

18-MONTH OUTLOOK

From December 2014 to May 2016



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 for the coming winter – and throughout the next 18 months – with adequate supply and reliable transmission service forecasted.

From December 2014 to May 2016, more than 2,800 MW of new supply will be incorporated into the province's existing generation fleet. This includes Ontario's first grid-connected solar projects, which are presently commissioning and are expected to be in service in the first month of this outlook period. By the end of the outlook period, the amount of solar generation connected to the grid is expected to grow to 280 MW, complementing about 1,800 MW of embedded solar facilities located within distribution networks.

Ontario currently benefits from adequate gas supply. The harsh winter earlier this year increased the demand for natural gas, resulting in depleted storage levels. Over the past several months, however, gas storage has increased and is now above the five-year average. As other jurisdictions become increasingly dependent on gas supply for electricity production, the IESO and its partners are engaging in ongoing discussion and analysis on future needs. Enhanced communication is key to gas generation supporting the needs of bulk power system.

Ontario was winter peaking in 2014 for the first time in 10 years due to milder summer weather. Since the period for the Industrial Conservation Initiative (ICI), where large customers reduce their demand on the top five peak days, runs from May 1, 2014 to April 30, 2015, it is likely that some of the five days will occur this coming winter under normal weather conditions. This means a greater response from the demand side is anticipated on peak days this winter compared to past winters. The ICI impacts are factored into the demand forecast in this report. The following table summarizes the forecasted seasonal peak demands over the next 18 months.

Season	Normal Weather Peak (MW)	Extreme Weather Peak (MW)
Winter 2014-15	22,266	23,259
Summer 2015	22,989	24,838
Winter 2015-16	22,215	23,031

Atikokan Generation Station, which is back in service, will contribute to continued reliability in northern Ontario; while Thunder Bay Generation Station will be back in service in 2015 Q2.

The other period to note is in the spring of 2015, when overlapping nuclear outages tighten the supply situation. During normal weather conditions, under the planned scenario, reserve requirements are expected to be met. Demand response initiatives, increased reliance on the interties and restricted outage programs will be among the actions available to manage reserves in the event of extreme weather scenarios. Market participants are also reminded to review their operational needs, such as fuel supply, to ensure their facilities are available to support the system during this period.

Conclusions & Observations

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

Demand Forecast

- Both Ontario's grid supplied energy demand and peak demand are expected to decline throughout the period of this Outlook. Growth in embedded solar and wind generation capacity and on-going conservation initiatives reduce the need for electricity from the bulk power system, while also putting downward pressure on peak electricity demands on the bulk system. In conjunction with conservation and time-of-use rates, summer peaks are expected to face greater downward pressure than winter peaks.

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 eleven weeks under the extreme weather scenarios largely due to the planned nuclear generator outages in spring 2015.
- For the **firm scenario**, reserve is below requirements for two weeks during the Outlook period under normal weather conditions. Under extreme weather condition, the reserve is below the requirement for fourteen weeks. The firm scenario excludes any new generating facilities which haven't reached commercial operation. As a result, the shortfall is more pronounced in the firm scenario than in the planned scenario.
- One of the units at Thunder Bay GS is expected to be converted to a biomass facility in 2015 Q2.
- More than 2,800 MW of grid-connected generation is expected to be added throughout this Outlook period, which includes about 1,750 MW of wind, 350 MW of hydroelectric, 300 MW of gas, 280 MW of solar, and 180 MW of biofuel resources.

Transmission Adequacy

Ontario's transmission system is expected to be able to reliably supply the demand while experiencing normal contingencies defined by planning documents 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).
- New shunt reactors have been installed at Dryden TS to help control voltages in northwestern Ontario.
- 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 control 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.
- The upgrading of the 115 kV breakers at Leaside TS is expected to be completed by December 5th and Manby TS is scheduled for completion by the end of December. These new facilities will increase the short-circuit interrupting capability of the 115kV system and allow new generation to be connected in the Manby and Leaside sectors.
- A new station, Copeland TS, is planned to be in service in downtown Toronto in Q3 2015. The new station will facilitate the refurbishment of the facilities at John TS, while also enhancing the load security in the downtown core.

Operability

- For the nuclear outages scheduled for spring 2015, the IESO has requested the transmitters to schedule preventive maintenance ahead of time to ensure reliable operation of their equipment, in particular voltage control facilities.
- Conditions for SBG are likely to continue over the Outlook period. However, it is expected that SBG will be managed effectively via normal market mechanisms including inter-tie scheduling, nuclear maneuvering or shutdown and the dispatch of grid-connected renewable resources.
- A recently released [report](#) prepared by the IESO and OPA concluded that increased reliance on interties through firm imports would require significant investments in transmission infrastructure, but that there are opportunities to enhance the benefits of existing interties that warrant Ontario's consideration.
- In the past several months, the natural gas storage levels at Enbridge and Union Gas facilities rose and now are above the five year average, which means fuel-supply shortfall for gas-fired units is less likely during the winter months, than if storages were below average.

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1 Introduction

This Outlook covers the 18-month period from December 2014 to May 2016 and supersedes the last Outlook released on September 4, 2014.

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:

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- 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 September 2014. The demand forecast has been updated to reflect the most recent economic projections. Actual weather and demand data for October 2014 has been included in the tables.

2.2 Updates to Resources

The 18-month assessment uses planned generator outages submitted by market participants to the IESO's Integrated Outage Management System (IOMS) as of October 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.

Past experience with the new projects has shown that their commissioning period varies vastly, typically from three to nine months. As announced in the previous Outlook, the IESO has changed the assumptions for the Firm scenario beginning in this Outlook to include only facilities that have achieved commercial operation status in addition to the existing resources. Facilities that have started commissioning, generators that are planned to come into service over the first three months of the Outlook and future uprates to existing generation facilities are no longer taken into account in the Firm scenario, but are still be part of the Planned scenario.

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 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. 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 October 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 December 2014 to May 2016 and supersedes the previous forecast released in September 2014. Tables of supporting information are contained in the [2014 Q4 Outlook Tables](#) spreadsheet.

