of 'Existing Generation Resources' and Table 4.2 for the list of 'Committed and Contracted Generation Resources' for this information.

For the energy adequacy assessment, only the Firm Scenario as per Table 4.3 with normal weather demand is considered. The key assumptions specific to the Energy Adequacy Assessment (EAA) are described in the IESO document titled "Methodology to Perform Long Term Assessments".

4.3.2 Results - Firm Scenario with Normal Weather

Table 4.6 summarizes key energy statistics over the 18-month period for the Firm Scenario with normal weather demand for Ontario as a whole, and provides a breakdown for each transmission zone. The results indicate that occurrences of unserved energy are not expected over the 18-month timeframe of this Outlook.

Based on these results it is anticipated that Ontario will be energy adequate for the normal weather scenario for the review period.

Table 4.6: Firm Scenario - Normal Weather: Key Energy Statistics for Ontario by Transmission Zone over the period March 3, 2014 to August 30, 2015

Zone	18 -Month Energy Demand		18-Month Energy Production		Net Inter-Zonal Energy Transfer	Potential Un-served Energy	Zonal Energy Demand on Peak Day of 18-Month Period	Available Energy on Peak Day of 18- Month Period
	TWh	Average MW	TWh	Average MW	TWh	GWh	GWh	GWh
Ontario	**207.9**	**15,867**	**207.9**	**15,867**	**0.0**	**0.0**	**459.4**	**622.3**
Bruce	1.1	87	63.2	4,824	62.1	0.0	2.2	151.0
East	12.0	919	13.8	1,053	1.8	0.0	25.3	67.1
Essa	10.3	782	3.3	248	-7.0	0.0	21.8	15.9
Niagara	6.1	466	17.6	1,346	11.5	0.0	14.4	41.5
Northeast	15.7	1,200	15.5	1,186	-0.2	0.0	25.3	35.6
Northwest	5.9	452	7.5	573	1.6	0.0	9.9	20.7
Ottawa	15.7	1,197	0.6	45	-15.1	0.0	34.5	1.9
Southwest	42.6	3,252	3.4	259	-39.2	0.0	92.5	19.5
Toronto	78.3	5,972	73.9	5,639	-4.4	0.0	187.1	200.3
West	20.2	1,540	9.1	694	-11.1	0.0	46.4	68.9

The monthly forecast of energy production capability, based on information provided by market participants, is included in the 2014 Q1 Outlook Tables Appendix A, Table A7.

Figures 4.4 and 4.5 show the percentage contribution from each resource type for each calendar year of the 18-month period under conditions of zero net exports, while Table 4.7 summarizes these simulated production results by resource type, for each year.

Figure 4.4: Production by Fuel Type - Mar 3 to Dec 31, 2014 (%)

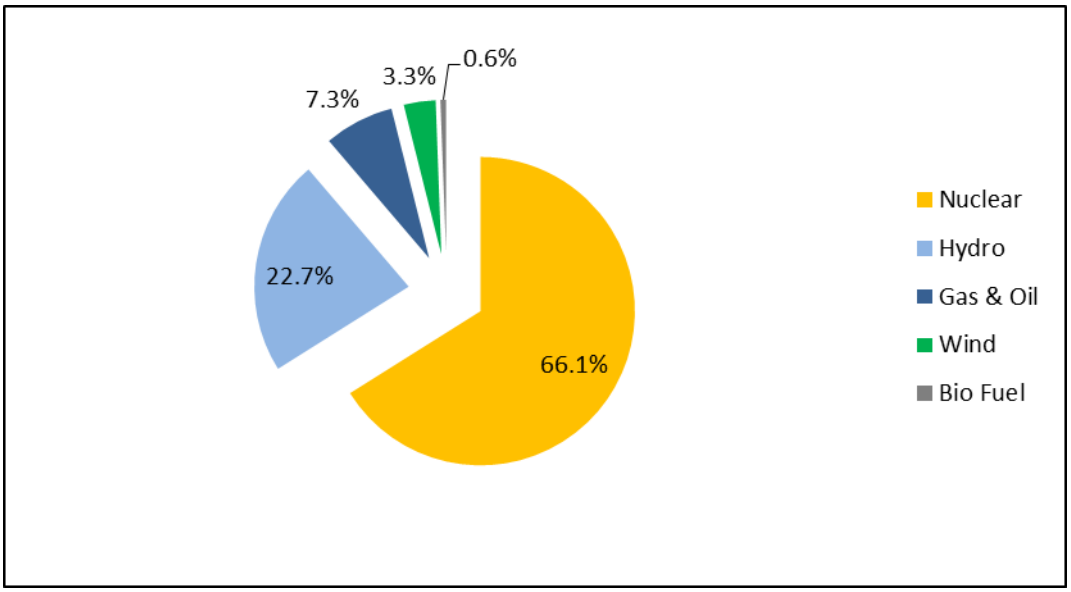


Figure 4.5: Production by Fuel Type - Jan to Aug 2015 (%)

