18-MONTH OUTLOOK

From December 2013 to May 2015

Power to Ontario. On Demand.

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

Executive Summary

The positive reliability outlook for system conditions is forecast to continue for Ontario in the near term.

Over the next 18 months the Independent Electricity System Operator (IESO) anticipates adequate supply levels and transmission resources to meet provincial demand under both normal and extreme weather conditions. Demand will remain relatively flat over this period.

Approximately 3,300 megawatts (MW) of transmission-connected renewable generation will account for most of the new supply that will come online over the 18-month timeframe covered by this report.

At the same time, the province will retire nearly 2,000 MW when the remaining units at Nanticoke Generating Station, a coal facility, officially cease operation in December 2013. A further 150 MW will be removed from service when the last unit at the Thunder Bay coal generating station begins conversion to biomass fuel in 2014.

Those changes are resulting in a transformed Ontario supply mix.

In order to adapt to this evolving landscape, the IESO has introduced several new operating innovations with the help of its market participant partners. Flexibility, essential to the real-time balancing of supply and demand, is being addressed now through a variety of sources, including increased maneuverability of some nuclear units, demand response measures and new tools for managing wind and solar variability.

Many of these new tools stem from the Renewables Integration Initiative (RII), which augmented visibility, forecast and dispatch elements to IESO operations and the marketplace. That includes the adoption of an hourly, centralized wind and solar forecast and enhanced visibility of renewable operations within the IESO Control room. Both changes have helped manage and maintain system reliability.

In September 2013, the third key element was achieved with the introduction of variable generation dispatch capability. This allows all grid-connected wind and solar resources to be dispatched - enhancing reliability, adding flexibility to the system and increasing market efficiencies by avoiding nuclear generator shutdowns during times of Surplus Baseload Generation, which are expected to continue through the outlook period.

Better, more comprehensive information is one of the keys to understanding and adjusting to the changes in Ontario's electricity infrastructure and supply mix.

This 18-Month Outlook includes one further example of the push for improved information and analysis. New energy modeling software has been used to produce an energy adequacy report, found in Section 4.3. The Energy Adequacy Assessment considers specific operating characteristics of all sources of supply, including variable resources. This provides the IESO with a better estimate of the sources of energy production that will likely be used to meet demand. The analysis also captures a broader spectrum of transmission constraints than is possible with a capacity analysis alone, as was the case in previous 18-Month Outlook reports.

Annual energy demand, meanwhile, is forecast to decrease by 0.5 per cent in 2013 relative to the prior year. Much of this decrease is due to the fact that 2012 was a leap year and had one additional day. Overall, economic and population growth are being mitigated by ongoing conservation initiatives and growth in embedded generation capacity, which is expected to reach 2,500 MW by May 2015. Embedded generation reduces bulk power system demand.

Those same factors will mitigate the growth of electricity consumption in 2014, when, despite more substantial population and economic growth, demand will rise by a modest 0.1 per cent.

Season	Normal Weather Peak (MW)	Extreme Weather Peak (MW)
Winter 2013-14	22,320	23,304
Summer 2014	22,917	24,848
Winter 2014-15	22,294	23,230

Conclusions & Observations

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

Demand Forecast

- Ontario's energy demand is expected to decline in 2013 by 0.5% relative to 2012. Growth in embedded generation capacity and on-going conservation initiatives reduce the need for bulk power system electricity. Since, 2012 was a leap year, the additional day bumped energy demand growth by 0.3%.The 2013 demand forecast therefore includes a corresponding 0.3% reduction in energy demand.
- 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.
- Although high peak demands are likely under extreme weather conditions, they are not expected to pose any province-wide reliability concerns.

Resource Adequacy

- Planning reserve requirements are expected to be met for all weeks in the normal weather scenarios.

	Normal Weather Scenario	Extreme Weather Scenario
Planned Scenario	• There are no weeks when reserve is lower than required	• There is one week when reserve is lower than required (May 2015)
Firm Scenario	• There are no weeks when reserve is lower than required	• There is one week when reserve is lower than required (May 2015)

- Coal generating units: Lambton GS has been shut down and Nanticoke will cease operation by the end of 2013.
- The first phase of the Lower Mattagami expansion project is the addition of a third unit at Little Long Generating Station with a 75 MW capacity. This generating unit is expected to be in service in Q1 2014.
- More than 3,300 MW of grid-connected renewable capacity will be added throughout this outlook period, including 280 MW of solar capacity.
- The IESO is working with the OPA on alternatives to ensure adequate supply to serve the anticipated load in the northwest.

Transmission Adequacy

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

- Several local area supply improvement projects are underway and will be placed in service during the timeframe of this Outlook. These projects, shown in Appendix B, will help relieve loadings of existing transmission stations and provide additional supply capacity for future load growth. The IESO, OPA, Ontario's transmitters and affected distributors are reviewing system needs and considering solutions in accordance with the Regional Planning Process established by the Ontario Energy Board (OEB).
- To help control voltages in northwestern Ontario, Hydro One will be installing new reactors. New reactors at Marathon are scheduled to be in service on December 18, 2013 and those at Dryden are scheduled for Q4 2014.
- High voltages in southern Ontario are being experienced more frequently during periods of light load. High voltages become more acute during these periods if shunt reactors are out-of-service. The IESO and Hydro One are currently managing this situation with day-to-day operating procedures.
- To improve the transmission capability into the Guelph area, Hydro One will be proceeding with the Guelph Area Transmission Refurbishment project to reinforce the supply into Guelph-Cedar Transformer Station (TS), with an expected completion date in Q2 2016.
- In the Cambridge area, a second 230/115 kV autotransformer at Preston TS and associated switching and reactive facilities are planned for 2016. This will provide additional capacity to meet forecast demand growth and help meet the IESO's load restoration criteria following a contingency on the main supply line. Studies will continue to assess the need for additional measures to address longer term needs in the area.
- Hydro One is working to change one of the 230 kV connections to Horner TS by the end of Q2 2014. With the planned change to the supply for Horner TS, the transmission transfer capability in Toronto and its vicinity is expected to be sufficient to supply the forecast load in this area with sufficient margin to allow for planned outages. Hydro One also plans to upgrade 115 kV breakers at Hearn and Leaside by Q4 2014. These upgrades will allow new generation to be connected in Manby and Leaside sectors.
- A new station, Copeland TS, is planned to be in service in downtown Toronto in Q1 2015. The new station will meet the short and mid-term need to facilitate refurbishment of facilities at John TS.
- In the eastern portion of the GTA, the new Clarington TS is scheduled to be in service by spring 2017. This facility will provide 500/230 kV transformation and 230 kV switching facilities to maintain supply reliability beyond Pickering GS end-of-life. Clarington TS will also improve reliability to loads in the Pickering, Ajax, Whitby, Oshawa and Clarington areas.

Operability

- The IESO and its stakeholder partners successfully implemented the dispatch tools, which facilitate a 5-minute forecast for transmission-connected wind and solar, developed under the Renewable Integration Initiative in September 2013. This project is already yielding results by integrating the hourly centralized forecast into the IESO scheduling tools, enhancing visibility of renewable output within the IESO Control Room and avoiding the shutdowns of nuclear generating units during SBG periods.
- Conditions for surplus baseload generation are likely to continue in 2013 and 2014. However, SBG will be managed effectively via normal market mechanisms including export scheduling, nuclear maneuvering or shutdown and the dispatch of grid-connected variable 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.

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1 Introduction

This Outlook covers the 18-month period from December 2013 to May 2015 and supersedes the last Outlook released on September 3, 2013.

The purpose of the 18-Month Outlook is:

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

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

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

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

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

- 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 August 2013. The demand forecast has been updated to reflect the most recent economic projections. Actual weather and demand data for October 2013 has been included in the tables.

2.2 Updates to Resources

Lambton Generating Station has been shut down and its capacity removed from Ontario's installed capacity, shown in Table 4.1. Before shutdown, the station was operating two coal-fired units (1,002 MW) and oil-fired stand-by generators (13.8 MW).

A new biomass generator, Domtar Weyerhaeuser has become operational. This generator can inject up to 2.5 MW into the IESO controlled grid after displacing the load at the facility.

Dow Chemicals installed generating capacity has been corrected to 46 MW.

This 18-Month Outlook includes an Energy Adequacy Assessment (EAA) of Ontario, which was conducted, using a new energy modeling software. The EAA considers specific operating characteristics of all sources of supply, including variable resources, providing the IESO with a better estimate of the sources of energy production which will likely be used to meet hourly demand. The results of the first assessment are included in section 4.3 of this Outlook.