Electricity demand is shaped by a several factors which have differing impacts. These factors can be grouped into those that increase demand (population growth and economic expansion), those that reduce demand (conservation and embedded generation) and those that shift demand (time of use rates and the Industrial Conservation Initiative). How each of these factors impacts electricity consumption varies by season and time of day.

Grid-supplied energy demand is forecasted to decline in the period covered by this Outlook. Though economic expansion and population growth lead to increased demand for electricity, the impacts of conservation and embedded generation more than offset these increases. This is due to the fact that conservation reduces the amount of end-use consumption and increased embedded generation output offsets the need for grid-supplied electricity by generating it on the distribution system.

Peak demands are subject to the same forces as energy demand, though the impacts vary. This is true not only when comparing energy versus peak demand, but also in comparing the summer and winter peak. Summer peaks are significantly impacted by the growth in embedded generation capacity and pricing impacts (Industrial Conservation Initiative and time-of-use rates). The majority of embedded generation is provided from solar powered facilities that have high output levels during the summer peak period and no output during the winter peak periods. Over the shoulder periods the timing of the peak hour and sunset are moving so the impact of embedded solar will vary.

Historically, the five highest peaks have occurred during the summer months; therefore the Industrial Conservation Initiative has a significant impact on the summer peak and none to date on the winter peaks. These impacts, combined with other conservation savings, will see the summer peaks decline over the forecast horizon. However, the mild weather led to very modest summer peaks in 2014 and this increases the likelihood of some of the five highest peaks occurring over the winter of 2014-2015. Generally, winter peaks are largely subject to downward pressure from conservation via gains in lighting efficiency, but this year should face increased downward pressure from the Industrial Conservation Initiative.

Minimum demand levels are similarly impacted by these same forces – primarily economic activity and embedded generation. The recession had led to lower levels of industrial activity, particularly overnight and on weekends due to reductions in the number of shifts. Although most embedded generation is solar, embedded wind generation contributes to lower minimums by supplanting grid-supplied electricity. However, offsetting some of this downward pressure on minimums there is a significant price incentive to shift load to overnight hours. Over the forecast, a relatively small increase in embedded wind generation and very modest economic growth and load shifting will lead to a small increase in minimum demand levels over the forecast.

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

Table 3.1: Forecast Summary

Season	Normal Weather Peak (MW)	Extreme Weather Peak (MW)
Winter 2014-15	22,266	23,259
Summer 2015	22,989	24,838
Winter 2015-16	22,215	23,031
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)	139.6	-0.6%
2015 Energy (Forecast)	139.6	0.0%

Table 3.2: Weekly Energy and Peak Demand Forecast

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)
07-Dec-14	21,095	22,193	409	2,900	06-Sep-15	18,506	22,050	1,370	2,514
14-Dec-14	20,866	22,219	555	2,897	13-Sep-15	18,257	20,777	680	2,466
21-Dec-14	21,212	22,538	690	2,940	20-Sep-15	17,991	20,134	781	2,488
28-Dec-14	20,459	21,537	362	2,770	27-Sep-15	17,109	18,369	420	2,436
04-Jan-15	20,781	21,700	528	2,819	04-Oct-15	17,225	17,601	554	2,466
11-Jan-15	22,266	23,259	570	2,996	11-Oct-15	17,217	17,661	786	2,490
18-Jan-15	21,569	22,479	547	2,951	18-Oct-15	17,755	18,181	507	2,450
25-Jan-15	21,723	22,505	483	2,953	25-Oct-15	17,763	18,320	392	2,536
01-Feb-15	21,722	22,514	404	2,985	01-Nov-15	18,252	18,719	318	2,571
08-Feb-15	20,991	22,089	734	2,944	08-Nov-15	18,969	19,381	416	2,635
15-Feb-15	20,375	21,896	635	2,860	15-Nov-15	19,292	20,079	601	2,656
22-Feb-15	20,113	21,839	581	2,821	22-Nov-15	19,744	20,606	342	2,735
01-Mar-15	20,737	21,773	501	2,891	29-Nov-15	20,190	21,250	607	2,775
08-Mar-15	19,893	20,720	531	2,805	06-Dec-15	20,727	21,866	409	2,856
15-Mar-15	18,913	19,933	649	2,718	13-Dec-15	21,013	21,957	555	2,900
22-Mar-15	18,285	19,120	611	2,628	20-Dec-15	20,706	21,819	690	2,886
29-Mar-15	18,353	19,592	569	2,632	27-Dec-15	20,401	22,190	362	2,849
05-Apr-15	18,175	18,842	567	2,540	03-Jan-16	20,781	21,723	528	2,803
12-Apr-15	17,506	18,535	471	2,507	10-Jan-16	22,215	23,031	570	2,993
19-Apr-15	16,860	17,358	496	2,460	17-Jan-16	21,490	22,198	547	2,942
26-Apr-15	16,644	17,030	531	2,437	24-Jan-16	21,645	22,227	483	2,945
03-May-15	17,509	19,899	721	2,430	31-Jan-16	21,642	22,232	404	2,979
10-May-15	17,662	20,250	849	2,417	07-Feb-16	20,922	21,910	734	2,935
17-May-15	18,594	21,820	845	2,448	14-Feb-16	20,305	21,727	635	2,850
24-May-15	18,943	21,914	1,175	2,403	21-Feb-16	20,023	21,648	581	2,810
31-May-15	19,427	21,607	1,330	2,452	28-Feb-16	20,662	21,697	501	2,890
07-Jun-15	19,719	23,224	1,292	2,612	06-Mar-16	19,843	20,671	531	2,815
14-Jun-15	20,888	23,631	1,055	2,646	13-Mar-16	19,417	20,438	649	2,751
21-Jun-15	21,659	24,083	835	2,687	20-Mar-16	18,222	19,059	611	2,626
28-Jun-15	22,378	24,066	754	2,758	27-Mar-16	18,300	19,541	569	2,585
05-Jul-15	22,498	23,996	1,016	2,716	03-Apr-16	18,400	18,979	567	2,582
12-Jul-15	22,989	24,838	814	2,791	10-Apr-16	17,486	18,518	471	2,520
19-Jul-15	22,871	23,997	838	2,694	13-Apr-16	16,831	17,333	496	2,460
26-Jul-15	22,384	24,410	1,035	2,803	24-Apr-16	16,605	16,997	531	2,436
02-Aug-15	22,229	24,433	841	2,794	01-May-16	17,473	19,867	721	2,436
09-Aug-15	21,573	24,626	958	2,754	08-May-16	17,639	20,231	849	2,419
16-Aug-15	21,526	24,137	985	2,740	15-May-16	18,563	21,791	845	2,450
23-Aug-15	21,511	23,802	1,362	2,760	22-May-16	18,905	21,875	1,175	2,458
30-Aug-15	20,370	23,010	1,413	2,637	29-May-16	19,407	21,562	1,330	2,397