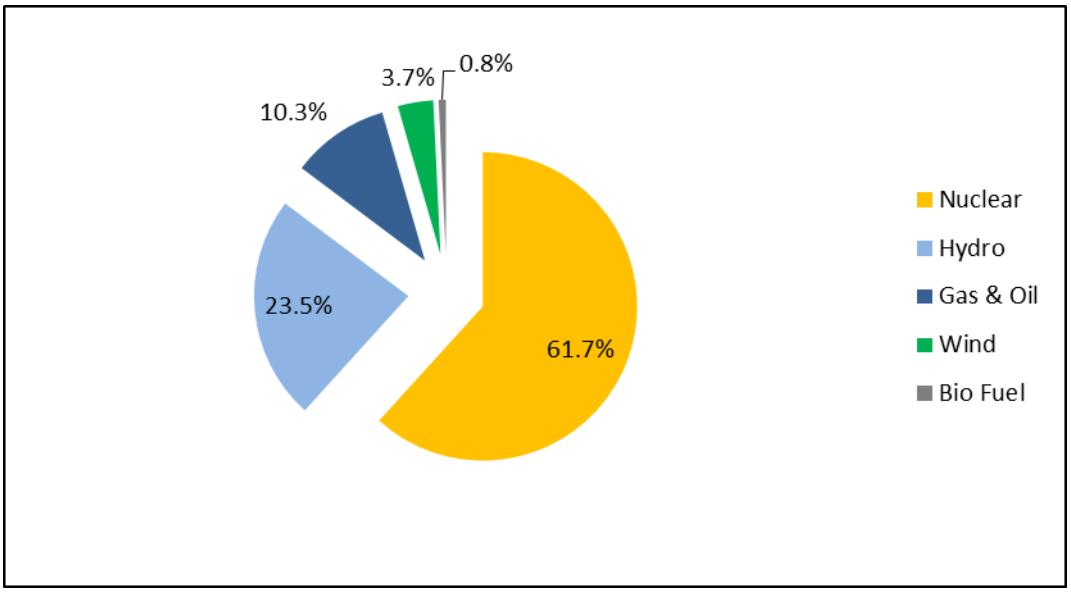


Table 4.7: Firm Scenario - Normal Weather: Ontario Energy Production by Fuel Type for 2014 and 2015

Grid-Connected Resource Type	2014 (Mar – Dec)	2015 (Jan – Aug)
	(GWh)	(GWh)
Nuclear	75,701	57,575
Hydro	25,999	21,963
Gas & Oil	8,383	9,582
Wind	3,827	3,459
Bio Fuel	679	706
Other (Solar & DR)	19	30
Total	114,608	93,315

4.3.3 Findings and Conclusions

The energy adequacy assessment results indicate that Ontario is expected to have sufficient supply to meet its energy forecast during this 18-Month Outlook period for the Firm Scenario with normal weather demand. However, additional sensitivity studies that included a provision for the load forecast uncertainty identified an increased risk of resource shortfall in June 2015, consistent with the results from the capacity adequacy assessment presented in section 4.2. This shortfall is largely attributed to the planned outages, which may need to be re-scheduled.

- 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;
- Evaluate transmission system adequacy based on the forecast 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 significant load growth to warrant 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". This Outlook contains transmission outage plans submitted to the IESO as of January 15, 2014.

5.3 Transmission System Adequacy

The IESO assesses transmission adequacy using the methodology 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.

The existing transmission infrastructure in some areas in the province, as described below, have been identified as currently having or anticipated to have some limitations to supply the local needs. Hydro One, the IESO and the OPA are considering long-term options to address these situations in accordance with local communities under the Regional Planning Process established by the OEB.

5.3.1 Toronto and Surrounding Area

The load supply capability to the GTA is expected to be adequate to meet the forecast demand through to the end of this 18-month period.

Following the re-termination of one of the 230 kV connections to Horner TS at the end of Q2-2014, the load supply capability of the Richview TS to Manby TS corridor will be adequate in the short term. To ensure that load security will continue to be maintained in the long-term, the IESO is working with the OPA, Hydro One and Toronto Hydro to develop the Central Toronto IRRP, where solutions that consider the full range of integrated demand / supply options are being developed for the Richview TS to Manby TS corridor.