The 18-month 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 October 31, 2013.

2.3 Updates to Transmission Outlook

The list of transmission projects, planned transmission outages and actual experience with forced transmission outages have been updated from the previous 18-Month Outlook. For this Outlook, transmission outage plans submitted to the IOMS as of October 9, 2013 were used.

2.4 Updates to Operability Outlook

The outlook for surplus baseload generation (SBG) conditions over the next 18 months uses planned generator outages as submitted by market participants to the IESO's IOMS. This Outlook is based on submitted generation outage plans as of October 9, 2013.

- End of Section -

3 Demand Forecast

The IESO is responsible for forecasting electricity demand on the IESO-controlled grid. This demand forecast covers the period December 2013 to May 2015 and supersedes the previous forecast released on September 3, 2013. Tables of supporting information are contained in the 2013 Q4 Outlook Tables spreadsheet.

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

Peak demands will face downward pressure from a number of factors. The growth in embedded solar capacity, conservation initiatives, time of use rates and the Global Adjustment Allocation will all have a significant impact on the grid supplied peaks. Contributions from distribution-connected solar resources will supplant grid-supplied electricity and have a significant impact on the summer peak. Conservation reduces the overall need for electricity and price impacts lead electricity customers to shift their usage to off-peak periods. Combined these impacts will act to reduce summer peaks going forward. Conversely, these factors are weaker or absent during the winter peak periods. The winter peak occurs after sundown so it is not impacted by embedded solar. The winter peak load is due to a mix of end-uses unlike the summer peak which is driven primarily by air conditioner load. The price impacts are also muted as the Global Adjustment Allocation has only affected summer peaks so far. While winter peaks will show a slight decrease over the forecast, this decrease will be smaller than the expected decrease in summer peaks

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

Table 3.1: Forecast Summary

Season	Normal Weather Peak (MW)	Extreme Weather Peak (MW)
Winter 2013-14	22,320	23,304
Summer 2014	22,917	24,848
Winter 2014-15	22,294	23,230
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 (Forecast)	140.6	-0.5%
2014 Energy (Forecast)	140.7	0.1%

Table 3.2: Weekly Energy and Peak Demand

Week Ending	Normal Peak (MW)	Extreme Peak (MW)	Load Forecast Uncertainty (MW)	Normal Energy Demand (GWh)	Week Ending	Normal Peak (MW)	Extreme Peak (MW)	Load Forecast Uncertainty (MW)	Normal Energy Demand (GWh)
08-Dec-13	20,721	22,231	677	2,899	07-Sep-14	18,994	22,374	1,370	2,453
15-Dec-13	21,284	22,324	496	2,940	14-Sep-14	18,775	21,021	680	2,453
22-Dec-13	21,395	22,502	585	2,966	21-Sep-14	18,619	19,736	781	2,515
29-Dec-13	19,358	20,827	755	2,725	28-Sep-14	17,746	17,997	420	2,463
05-Jan-14	20,820	21,445	353	2,848	05-Oct-14	16,982	17,441	554	2,464
12-Jan-14	22,320	23,304	570	3,050	12-Oct-14	17,241	17,732	786	2,501
19-Jan-14	21,781	22,656	547	2,995	19-Oct-14	17,962	18,348	507	2,486
26-Jan-14	21,906	22,656	483	3,007	26-Oct-14	17,945	18,365	392	2,553
02-Feb-14	21,759	22,585	404	3,042	02-Nov-14	18,533	18,926	318	2,608
09-Feb-14	20,964	22,250	734	2,991	09-Nov-14	18,830	19,569	416	2,651
16-Feb-14	20,552	22,053	635	2,906	16-Nov-14	19,398	20,047	601	2,716
23-Feb-14	20,324	21,916	581	2,871	23-Nov-14	19,877	20,629	342	2,767
02-Mar-14	20,886	21,842	501	2,943	30-Nov-14	20,391	21,535	607	2,818
09-Mar-14	19,976	21,334	531	2,859	07-Dec-14	20,918	21,989	409	2,887
16-Mar-14	18,961	20,500	649	2,767	14-Dec-14	20,734	21,969	555	2,888
23-Mar-14	18,365	19,681	611	2,661	21-Dec-14	21,027	22,233	690	2,927
30-Mar-14	18,444	20,202	569	2,689	28-Dec-14	20,163	21,160	362	2,750
06-Apr-14	17,732	19,655	567	2,622	04-Jan-15	20,358	21,385	528	2,823
13-Apr-14	17,463	19,033	471	2,542	11-Jan-15	22,294	23,230	570	3,024
20-Apr-14	17,005	17,777	496	2,450	18-Jan-15	21,639	22,482	547	2,973
27-Apr-14	16,899	17,653	531	2,448	25-Jan-15	21,735	22,424	483	2,976
04-May-14	17,587	19,512	721	2,457	01-Feb-15	21,747	22,426	404	3,011
11-May-14	17,685	19,884	849	2,438	08-Feb-15	21,027	22,079	734	2,966
18-May-14	18,558	21,905	845	2,466	15-Feb-15	20,489	21,867	635	2,884
25-May-14	18,955	22,025	1,175	2,418	22-Feb-15	20,164	21,768	581	2,839
01-Jun-14	19,049	22,258	1,330	2,502	01-Mar-15	20,749	21,755	501	2,919
08-Jun-14	19,969	23,387	1,292	2,639	08-Mar-15	19,880	20,638	531	2,835
15-Jun-14	20,915	23,799	1,055	2,683	15-Mar-15	18,855	19,782	649	2,751
22-Jun-14	21,768	24,051	835	2,767	22-Mar-15	18,274	18,963	611	2,648
29-Jun-14	22,521	24,318	754	2,770	29-Mar-15	18,314	19,448	569	2,653
06-Jul-14	22,557	23,969	1,016	2,676	05-Apr-15	18,037	18,732	567	2,567
13-Jul-14	22,917	24,848	814	2,754	12-Apr-15	17,547	18,480	471	2,526
20-Jul-14	22,780	23,800	838	2,703	19-Apr-15	16,782	17,154	496	2,485
27-Jul-14	22,134	24,021	1,035	2,786	26-Apr-15	16,661	17,057	531	2,460
03-Aug-14	22,115	24,272	841	2,786	03-May-15	17,487	19,816	721	2,440
10-Aug-14	21,373	24,464	958	2,684	10-May-15	17,541	20,139	849	2,418
17-Aug-14	21,279	23,847	985	2,695	17-May-15	18,419	21,666	845	2,443
24-Aug-14	21,256	23,511	1,362	2,733	24-May-15	18,813	21,770	1,175	2,394
31-Aug-14	20,153	22,866	1,413	2,638	31-May-15	19,327	21,528	1,330	2,446

3.1 Actual Weather and Demand

Since the last forecast the actual demand and weather data for August, September and October have been recorded.

August

- August was milder than normal. Demand for the month was 12.1 TWh (both actual and weather-corrected). This is a decrease compared to the previous August. The monthly peak was 22,833 MW and occurred on August 29th, which was not the hottest day of the month. The weather corrected peak was similar at 22,892 MW. The actual peak was lower than the previous August and the weather corrected peak on that day was very similar.

- Wholesale customers' consumption decreased by 0.7% over the previous August. Growth has been weak since the spring.

September

- September was slightly milder than normal, though the peak conditions were hotter than normal. The monthly energy was 10.8 TWh (both actual and weather corrected) and the peak was 22,682 MW actual and 20,604 MW weather corrected. The peak occurred on September 10th, which was the second hottest day of the month. Though the peak was higher than the previous September, the energy demand was lower.
- Wholesale customers' consumption increased by 4.0% over the previous September which was a reversal compared to the previous two months.

October

- The weather for October was close to normal with the peak demand occurring on the coldest day of the month. The actual peak for the month was 18,445 MW (18,888 MW weather corrected) which is fairly consistent for October values since 2009. The monthly energy was 11.1 TWh (11.3 TWh weather corrected). These numbers are also consistent with Octobers since 2009.
- Wholesale customers' consumption increased for the second consecutive month. Their consumption rose 4.4% compared to the previous October.

Overall, energy demand for the six months from May to October was down 3.4% compared with the same six months one year prior. Much of that decline was due to the moderate 2013 summer, so after correcting for weather the reduction is a more modest 1.8%. Over the same time, wholesale consumers' consumption had increased by 1.0%.