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's temperature was milder than normal though. As a result, Ontario's energy demand for the month was 11.7 TWh (11.8 TWh weather corrected). The actuals and weather corrected values were the lowest since 1997.
- Peak day temperatures were also milder than normal for August. The peak occurred on the hottest day of the month which was cooler and less humid than normal. The summer of 2014

did not experience a typical summer heat wave. The sustained, high temperatures of a heat wave lead to a heat build-up that drives peaks higher. If high temperatures are fleeting the peaks tend to be lower. The actual peak was 21,363 MW (21,651 MW weather-corrected) which was the lowest August peak since August 1999.

- Wholesale customers' consumption for the month increased by 4.8% over the previous August.

September

- September's weather was warmer than normal. This is evidenced by the monthly energy which was 10.8 TWh and 10.7 TWh weather corrected. Both values are consistent with the September values since the recession.
- The peak occurred on the hottest day of the month. The actual peak of 21,123 MW is typical of the September experience since the recession. However, given the warmer than normal weather, the weather corrected value was a much more modest 19,374 MW which is similar to the September 2009 value.
- Wholesale customers' consumption continued to show consistent growth with a 3.1% increase over the previous September.

October

- The weather for October was milder than normal. Generally, the month is a cold weather month so the weather corrected energy for the month was higher than the actual (11.0 TWh versus 10.8 TWh). These numbers are consistent with October demands since 2009.
- The peak for the month was 17,784 MW (18,781 MW weather corrected) which is fairly consistent for October values since 2009. The peak occurred at the end of the month as the weather turned colder. The peak occurred on the fourth coldest day of the month but during a string of cold days.
- Wholesale customers' consumption growth fell for the first time since July 2013. Year over year load fell by 3.6% with the reduction led both those same sectors that had led the recent growth, mining, steel and petroleum.

Overall, energy demand for the three months from August to October was down 2.1% compared with the same three months one year prior. After adjusting for the milder weather, demand for the three months showed a more modest 1.7% decrease.

For the three months wholesale customers' consumption posted a 1.3% increase over the same months a year prior.

The [2014 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

Ontario's economy continues to exhibit modest growth. There have been a number of recent developments that bode well for the Ontario economy. First, over the past six months employment growth has been broad based, a reversal of period May 2012 to April 2014 where almost all the job growth was concentrated in the Greater Toronto Area. Second, a lower dollar and lower oil prices will help Ontario's export oriented energy intensive industries. The U.S. economy continues to strengthen which also is good for Ontario's export industries. As well, Canada still enjoys low borrowing costs, reasonable debt loads and an educated and productive labour force. On the down side, geopolitical tensions continue to undermine confidence in global markets. As well, lower commodity prices have a negative effect on Ontario's resources sector.

The wholesale customers' electricity consumption has shown consistent gains since August of 2013, indicating a higher level of economic activity. The results vary by sector but are confirmation of the broader economic direction.

- The risks aside, Ontario's economy should see improved growth in 2014 and 2015. Table 3.3.4 of the [2014 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 [2014 Q4 Outlook Tables](#) presents the weekly weather data for the forecast period.

Conservation, Embedded Generation, Demand Management and Pricing

Conservation will continue to grow throughout the forecast period. The demand forecast is decremented for the impacts of conservation. The impact of time-of-use rates and ICI are factored into the demand forecast as they have a downward impact on peak demands.

Embedded generation capacity will continue to grow over the forecast horizon. The forecast of grid supplied electricity is directly impacted by the growth of distribution connected generation as it supplants the need for bulk system power. The forecast accounts for the growth in embedded generation production.

Demand measures include dispatchable loads, Demand Response 3 and Peaksaver Plus. Demand measures are treated as resources in the assessment and therefore have no impact on demand. The actual impacts of these programs are added back to the demand and the forecast is based on demand prior to the impact of these programs. The total demand measure capacity is discounted based on historical and contract data, to reflect the reliably available resource capacity.

- 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 generation capacity is summarized in Table 4.1. This includes capacity from new projects that have completed commissioning and the market entry process.

Table 4.1: Existing Generation Capacity as of October 3, 2014

Fuel Type	Total Installed Capacity (MW)	Forecast Capability at Winter Peak (MW)	Number of Stations	Change in Installed Capacity (MW)	Change in Stations
Nuclear	12,947	12,371	5	0	0
Hydroelectric	8,119	6,059	71	0	0
Gas/Oil	9,920	9,210	29	0	0
Wind	2,483	894	20	0	0
Biofuel	302	289	7	0	0
Total	33,771	28,822	132	0	0

In addition, two electricity storage facilities comprising of a 4 MW flywheel and a 2 MW battery facility are available to provide regulation service.