Hydro One is continuing with the replacement of the 115 kV breakers at Manby TS and Leaside TS as well as the replacement of the entire 115 kV switchyard at Hearn SS. The new equipment is expected to be in service by the end of 2014 and will allow additional generation to be incorporated into the Toronto 115 kV system.

Following receipt of environmental approvals, the development of Clarington TS is proceeding with a scheduled in-service date of fall-2017. This will ensure that the increased 500 kV to 230 kV transformation capacity that it will provide will be available before Pickering GS is shutdown. Without this additional capacity there would have been an increased risk of the existing auto-transformers at Cherrywood being overloaded.

The associated 230 kV switching facilities at Clarington TS will also improve the supply reliability to the loads in the Pickering, Ajax, Whitby, Oshawa and Clarington areas by providing a full, alternative source of supply to these loads.

In central Toronto, Copeland TS is expected to be in service in Q2 2015. The new station will accommodate some load to be transferred from John TS. This will help meet the short- and mid-term need for additional supply capacity in the area and will also facilitate the refurbishment of the facilities at John TS.

High voltages in southern Ontario continue to present operational challenges during periods of light load. The situation has become especially acute during those periods when the shunt reactors at Lennox TS have been unavailable due either to repair or maintenance activities. While the IESO and Hydro One are currently managing this situation with day-to-day operating procedures, planning work for the installation of new voltage controls devices has been initiated.

In order to increase the load meeting capability of the two 230 kV circuits between Claireville TS and Minden TS and allow the proposed Vaughan TS No. 4 to be connected, Hydro One is planning to install two 230 kV in-line breakers at Holland TS, together with a load rejection scheme. These facilities are scheduled to be in-service by early 2017. Until these facilities

become available, operational measures will be required to avoid possible overloading of these circuits during peak load periods.

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, circuit- switchers or breakers will be installed at Guelph North Junction 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 coordination with the Guelph Area Transmission Refurbishment project, a second 230/115 kV autotransformer at Preston TS, together with the associated switching and reactive facilities, is also planned to be in-service by 2017. This incremental investment is required not only to reduce the interruption time for the affected customers in the Cambridge area following a major transmission outage, but also to accommodate the development of the Cambridge No. 2 transformer station on the 115kV system between Preston TS and Detweiler TS to meet the increased load in the area.

Beyond 2016, further facilities will be required to address the longer term supply needs of the area and also to satisfy the IESO's load restoration criteria.

Two new 500 kV switching stations, Evergreen and Ashfield, are planned to be in service by the end of 2014 to accommodate new wind farms rated at 384 MW and 270 MW, respectively.

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

Completion of the transmission reinforcements from the Niagara region into the Hamilton-Burlington area continues to be delayed. 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 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 the 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 transmission system supplying the Ottawa area, while enabling the incorporation of new generation in the Ottawa area. To address load growth in the Ottawa area, a new load supply transformer station, Terry Fox MTS went into service in December, 2013. Another transformer station Orleans TS, is expected to come into service by Q2 2015.

A joint regional planning group representing the IESO, OPA, Hydro One and the affected distributors is currently assessing the supply and reliability needs in the Ottawa area and examining potential alternatives to address these needs.

When high imports from Hydro Quebec on the HVDC interconnection coincide with peak loads in the Ottawa area, the 230 kV circuits between Hawthorne TS and Merivale TS can be thermally limiting. This is currently managed with operational measures. The IESO and the OPA, working with Hydro One, will assess the need for bulk system enhancements to manage this issue in the future.

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 upgrading the thermal rating of 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 into 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

In northeast Ontario, Hydro One is expected to finish the transmission work required to accommodate the increased output from the Lower Mattagami generation expansion project by the end of Q2 2014. 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, particularly during times with low westbound power transfers into the zone.

To reduce and eventually eliminate the dependence on operational measures for voltage control in northwest Ontario, additional reactive compensation is required. New shunt reactors came into service at Marathon in December, 2013 and new shunt reactors at Dryden will be in service by the end of 2014 to help resolve this problem. Atikokan generating station, which is being converted to biomass, is slated to come in service during 2014 Q3 and will further improve the voltage management capability in this area.

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 OPA has issued a draft IRRP, with assistance from the IESO, Hydro One, local distributors, customers and First Nations in the area to resolve these issues. This regional planning study accounts 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 conversion of Atikokan from coal to biomass. Additionally, the Long Term Energy Plan (LTEP) also indicated the conversion of one of the Thunder Bay units from coal to advanced biomass operation. 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.