The 2013 Q4 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

The global economic outlook remains weak, having not changed much over the last several outlooks. There have been some modest economic improvements but sustained and broad based growth has thus far remained elusive.

The outlook for Ontario's economy is likewise for modest improvement over the forecast horizon.

- Table 3.3.4 of the 2013 Q4 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 2013 Q4 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 capacity.

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

- End of Section -

4 Resource Adequacy Assessment

This section provides an assessment of the adequacy of resources to meet the forecast demand. When reserves are below required levels, with potentially adverse effects on the reliability of the grid, the IESO 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 October 23, 2013

Fuel Type	Total Installed Capacity (MW)	Forecast Capability at Winter Peak* (MW)	Number of Stations	Change in Installed Capacity (MW)	Change in Stations
Nuclear	12,947	11,515	5	0	0
Hydroelectric	7,939	6,089	70	0	0
Coal	2,291	0	2	-1,002	-1
Oil / Gas	9,920	9,396	29	-68	0
Wind	1,725	576	14	0	0
Biomass / Landfill Gas	124	92	7	3	1
Total	34,946	27,668	127	-1,067	0

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

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/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. This data is accurate as of September 30, 2013. 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)	Capacity Considered 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	2013-Q4		Construction	8	8
New Third Unit at Little Long	Northeast	Water	2013-Q4		Commissioning	67	67
Nanticoke Coal Shutdown	Southwest	Coal	2013-Q4			-1,985	-1,985
Twin Falls	Northeast	Water	2014-Q1		Construction	5	5
Port Dover and Nanticoke Wind Project	Southwest	Wind	2014-Q1		Commissioning	104	104
Haldimand Solar Project	Southwest	Solar	2014-Q1		NTP		100
Goulais Wind Farm	Northeast	Wind	2014-Q2		pre-NTP		25
South Kent Wind Project	West	Wind	2014-Q2		Construction		270
Leamington Pollution Control Plant	West	Oil	2014-Q2				2
Adelaide Wind Power Project	West	Wind	2014-Q3		Pre-NTP		40
Bornish Wind Energy Centre	Southwest	Wind	2014-Q3		NTP		74
Grand Bend Wind Farm	Southwest	Wind	2014-Q3		Pre-NTP		100
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
Bluewater Wind Energy Centre	Southwest	Wind	2014-Q3		NTP		60
Jericho Wind Energy Centre	Southwest	Wind	2014-Q3		Pre-NTP		150
McLean's Mountain Wind Farm	Northeast	Wind	2014-Q3		Construction		60
Atikokan conversion to biomass	Northwest	Biomass	2014-Q3		Construction		205
White Pines Wind Farm	East	Wind	2014-Q3		Pre-NTP		60
Liskeard 1	Northeast	Solar	2014-Q3		NTP		10
Liskeard 3	Northeast	Solar	2014-Q3		NTP		10
Liskeard 4	Northeast	Solar	2014-Q3		NTP		10
Northland Power Solar Abitibi	Northeast	Solar	2014-Q3		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
Bow Lake Phase 2	Northeast	Wind	2014-Q3		pre-NTP		40
Gitchi Animki Bezhig Generating Station	Northwest	Water	2014-Q3		Construction		9
Gitchi Animki Niizh Generating Station	Northwest	Water	2014-Q3		Construction		10
Goshen Wind Energy Centre	Southwest	Wind	2014-Q3		Pre-NTP		102
Grand Valley Wind Farms (Phase 3)	Southwest	Wind	2014-Q3		Pre-NTP		40
Haldimand Wind Project	Southwest	Wind	2014-Q4		Construction		149
Thunder Bay Coal Shutdown	Northwest	Coal	2014-Q4			-306	-306
Armow Wind Project	Southwest	Wind	2014-Q4		pre-NTP		180
K2 Wind Project	Southwest	Wind	2014-Q4		pre-NTP		270
Kingston Solar Project	East	Solar	2014-Q4		pre-NTP		100
Peeshoo Project	Northeast	Water	2015-Q1		Pre-NTP		7
Wahpeestan Project	Northeast	Water	2015-Q1		Pre-NTP		7
Wapoose Project	Northeast	Water	2015-Q1		Pre-NTP		7
Neeskah Project	Northeast	Water	2015-Q1		Pre-NTP		7
New Third Unit at Harmon	Northeast	Water	2015-Q1		Construction		78
New Third Unit at Kipling	Northeast	Water	2015-Q1		Construction		78
Trout Lake River Hydroelectric Project	Northwest	Water	2015-Q1		Pre-NTP		4
Bow Lake Phase 1	Northeast	Wind	2015-Q1		pre-NTP		20
Dufferin Wind Farm	Southwest	Wind	2015-Q1		NTP		100
Niagara Region Wind Farm	Southwest	Wind	2015-Q2		Pre-NTP		230
Total						**-1,744**	**1,077**

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

The generation capability assumptions are as follows:

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

Table 4.3: Summary of Scenario Assumptions for Resources

		Planned Scenario	Firm Scenario
Over the 18-Month Period	Total Existing Installed Resource Capacity (MW)	34,946	
	New Generation and Capacity Changes (MW)	All Projects	Generator shutdowns or retirements, Commissioning Generators and Generators starting in the first 3 months
		1,077	-1,744

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 Winter Peak	2015 Winter Peak
Seasonal Peak Comparison	Growth in Conservation at Peak (MW)	125	
	Growth in Embedded Generation Capacity at Peak (MW)	695	
	Demand Measures Effective Capacity at Peak (MW)	512	577
	Ontario Peak Demand (MW)	22,320	22,294

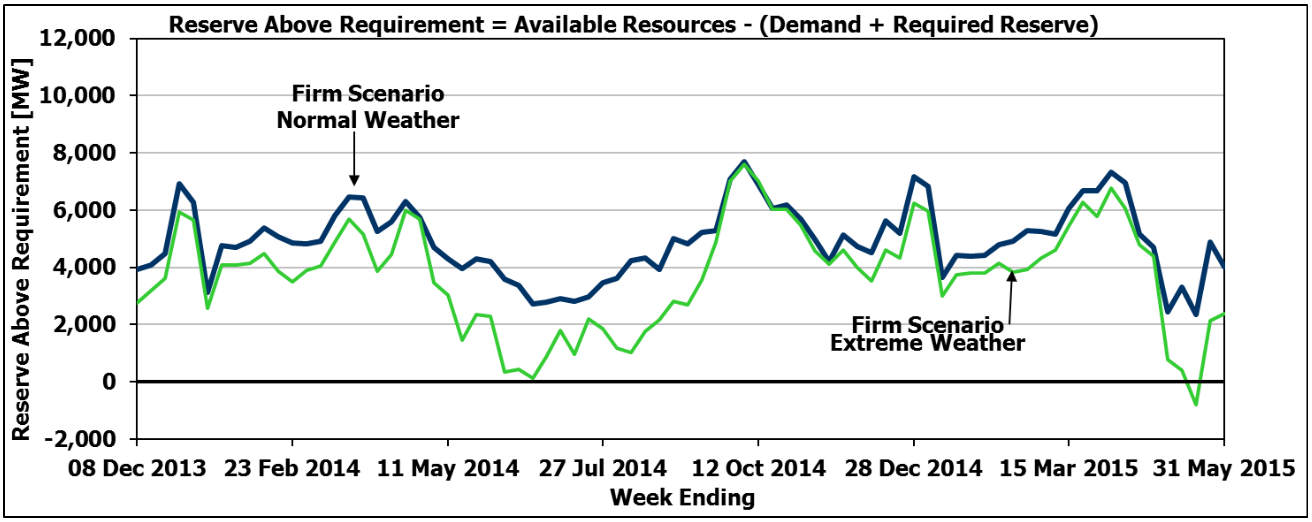
4.2 Capacity Adequacy Assessment

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 72 MW of hydroelectric capacity.