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 generation projects in the IESO's Connection Assessment and Approval process (CAA), those that are under construction, as well as 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 October 15, 2014. For projects that are under contract, the estimated effective date is based on the best information available to the IESO. If a project is delayed, the estimated effective date will be the best estimate of the commercial operation 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
Silvercreek Solar Park	West	Solar			Commercial Operation	10	10
Liskeard 3	Northeast	Solar			Commercial Operation	10	10
Liskeard 4	Northeast	Solar			Commercial Operation	10	10
Adelaide Wind Energy Centre	Southwest	Wind			Commercial Operation	60	60
Bluewater Wind Energy Centre	Southwest	Wind			Commercial Operation	60	60
Bornish Wind Energy Centre	Southwest	Wind			Commercial Operation	74	74
New Unit at Smoky Falls	Northeast	Water	2014-Q4		Commissioning		89
Second New Unit at Smoky Falls	Northeast	Water	2014-Q4		Commissioning		89
Liskeard 1	Northeast	Solar	2014-Q4		Commissioning		10
Northland Power Solar Abitibi	Northeast	Solar	2014-Q4		Construction		10
Northland Power Solar Empire	Northeast	Solar	2014-Q4		Construction		10
Northland Power Solar Long Lake	Northeast	Solar	2014-Q4		Construction		10
Northland Power Solar Martin's Meadows	Northeast	Solar	2014-Q4		Construction		10
Grand Renewable Energy Park	Southwest	Wind	2014-Q4		Construction		149
Jericho Wind Energy Centre	Southwest	Wind	2014-Q4		Construction		150
Twin Falls	Northeast	Water	2014-Q4		Construction		5
Third New Unit at Smoky Falls	Northeast	Water	2015-Q1		Commissioning		89
Adelaide Wind Power Project	West	Wind	2015-Q1		NTP		40
Grand Valley Wind Farms (Phase 3)	Southwest	Wind	2015-Q1		Pre-NTP		40
Goshen Wind Energy Centre	Southwest	Wind	2015-Q1		Construction		102
Dufferin Wind Farm	Southwest	Wind	2015-Q1		Construction		100
New Third Unit at Kipling	Northeast	Water	2015-Q1		Construction		78
Thunder Bay Unit 3 conversion to biomass	Northwest	Biomass	2015-Q2		Construction		142
Goulais Wind Farm	Northeast	Wind	2015-Q2		NTP		25
Niagara Region Wind Farm	Southwest	Wind	2015-Q2		Pre-NTP		230
Bow Lake Phase 1	Northeast	Wind	2015-Q2		NTP		20
Grand Renewable Energy Park	Southwest	Solar	2015-Q2		Construction		100
K2 Wind Project	Southwest	Wind	2015-Q2		Construction		270
High Falls Hydropower Development	Northwest	Water	2015-Q2		Pre-NTP		5
White Pines Wind Farm	East	Wind	2015-Q2		Pre-NTP		60
Leamington Pollution Control Plant	West	Oil	2015-Q3		Approvals and Permits		2
Cedar Point Wind Power Project Phase II	Southwest	Wind	2015-Q4		Pre-NTP		100
Kingston Solar Project	East	Solar	2015-Q4		NTP		100
Green Electron Power Project	West	Gas	2015		Construction		298
Armow Wind Project	Southwest	Wind	2015-Q4		NTP		180
Grand Bend Wind Farm	Southwest	Wind	2015-Q4		NTP		100
Total						264	2,876

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 Table 4.3.

Table 4.3: Summary of Scenario Assumptions for Resources

		Planned Scenario	Firm Scenario
Over the 18-Month Period	Total Existing Installed Resource Capacity (MW)	33,771	
	New Generation and Capacity Changes (MW)	All Projects	Generators reached commercial operation and generator shutdowns and retirements
		2,876	264

Both scenarios' starting point is the existing installed resources shown in Table 4.1. The Planned Scenario assumes that all resources scheduled to come into service are available over the study period. The Firm Scenario only assumes resources that have reached commercial operation. Also considered for both scenarios are generator-planned shutdowns or retirements that have high certainty of occurring in the future. The Firm and Planned scenarios also differ in their assumptions regarding the amount of demand measures. The Firm scenario considers demand response programs from existing participants only, while the Planned scenario considers demand response programs from future participants too. Both scenarios recognize that resources are not available during times for which the generator has submitted planned outages.

The generation capability assumptions used in this Outlook are described in the following paragraphs.

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 2014. 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. Table 4.4 shows the historical hydroelectric median values calculated with the data from May 2002 to March 2014. These values are updated annually to coincide with the release of summer 18-Month Outlook.

Table 4.4: Monthly Historical Hydroelectric Median Values

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Historical Hydroelectric Median Values (MW)	6,059	6,025	5,876	5,812	5,841	5,716	5,684	5,414	5,018	5,401	5,730	6,131

- Thermal generators' capacity and energy contributions, planned outages, expected forced outage rates and seasonal deratings are based on market participant submissions or calculated by the IESO based on actual experience.

- 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 that subsequently reach a contract with the OPA or register with the IESO as a dispatchable facility are 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. Table 4.5 shows the monthly WCC values (with actual historic wind output up to February 28, 2014). These values are updated annually to coincide with the release of summer Outlook.

Table 4.5: Monthly Wind Capacity Contribution Values

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
WCC (% of Installed Capacity)	33.1%	33.1%	26.2%	22.4%	23.4%	13.6%	13.6%	13.6%	16.7%	21.6%	28.6%	33.1%

- For solar generation, the monthly Solar Capacity Contribution (SCC) values are used at the time of weekday peak. For annual solar energy contribution, 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 4.6 shows the monthly SCC values. These values are updated annually to coincide with the release of summer Outlook.

Table 4.6: Monthly Solar Capacity Contribution Values

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
SCC (% of Installed Capacity)	0.0%	0.0%	0.0%	1.0%	37.0%	27.0%	27.0%	27.0%	6.0%	1.0%	0.0%	0.0%