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 as more than 3,100 MW of wind, solar and biomass capacity are expected be connected to the transmission grid. By August 2015, the total wind and solar generation connected both to the transmission and distribution networks in Ontario are expected to reach 7,000 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 1,800 MW of embedded solar capacity that will be in service during the outlook period.

A number of operational changes arising from the Renewable Integration Initiative (RII) have been implemented to support these levels of new supply including grid-connected dispatch capability, which has already yielded positive results such as preventing nuclear shutdowns during SBG events. Another component, which integrates the hourly centralized forecast into the IESO scheduling tools, provides enhanced visibility of renewable operations within the IESO Control Room.

The capability to dispatch variable generation provides the system operator with increased operational flexibility from available variable generation resources which contributes to increased reliability, and allows the IESO to operate the system more efficiently.

6.1 Surplus Baseload Generation (SBG)

Baseload generation is made up of nuclear, run of the river hydroelectric and variable generation such as wind and solar. 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 export scheduling, nuclear curtailments and wind dispatch scheduled through the IESO-administered markets.

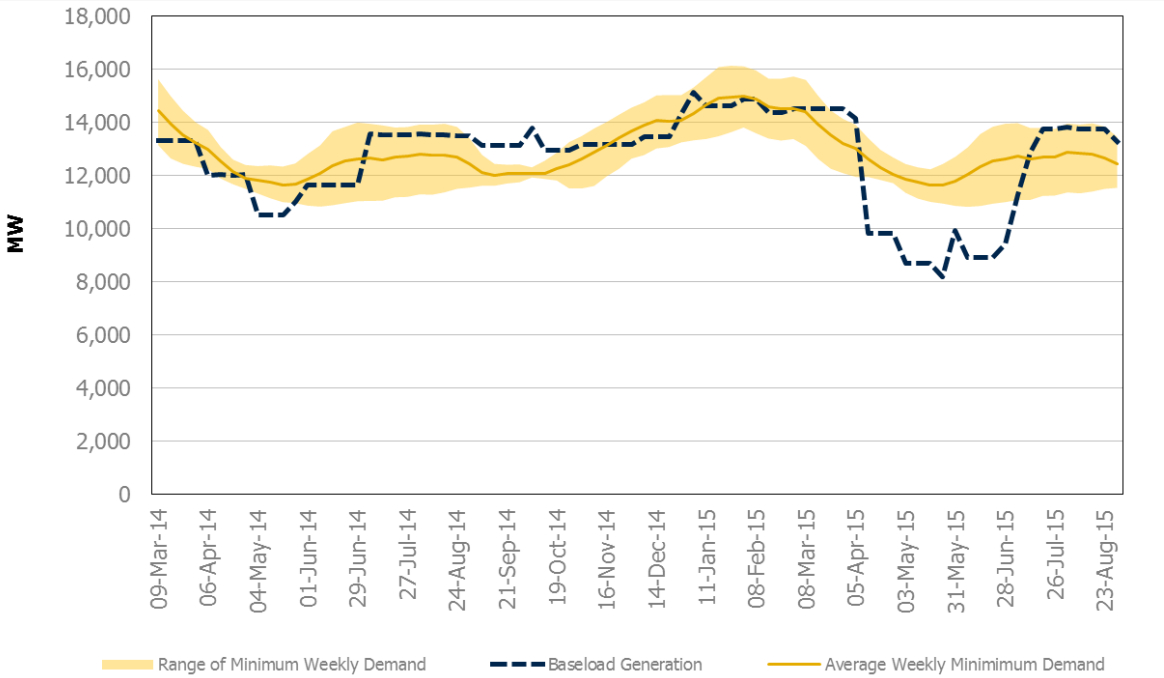
Transmission-connected variable generation became dispatchable in September 2013, thus providing additional flexibility to manage SBG. SBG control actions usually occur in the spring and fall, when the Ontario demand is lowest, but can occur at any time of the year.

The forecast 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, 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

[1] Ontario's aggregate net exports assumption for each month is calculated annually. It considers the median of net exports for the subject month during low demand hours. The median values of net export assumptions range from 1,300 MW to 2,900 MW, depending on the month.

excluded from this analysis due to uncertainty and the highly variable nature of commissioning schedules.

Figure 6.1: Minimum Ontario Demand and Baseload Generation (includes Net Export assumption)



Ontario will continue to experience SBG conditions with declining wholesale demand for electricity and increasing quantities of baseload generation on the system. The steep decline in SBG in the spring of 2015 is attributed to planned generation outages, as previously discussed in section 4.2 of this report. The vast majority of SBG is managed through normal market mechanisms including export scheduling and nuclear maneuvering. IESO's variable generation dispatch tools have provided additional flexibility to manage SBG events.

- End of Document -