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

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

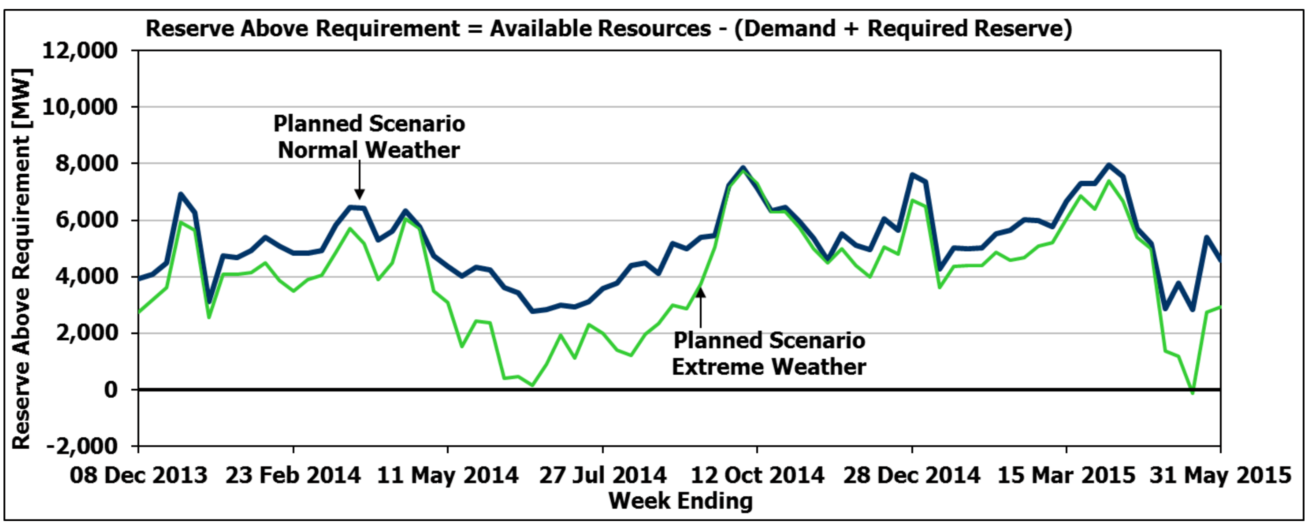


4.2.2 Planned Scenario with Normal and Extreme Weather

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 3,300 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.

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. The monthly forecast of energy production capability, as provided by market participants, is included in the 2013 Q4 Outlook Tables Appendix A, Table A7.

Table 4.5: Summary of Available Resources

Notes	Description	Winter Peak 2014		Summer Peak 2014		Winter Peak 2015	
		Firm Scenario	Planned Scenario	Firm Scenario	Planned Scenario	Firm Scenario	Planned Scenario
1	Installed Resources (MW)	33,399	33,399	33,508	34,229	33,202	35,487
2	Total Reductions in Resources (MW)	5,576	5,576	5,601	6,205	5,081	6,760
3	Demand Measures (MW)	512	512	502	502	577	577
4	Available Resources (MW)	28,335	28,335	28,409	28,526	28,699	29,304

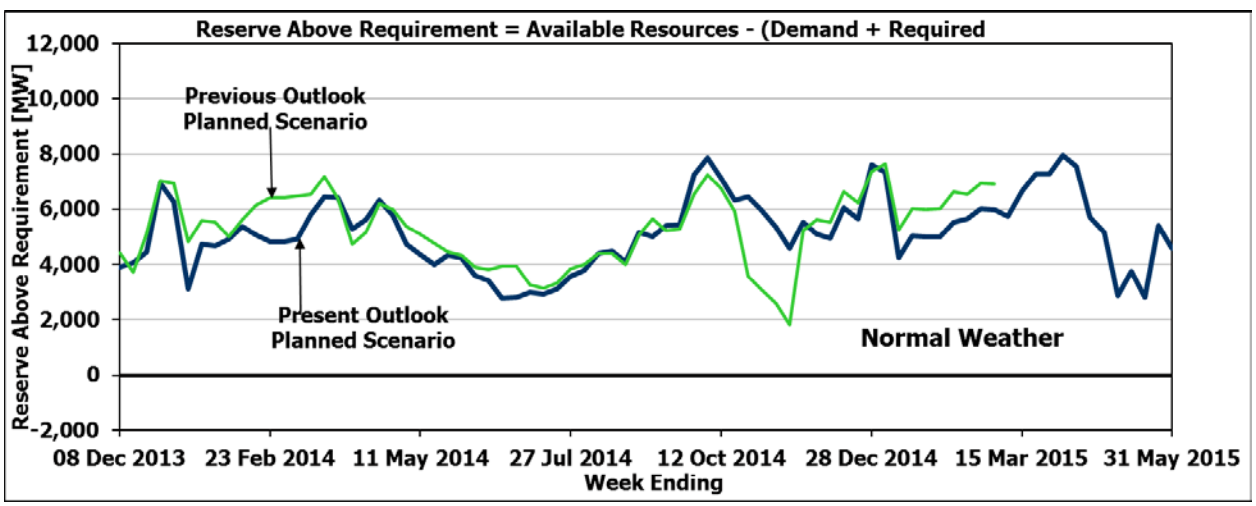
Notes on Table 4.5:

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

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

Figure 4.3 provides a comparison between the forecast Reserve Above Requirement values in the present Outlook and the forecast Reserve Above Requirement values in the previous Outlook published on September 3, 2013. The difference is mainly due to the changes to outages and changes in the demand forecast.

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



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

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 as follows:

- Seasonal hydroelectric generation capability is based on median historic seasonal production and operating reserve data available since market opening. Further, based on the historical data monthly, daily and hourly energy limits are imposed.
- Wind and solar units are modeled based on simulated wind and solar production data to produce hourly profiles for each wind and solar site respectively
- Gas units are modeled using heat rates estimated from historical offer data and its correlation with natural gas spot market prices. Nuclear units are modeled based on historical offer data.
- Non-utility generation (NUG) schedules are derived from historical generation provided by NUGs.
- Floor prices[1] for wind, solar and flexible nuclear generation resources are explicitly modeled as provided for in the Market Rules.
- Planned transmission outages are modeled based on Market Participant submitted information. Only outages for lines at a voltage level of 115 kV and higher and with duration five days or longer are considered.
- Thermal limits of all transmission elements operated at 50 kV and higher are utilized.
- Import and export capabilities are not included in the assessment.
- Load Forecast Uncertainty, which is caused due to weather volatility, is not included in the assessment.
- Operating Reserve is deterministically modeled based on historical schedules (most recent two years) of generators.

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[1] As per the Renewable Integration - Stakeholder Engagement # 91.

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 potential 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 scenarios for the review period.

Table 4.6: Firm Scenario - Normal Weather: Key Energy Statistics for Ontario by Transmission Zone over the period December 2, 2013 to May 31, 2015

Zone	18 -Month Energy Demand		18-Month Energy Production		Net Inter-Zonal Energy Transfer (TWh)	Potential Un-served Energy (GWh)	Zonal Energy Demand on Peak Day of 18-Month Period (GWh)	Available Energy on Peak Day of 18-Month Period (GWh)
	TWh	Average MW	TWh	Average MW				
Ontario	**210.4**	**16,055**	**210.4**	**16,055**	**0.0**	**0.0**	**452.9**	**688.4**
Bruce	1.1	85	66.5	5,078	65.4	0.0	2.2	150.6
East	12.4	948	13.8	1,051	1.4	0.0	25.2	95.0
Essa	10.8	827	3.5	271	-7.3	0.0	21.7	19.4
Niagara	6.2	472	18	1,377	11.9	0.0	14.4	49.8
Northeast	16.8	1,281	15.9	1,217	-0.8	0.0	25.2	68.0
Northwest	6.1	465	7.5	574	1.4	0.0	9.9	27.6
Ottawa	15.9	1,213	0.6	47	-15.3	0.0	33.7	2.0
Southwest	42.8	3,263	3	228	-39.8	0.0	89.8	22.5
Toronto	78.3	5,979	73	5,573	-5.3	0.0	186.2	186.7
West	19.9	1,522	8.4	639	-11.6	0.0	44.8	66.9

Figures 4.4, 4.5 and 4.6 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.

It should be noted that coal resources were deliberately priced at the top of the offer stack. This approach is used to minimize any dependency on coal and to highlight situations where coal is required for reliability.