4.2 Capacity Adequacy Assessment

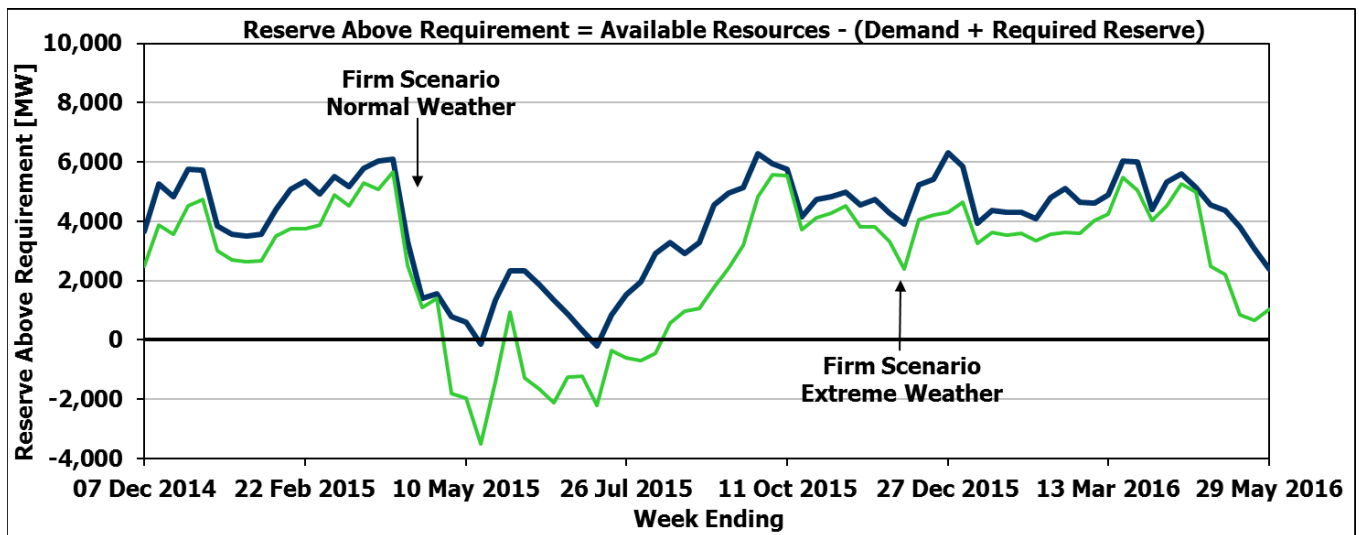
The capacity adequacy assessment accounts for zonal transmission constraints imposed by planned transmission outages. The planned outages occurring during this Outlook period have been assessed as of October 15, 2014.

4.2.1 Firm Scenario with Normal and Extreme Weather

The firm scenario incorporates generation capacity that reached commercial operation and capacity being removed from service during the 18 months. This will include the addition of about 190 MW of wind, 40 MW of biofuel and 30 MW of solar 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, the reserve requirement is being met throughout the Outlook period except for two weeks under normal weather conditions. During extreme weather conditions, the reserve is lower than the requirement for a total of fourteen weeks during the spring and summer of 2015. This shortfall is largely attributed to the planned generator outages scheduled during those weeks.

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

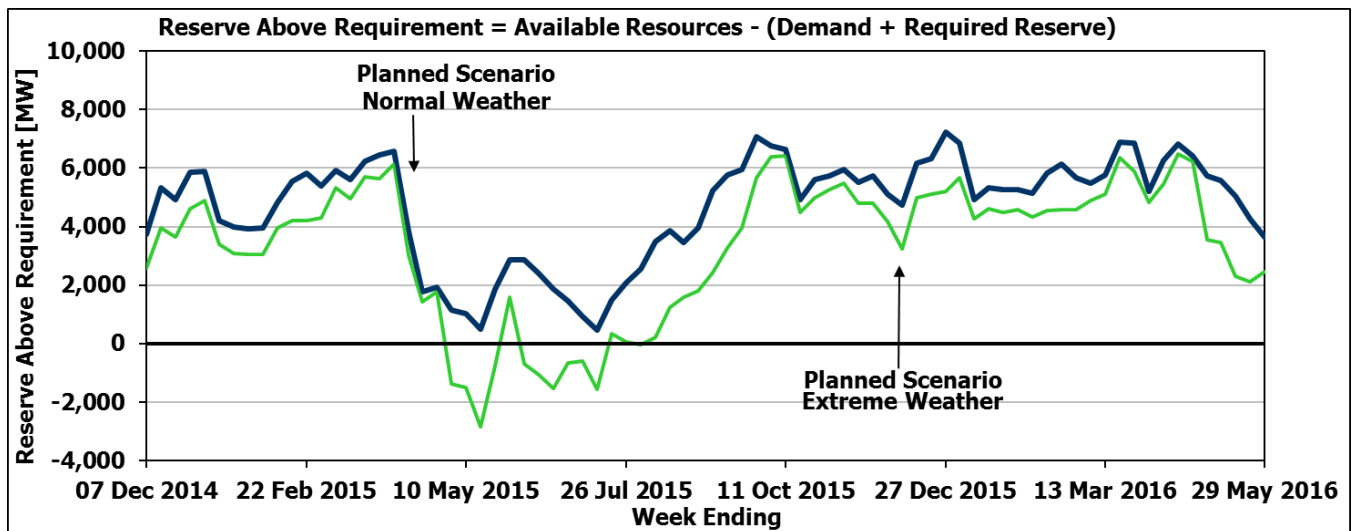


4.2.2 Planned Scenario with Normal and Extreme Weather

The planned scenario incorporates all existing capacity plus all capacity coming in service and being removed from service over the Outlook period. More than 2,800 MW of generation capacity is expected to connect to Ontario's grid over this Outlook period.

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 requirement is being met throughout the Outlook period under normal weather conditions. The reserve is lower than the requirement for eleven weeks during the spring and summer months of 2015 under extreme weather conditions. This shortfall is largely attributed to the planned outages scheduled for those weeks.

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



4.2.3 Comparison of Resource Scenarios

Table 4.7 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 4.7: Summary of Available Resources