Figure 4.4: Production by Fuel Type - Dec. 2-31, 2013 (%)

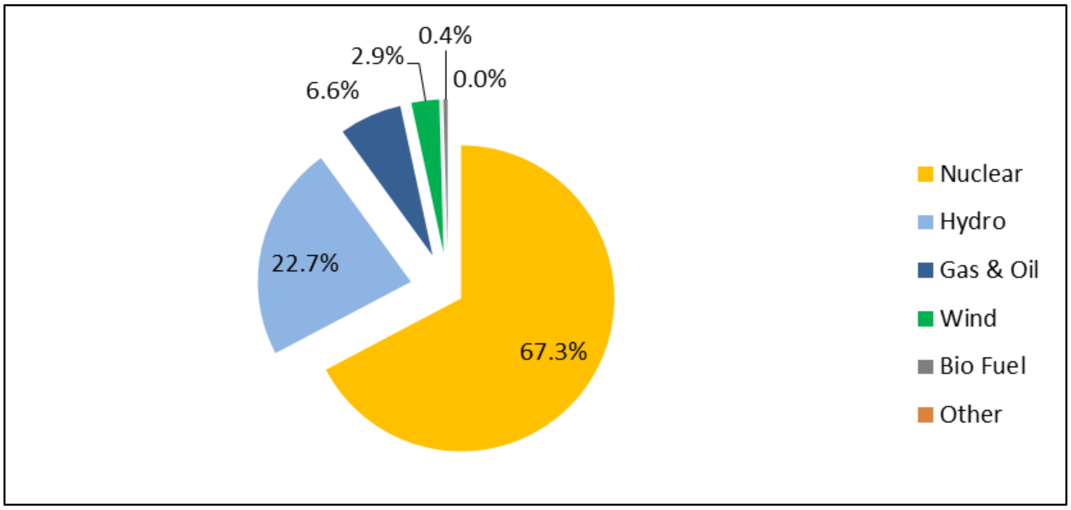


Figure 4.5: Production by Fuel Type - Jan. to Dec. 2014 (%)

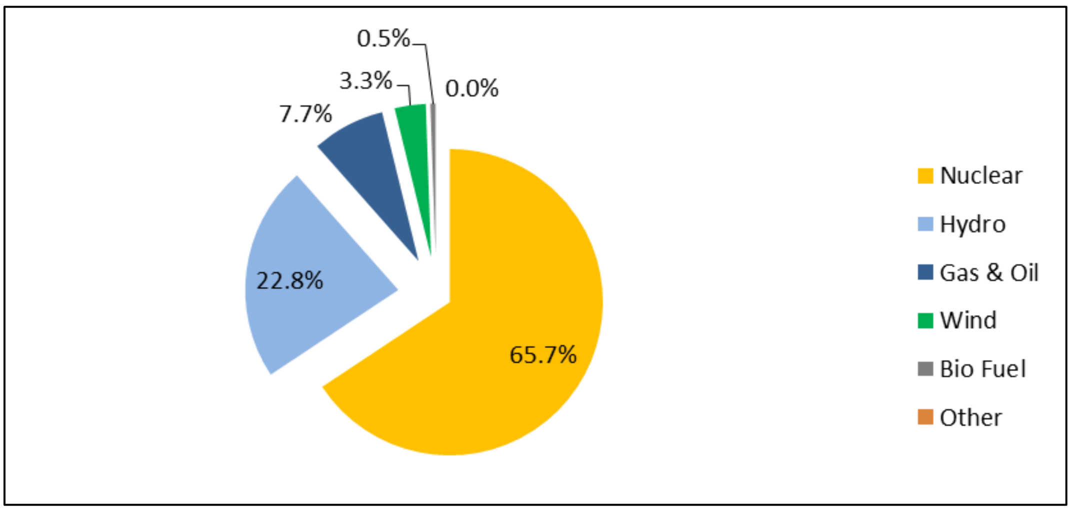


Figure 4.6: Production by Fuel Type - Jan. to May 2015 (%)

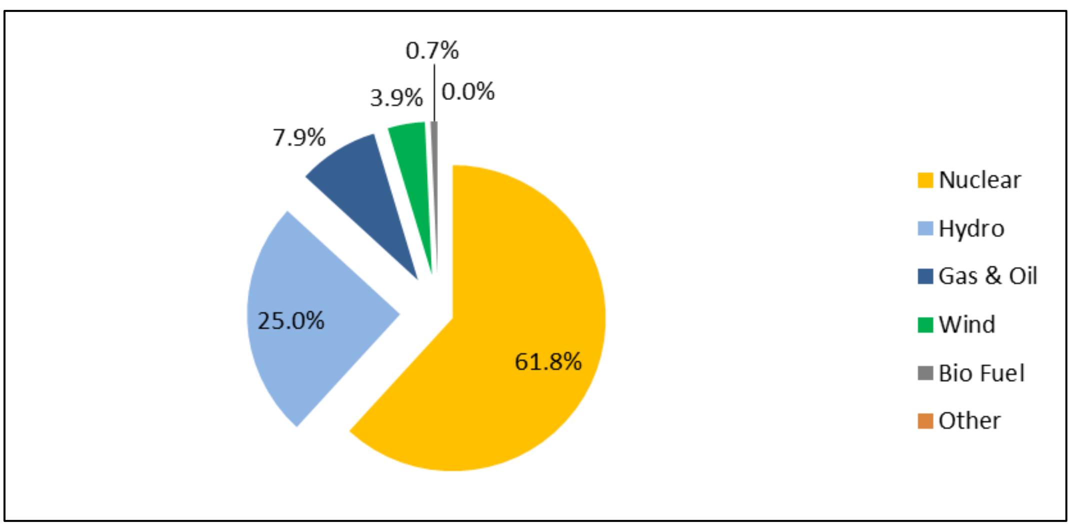


Table 4.7: Firm Scenario - Normal Weather: Ontario Energy Production by Fuel Type for 2013, 2014 and 2015

Grid-Connected Resource Type	2013 (Dec.) (GWh)	2014 (Jan. – Dec.) (GWh)	2015 (Jan. – May) (GWh)	Total (GWh)
Nuclear	8,246	91,958	35,917	136,121
Hydro	2,785	31,915	14,537	49,238
Gas & Oil	810	10,777	4,954	16,541
Wind	360	4,585	2,282	7,227
Bio Fuel	54	760	416	1,230
Other (Solar, Coal & DR)	1	13	9	23
Total	12,255	140,008	58,116	210,379

4.3.3 Findings and Conclusions

The energy adequacy assessment results indicate that Ontario is expected to have sufficient supply to meet its energy requirements during this 18-Month Outlook period.

- 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 October 9, 2013.

5.3 Transmission System Adequacy

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

As a result of localized load increases, several areas in the province have been identified as having limited capability of existing transmission infrastructure. 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 Greater Toronto Area's (GTA's) electricity supply is expected to be adequate to meet the forecasted demand. Hydro One is working to change one of the 230 kV connections to Horner TS by the end of Q2 2014. This transmission enhancement will increase the load supply capability in the southwestern GTA to allow a reliable supply beyond this 18-month outlook period with sufficient margin to allow for planned outages.

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 in the Toronto 115 kV area.

Subject to the necessary approvals, Clarington TS is scheduled to be in service by spring of 2017. The increased 500 to 230 kV transformation capability is necessary in advance of the shutdown of Pickering GS to avoid possible overloading of the existing auto-transformers at Cherrywood TS. 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 Q1 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 are being experienced more frequently during periods of light load. High voltages become more acute during these periods if shunt reactors are also unavailable due to either repair or maintenance activities. The IESO and Hydro One are currently managing this situation with day-to-day operating procedures.

In order to strengthen the supply to the load connected to the two 230 kV circuits between Claireville TS and Minden TS and to allow the proposed Vaughan TS No. 4 to be connected, Hydro One is planning to install two 230kV 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 the second quarter of 2016. As part of this project, interrupter switches or breakers will be installed at Inverhaugh SS that will allow the 230 kV system between Detweiler

TS and Orangeville TS to be sectionalized. This will improve the restoration capability and reduce restoration times to the loads in the Waterloo, Guelph and Fergus areas.

In 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 2016. This incremental investment is required not only to reduce the interruption time for the affected customers in the area following a major transmission outage, but also to provide the additional capacity needed to meet the forecast load growth in the Cambridge 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 500kV switching stations, Evergreen and Ashfield, are planned to be in service by the end of 2014 to accommodate 384 MW and 270 MW wind farms, 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 is scheduled to be in service on December 9, 2013. Another transformer station Orleans TS, is expected to come into service by Q2 2014.

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.

During peak load periods that have coincided with high transfers from Hydro Quebec via the HVDC interconnection, it has been necessary to constrain on local hydroelectric generation to back-off the flows on the circuits between Hawthorne TS and Merivale TS and reduce the risk of overloading.

During a dry year, with insufficient water to operate the hydroelectric stations during peak load periods, imports from Hydro Quebec would need to be constrained-off to reduce the transfers between Hawthorne TS and Merivale TS and avoid possible post-contingency overloading of the circuits between these stations.

5.3.5 West Zone

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

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

Transmission transfer capability 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

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 the fourth quarter of 2013.

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

There have been 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 these operational measures, additional reactive compensation is required for voltage control in this zone. Hydro One is working on the installation of new shunt reactors at Marathon, scheduled to be in service on December 18, 2013 and new shunt reactors at Dryden by the end of 2014 in an effort to resolve this problem.

Some loads in the north of Dryden to Pickle Lake area experienced significant growth over the last few years and recently indicated their intention to expand operations. The transmission circuits in the area are currently operating close to their capability. The OPA has issued a draft Integrated Regional Resource Plan, 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. 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 3,300 MW of wind, solar, hydroelectric and biomass capacity are expected be connected to the transmission grid. By May 2015, the total wind and solar generation connected both to the transmission and distribution networks in Ontario are expected to exceed 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 1,700 MW of embedded solar capacity that will be in service during the outlook period.

A number of operational changes were needed to support these levels of new supply. The IESO's Renewable Integration Initiative (RII) was undertaken to address three key elements – forecast, visibility and dispatch of renewable resources. In 2013, tools developed under the RII were successfully rolled out. The biggest component was the ability to dispatch variable generation, which was implemented in September, 2013. RII initiatives have already yielded results, including the integration of the hourly centralized forecast into the IESO scheduling tools which 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.

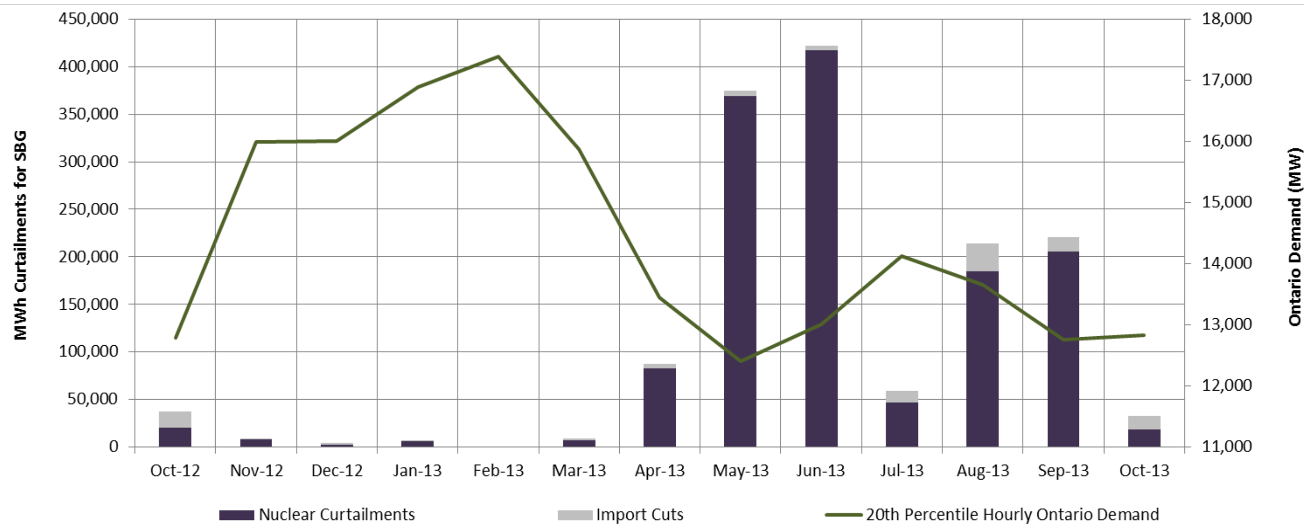
6.1 Surplus Baseload Generarion (SBG)

Baseload generation is made up of nuclear, run of the river hydroelectric and variable generation such as wind. SBG conditions occur when the amount of baseload generation exceeds Ontario demand. However, when the baseload supply is expected to exceed Ontario demand, 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. However, in 2013 significant levels of SBG were encountered in May and June.

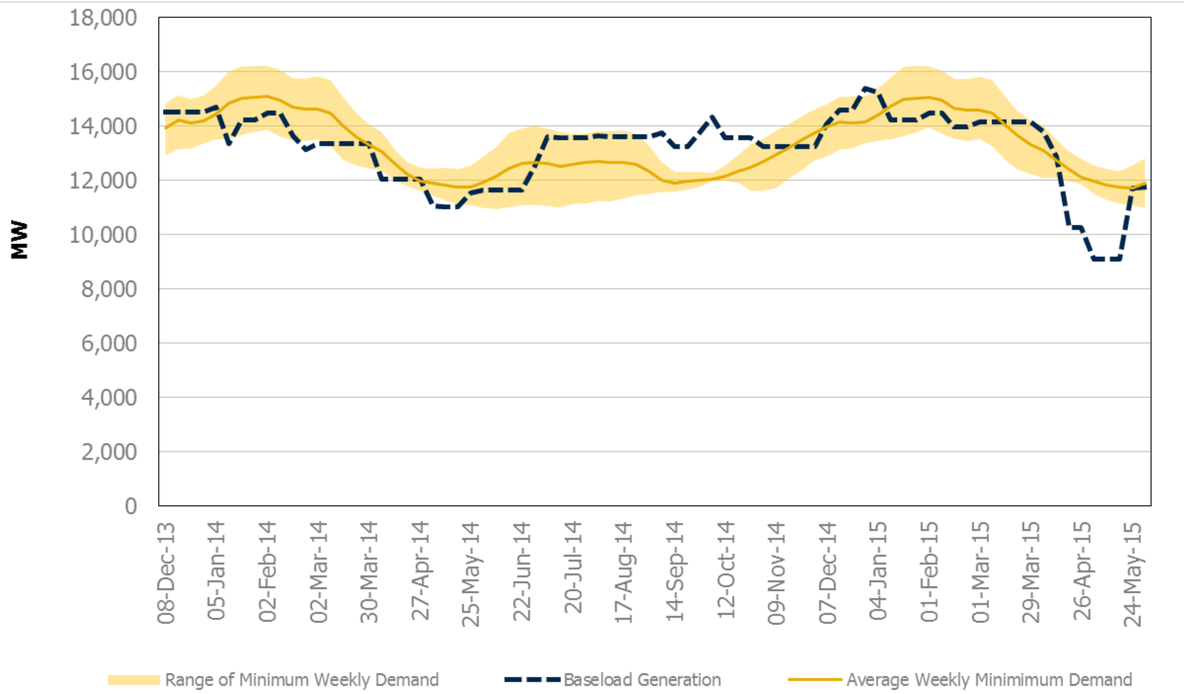
Figure 6.1 shows the volume of nuclear and import curtailments due to surplus baseload conditions versus the bottom 20% hourly Ontario demand up till October 2013. The amount of nuclear and import curtailments for SBG in Q2 of 2013 were 883 GWh as compared to the 494 GWh curtailments in Q3. This difference is attributed to higher demands during the summer months which result in fewer SBG related shutdowns. There have been another 32 GWh of nuclear curtailments in the month of October 2013.

Figure 6.1: MWh Curtailments for SBG versus Ontario Demand



The expected SBG for the next 18 months can be seen in Figure 6.2. 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 projected export capability[2]. The expected contribution from self-scheduling and intermittent generation has also been updated to reflect the latest data. Output from commissioning units is explicitly excluded from this analysis due to uncertainty and the highly variable nature of commissioning schedules.

Figure 6.2: Minimum Ontario Demand and Baseload Generation (includes Net Export assumption)



Ontario will continue to experience an increase in SBG conditions with declining wholesale demand for electricity and significant quantities of baseload generation on the system. However, the vast majority of SBG is managed through normal market mechanisms including export scheduling and nuclear maneuvering. The IESO has gained another tool in September 2013, developed as part of IESO's RII to help manage SBG as grid connected wind becomes a dispatchable resource.

[2] 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.

7 Historical Review

This section provides a review of past power system operation, including the most recent months of operation.

7.1 Weather and Demand Historic Review

Since the last Ontario Demand Forecast document was published, actual demand and weather data have been reported for the six months of May through October.

Overall, energy demand for the six months was down 3.4% compared with the same six months one year prior. Much of that decline was due to the mild 2013 summer, so after correcting for weather the reduction is a smaller 1.8%. Over the same time, wholesale consumers' consumption had shown an increase of 1.0%.

7.2 Hourly Resource Contributions at Time of Weekday Peak

The figures from 7.2.1 to 7.2.4 show the contributions made by wind generators, hydro generators, imports, and net interchange into Ontario at the time of weekday peak. The period analyzed is from October 2012 to September 2013. Holiday and weekend data were not considered in the analysis since hydro peaking generation and interchange transactions during this timeframe are not typical of time periods when Ontario's supply adequacy may be challenged.