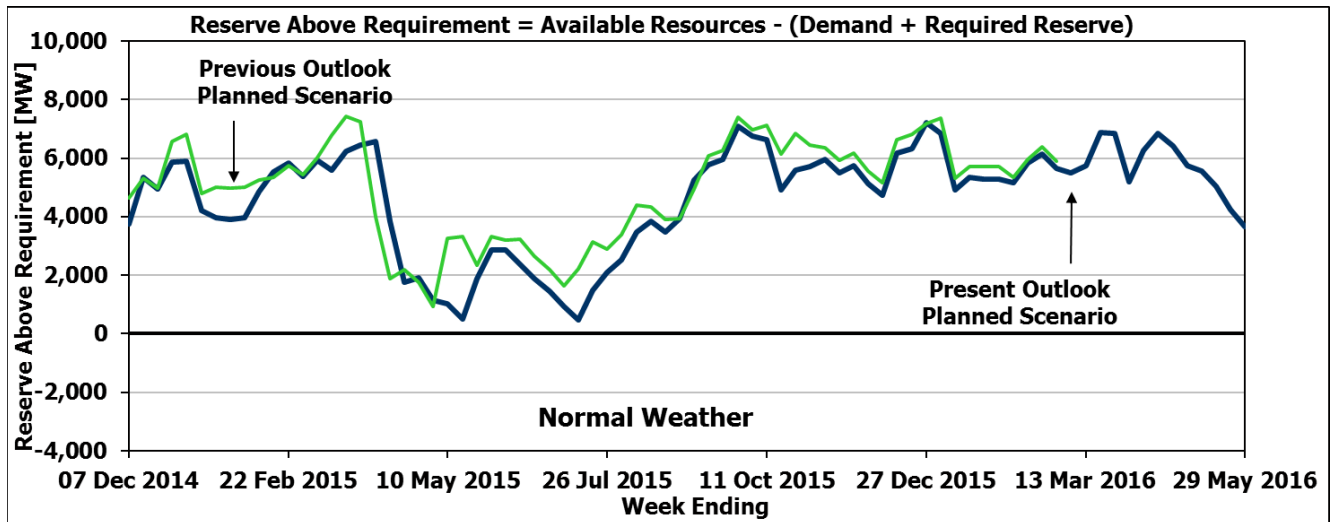
Notes	Description	Winter Peak 2015		Summer Peak 2015		Winter Peak 2016	
		Firm Scenario	Planned Scenario	Firm Scenario	Planned Scenario	Firm Scenario	Planned Scenario
1	Installed Resources (MW)	34,035	34,566	34,035	36,166	34,035	36,647
2	Total Reductions in Resources (MW)	5,340	5,512	8,577	10,123	5,441	7,016
3	Demand Measures (MW)	490	490	503	503	490	490
4	Available Resources (MW)	29,184	29,544	25,960	26,545	29,083	30,121

Notes on Table 4.7:

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 expected 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 4, 2014. 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 Capacity and Table 4.3 for the list of 'Committed and Contracted Generation Resources' for this information. The monthly forecast of energy production capability, based on information provided by market participants, is included in the [2014 Q4 Outlook Tables](#) Appendix A, Table A7.

For the energy adequacy assessment, only the Planned Scenario as per Table 4.4 with normal weather demand is considered. In addition, in order to reasonably capture the variability and uncertainty associated with wind resources, multiple wind samples (hourly profiles) were considered in the energy adequacy assessment. Generator forced outages were modelled using a convergent Monte Carlo technique which pre-filters statistically unlikely outage patterns. 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 - Planned Scenario with Normal Weather

Table 4.10 summarizes key energy statistics over the 18-Month period for the Planned Scenario with normal weather demand for Ontario as a whole, and provides a breakdown by each transmission zone.

The results indicate that no occurrences of unserved energy are expected in Ontario over the 18-Month timeframe of this Outlook.

Table 4.8: Planned Scenario - Normal Weather: Summary of Zonal Energy Statistics for the Outlook Period

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	209.4	15,977.0	209.4	15,977.0	0.0	0.0	455.4	591.9
Bruce	0.9	66.0	64.7	4,940.0	63.8	0.0	1.4	133.7
East	12.3	936.0	14.0	1,069.0	1.7	0.0	25.5	76.9
Essa	11.1	848.0	3.5	267.0	-7.6	0.0	23.3	15.2
Niagara	5.9	450.0	21.2	1,619.0	15.3	0.0	14.5	41.4
Northeast	17.0	1,296.0	14.9	1,140.0	-2.1	0.0	25.8	34.8
Northwest	5.9	453.0	7.2	550.0	1.3	0.0	9.5	18.5
Ottawa	15.9	1,217.0	0.5	37.0	-15.4	0.0	33.7	2.3
Southwest	43.3	3,307.0	5.4	409.0	-37.9	0.0	91.1	19.6
Toronto	78.5	5,989.0	68.7	5,242.0	-9.8	0.0	187.7	182.3
West	18.6	1,417.0	9.2	703.0	-9.4	0.0	43.0	67.2

Figures 4.4 to 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 4.11 summarizes these simulated production results by resource type, for each year.

Figure 4.4: Production by Fuel Type – Dec. 1 to Dec. 31, 2014 (%)

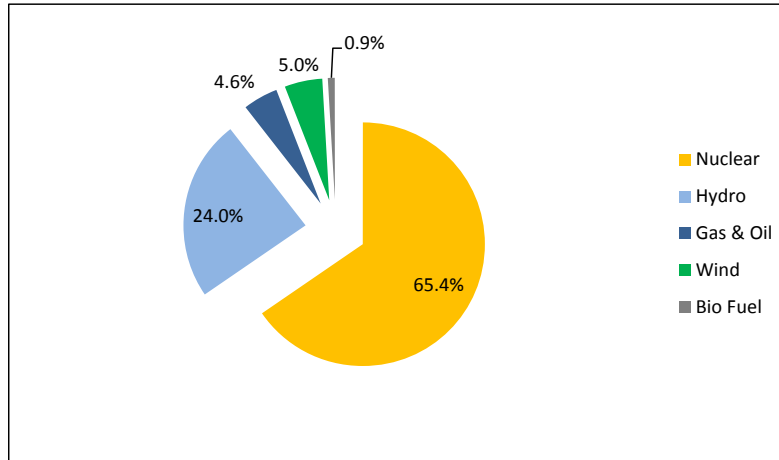


Figure 4.5: Production by Fuel Type – Jan. to Dec. 2015 (%)

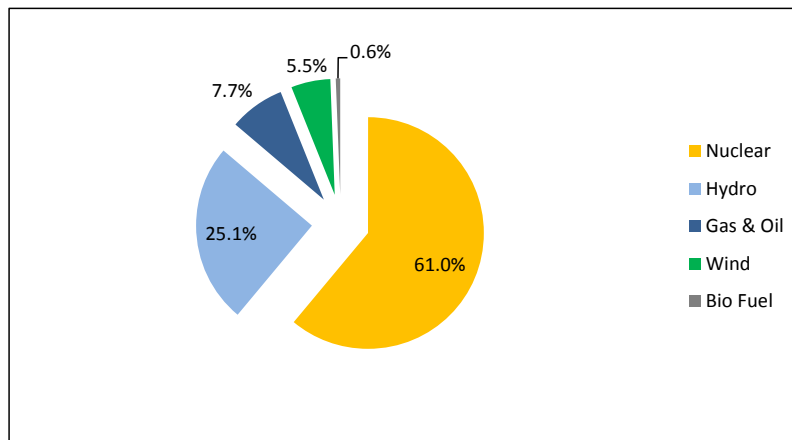


Figure 4.6: Production by Fuel Type – Jan. 1 to May 29, 2016 (%)