Figure 7.2.1 indicates the amount of wind contribution to the wholesale market at the time of weekday peak, compared to the forecast values. The forecast methodology takes into account seasonal variances in wind patterns, among other factors. Installed wind capacity is expected to continue to grow with wind generation procured under the FIT programs.

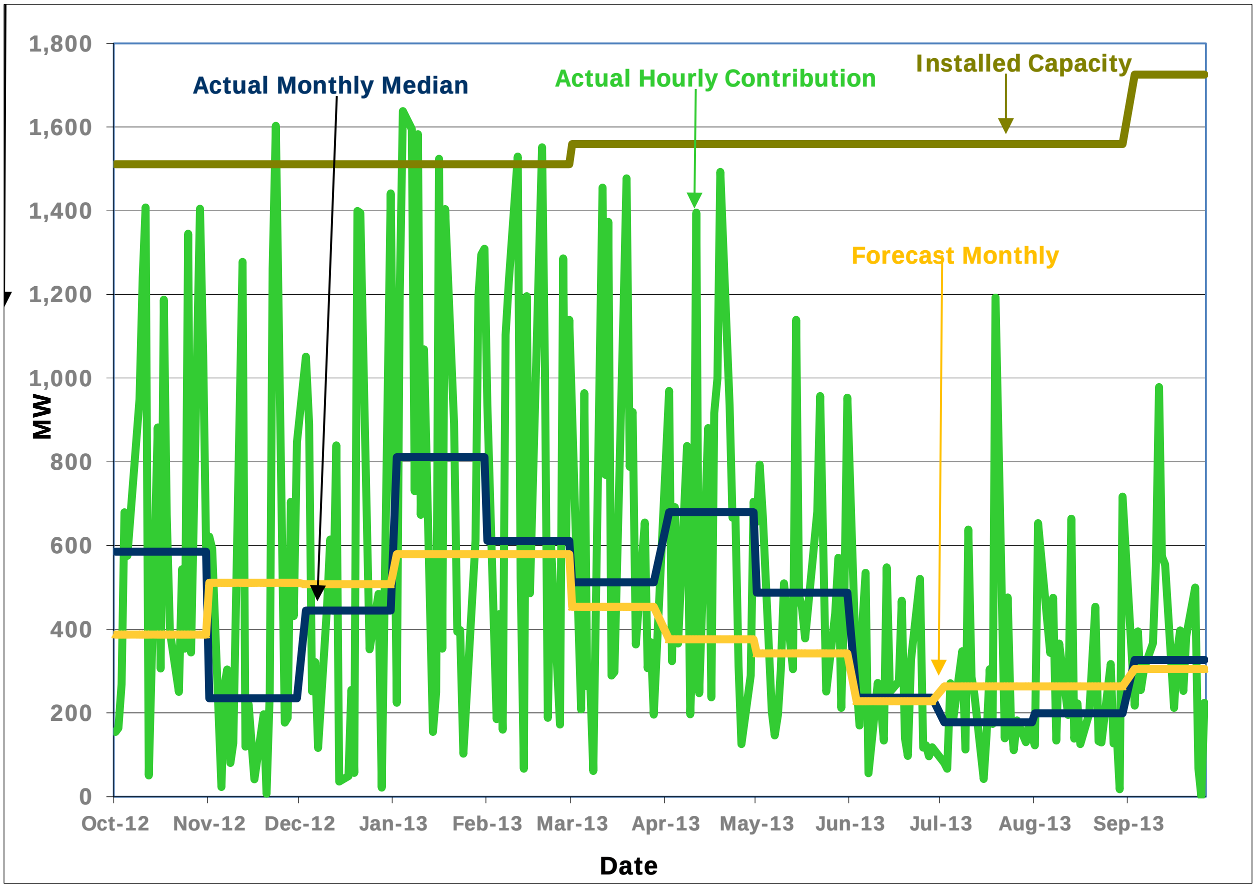


Figure 7.1: Wind Contributions at the Time of Weekday Peak

Note: Commercially operable capacity does not include commissioning units. Therefore actual hourly contribution may exceed commercial capability.

Figure 7.2.2 indicates the amount of hydroelectric contributions to energy and operating reserve markets at the time of weekday peak, excluding weekends and holidays, compared to the forecasted contributions. The forecasted monthly median is typically the median contribution of hydroelectric energy at the time of weekday peak since 2002. However, if low water persists, the forecast is adjusted accordingly to reflect the observed trend. The hydroelectric contribution at the hour of weekday peak for February through July was consistently lower than forecasted, averaging 6% below forecast. The lower values are due to a decrease in precipitation levels from previous years and project related outages scheduled for hydroelectric generating stations. The trend is reversed in the last two months.

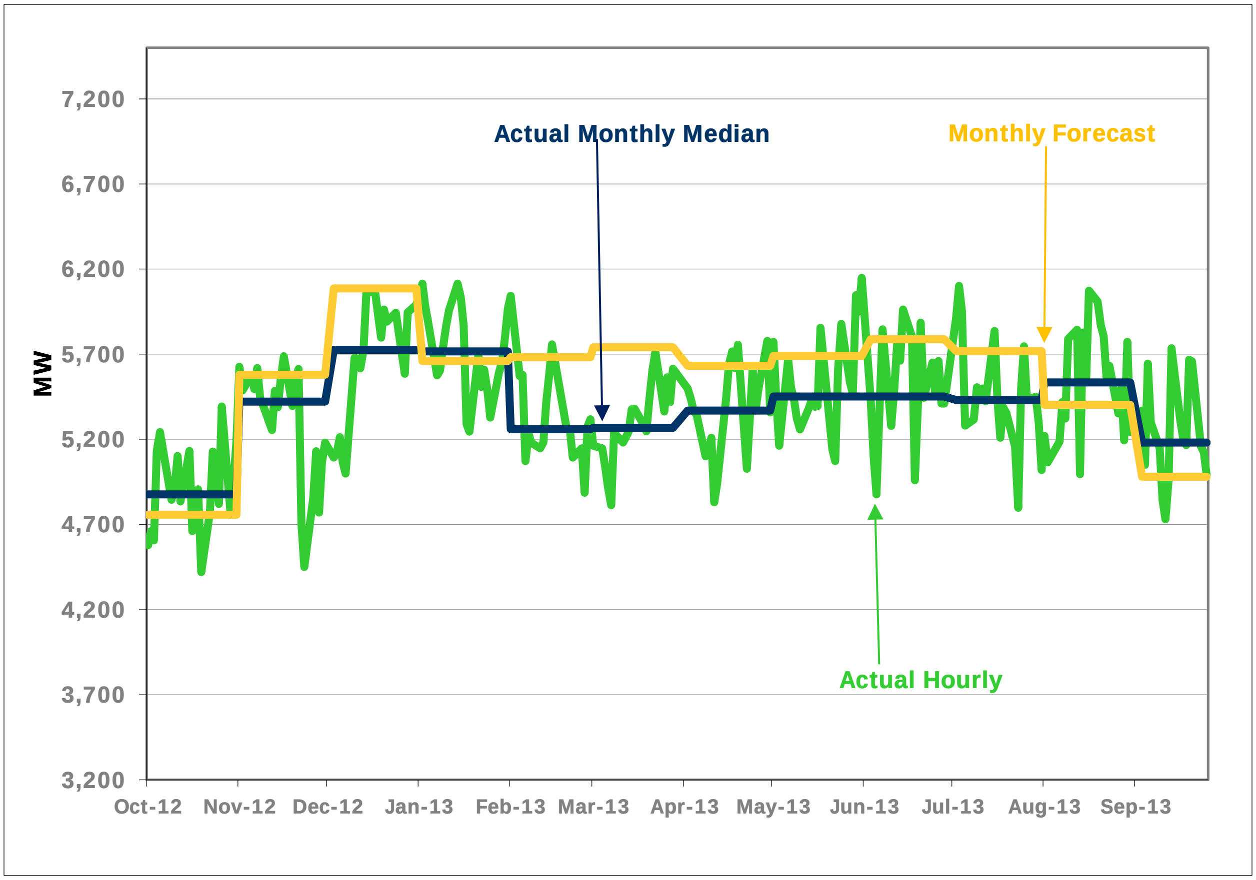


Figure 7.2: Hydro Contributions (Energy and Operating Reserve) at the Time of Weekday Peak

Figure 7.2.3 shows imports into Ontario at the time of weekday peak. Summer 2013 imports were noticeably higher than the rest of the reporting period. This correlates to a yearly period with high demands, high prices and consequently an increase in imports.

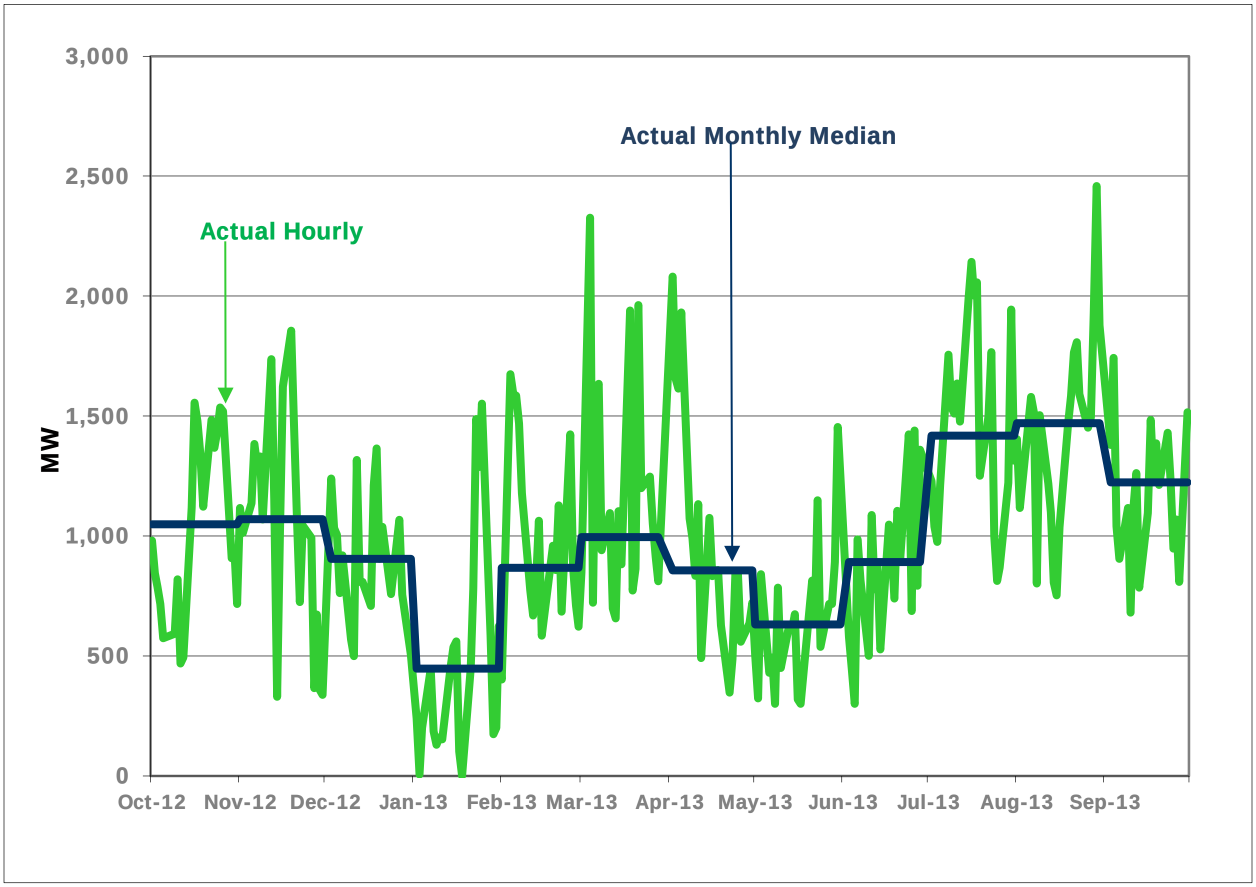


Figure 7.3: Imports into Ontario at the Time of Weekday Peak

Figure 7.2.4 shows the amount of net interchange at the time of weekday peak, excluding weekends and holidays. Net Interchange is the difference between total imports into Ontario and total exports out of Ontario. The trend below illustrates the typical economics of spare capacity in Ontario with respect to external jurisdictions. .

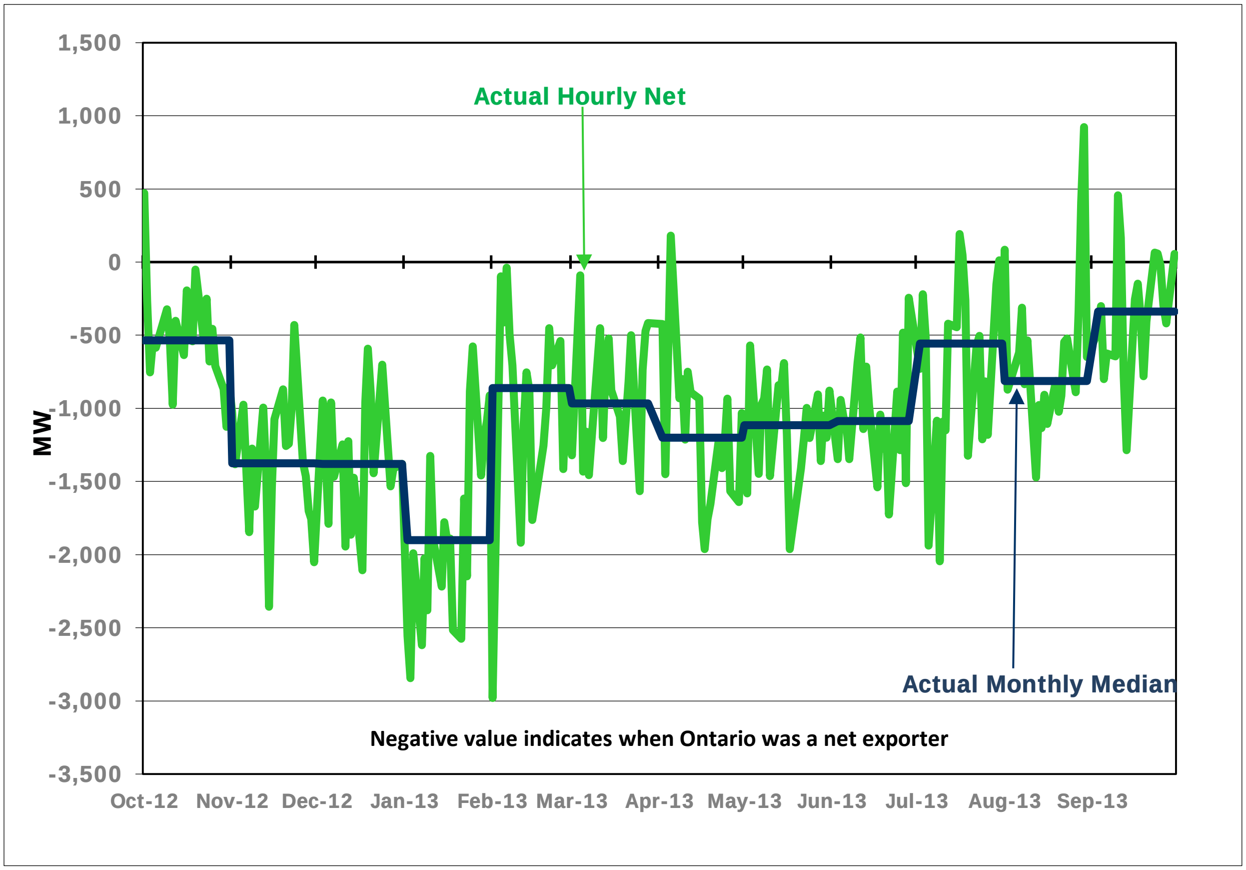


Figure 7.4: Net Interchange into Ontario at the Time of Weekday Peak

7.3 Report on Initiatives

The IESO's Renewable Integration Initiative (RII) has successfully integrated the hourly centralized variable generation forecast into the IESO scheduling tools and provided enhanced visibility of renewable generator output for IESO Control Room Operators. The dispatch of grid-connected renewable resources, which started on September 11, 2013, has already prevented shutdown of nuclear generating units on four occasions.

In the first 30 days after wind became dispatchable, about 1% of the wind energy that could have been generated was curtailed due to global SBG concerns while 6% of total wind energy available was curtailed due to local SBG concerns. The majority of local SBG concerns were in the northeast and northwest where transmission constraints are more frequent. Wind dispatch in these areas prevented water spillage which was a primary alternative solution to mitigate local SBG in these areas before wind became dispatchable.

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