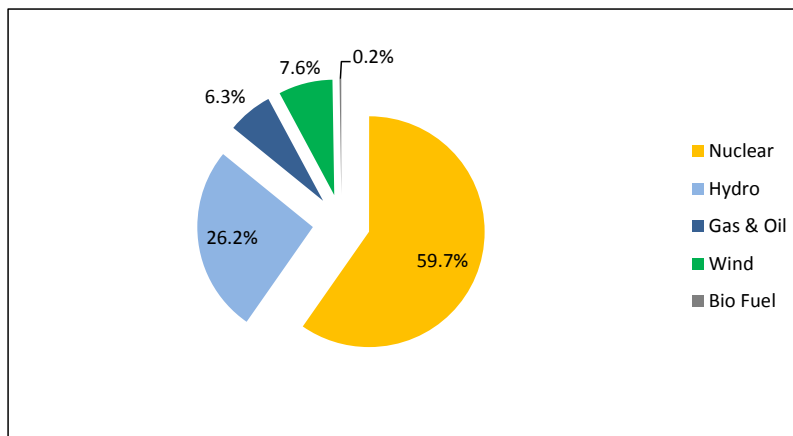


Table 4.9: Planned Scenario - Normal Weather: Ontario Energy Production by Fuel Type for 2014 to 2016

Grid-Connected Resource Type	2014 (Dec)	2015 (Jan – Dec)	2016 (Jan 1 - May 29)	Total
	(GWh)	(GWh)	(GWh)	(GWh)
Nuclear	8,333	85,008	34,232	127,574
Hydro	3,062	35,022	15,009	53,093
Gas & Oil	590	10,740	3,612	14,942
Wind	635	7,596	4,354	12,585
Biofuel	118	860	139	1,116
Other (Solar & DR)	1	40	15	56
Total	12,739	139,266	57,361	209,366

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 the 18-Month Outlook period for the Planned scenario with normal weather demand.

- End of Section -

5 Transmission Reliability Assessment

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.

5.1 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 October 15, 2014.

5.2 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.

5.2.1 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.

The upgrading of the 115 kV breakers at Leaside TS is expected to be completed by December 5th and Manby TS is scheduled for completion by the end of December. Once this work is completed, it will allow additional generation to be incorporated into the Toronto 115 kV system and the distribution level by increasing the short-circuit capability of the 115 kV system.

Following receipt of environmental approvals, the development of Clarington TS has started with a scheduled in-service date of fall-2017. This will ensure that the additional 500 kV to 230 kV transformation capacity required to maintain supply reliability, will be available before

Pickering GS is shutdown. Without this additional capacity there would have been an increased risk of overloading 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 Q3 2015. The new station will allow 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, the situation is expected to become more difficult once Pickering GS is shut down in 2020. Planning work for the installation of new voltage control 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.

Transmission transfer capability in Toronto and Surrounding area is expected to be sufficient for the purpose of supplying load in this area with a margin to allow for planned outages.

5.2.2 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 is 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 are to be installed at Guelph North Junction that will allow the 230 kV system between Detweiler TS and Orangeville TS to be sectionalized. These devices will reduce the restoration times for the loads in the Waterloo, Guelph and Fergus areas following a supply interruption.

In association 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 planned to be in-service by 2017. This incremental investment is required not only to improve the load restoration capability to those customers in the Cambridge area affected by a major transmission outage, but also to accommodate the development of the Cambridge No. 2 transformer station on the 115 kV system between Preston TS and Detweiler TS to meet load growth 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.

Ashfield, a new 500 kV switching station scheduled to be in service by the end of Q1 2015 to accommodate a new wind farm rated at 270 MW.

Hydro One is planning to replace the aging infrastructure at the Bruce 230 kV switchyard, with a completion date of June 2018. While this work is being implemented, careful coordination of the transmission and generation outages will be needed.

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

5.2.3 Niagara Zone

Completion of the transmission reinforcements from the Niagara region into the Hamilton-Burlington area continues to be delayed and the transmission congestion will still restrict connection of new generation in the area. This project, if completed, would increase the transfer capability from the Niagara region to the rest of the Ontario system by approximately 700 MW.

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 alleviate the short circuit capability issue which restricted connection of new generation in the area.

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

5.2.4 East Zone and Ottawa Zone

To address load growth in the Ottawa area, a new load supply transformer station, Orleans TS, is expected to come into service by Q4 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.

With further increases in the amount of load supplied from the 230 kV system in the Merivale area and with a minimum threshold of 400 MW on the level to which the transfers from Hydro Quebec can be automatically reduced following the loss of one of the 230 kV Hawthorne-to-Merivale circuits, there is an increased possibility that imports may need to be restricted during peak load periods. The situation will be especially challenging during periods of low hydroelectric output from the plants on the Ottawa and Madawaska Rivers, which is not uncommon during summer peak periods.

Transmission transfer capability in East Zone and Ottawa Zone is expected to be sufficient for the purpose of supplying load in this area with a margin to allow for planned outages.

5.2.5 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](#).

The thermal rating upgrade of two 230 kV circuits from Lambton TS to Longwood TS is complete. This upgrade will increase the transfer capability into the London area by approximately 100 MW.

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.

5.2.6 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 Q4-2015.

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 was required. New shunt reactors at Dryden are now in service, which will complement the reactors at Marathon and help to resolve this problem. Atikokan generating station was converted to biomass and is now in service improving 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 Integrated Regional Resource Plan (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 recent expansion plans of customers in the area.

One of the Thunder Bay units will be converted to advanced biomass operation. To accommodate the outages required to complete the conversion of these units, the planned maintenance of other critical equipment has been advanced, and plans have been developed to manage the high voltage situations.

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.

6.1 Operation during Nuclear Outages

Voltage control will be challenging during the nuclear outages in the spring of 2015, especially during off-peak periods. Studies to determine the best ways of controlling voltages will be completed by the end of this year and plans to manage grid security will be in place well before the outages are planned to start. Control Room Operators will run simulations of high voltage conditions in the IESO simulator prior to the outage and will be well prepared for any unexpected events that may occur.

The new limits tools yielding the ability to compute operating security limits in near real time will again prove very useful should unforeseen operating conditions occur through the nuclear outages period.

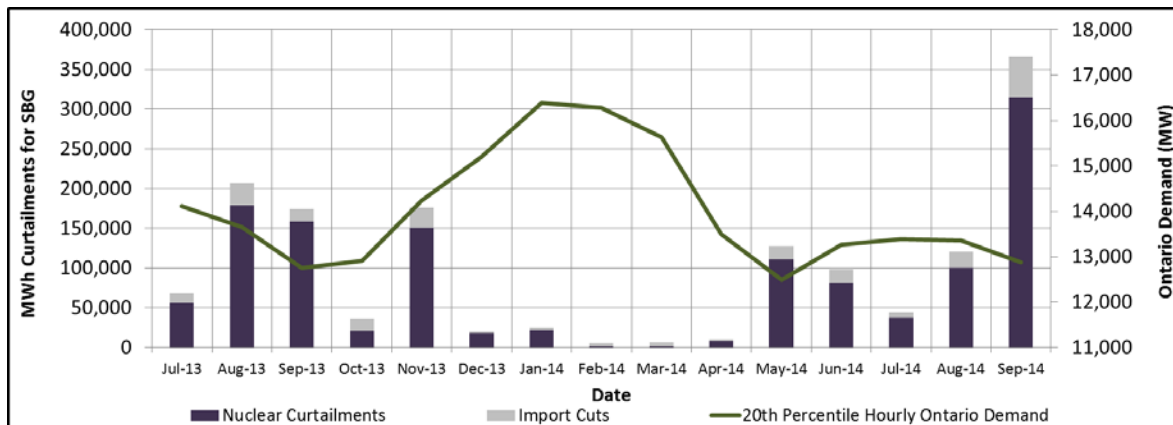
For the nuclear outages scheduled for spring 2015, the IESO has been actively working with transmitters, generators, natural gas pipelines and our interconnected neighbours to ensure reliable operation during this period.

6.2 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.

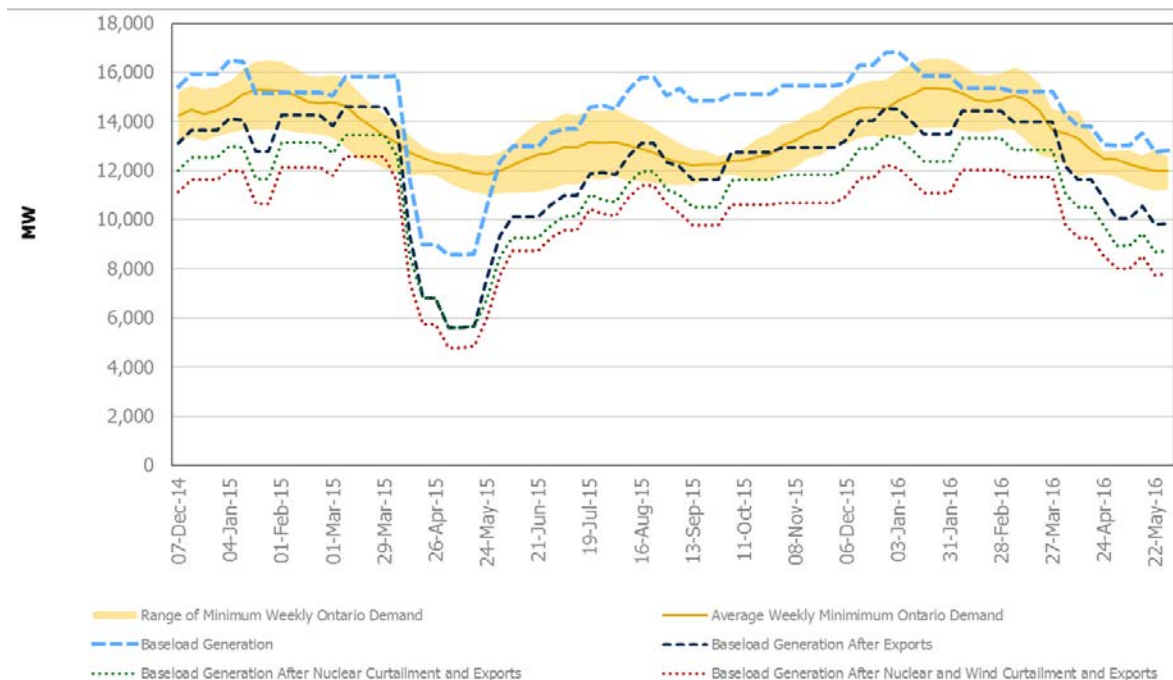
Maneuvering capability from eight units at Bruce Power and dispatchable variable generation has provided additional flexibility to manage SBG, while also mitigating the need for manual control actions. These actions usually occur in the spring and fall, when Ontario demand is lowest.

Figure 6.1 shows the volume of nuclear and import curtailments due to surplus baseload conditions versus the bottom 20% hourly Ontario demand.

Figure 6.1: MWh Curtailments for SBG versus Ontario Demand

The amount of nuclear and import curtailments for SBG in Q3 2014 surpassed the Q3 2013 by 81.7 GWh. This can be attributed to more nuclear outages taken in Q3 of last year than this year.

Figure 6.2 shows the forecast SBG for the next 18 months and the flexibility from nuclear and variable generation.

Figure 6.2: Minimum Ontario Demand and Baseload Generation

Ontario will continue to experience SBG conditions during this Outlook period. 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 can be managed through normal market mechanisms including export scheduling and nuclear maneuvering. IESO's variable generation dispatch tools have provided additional flexibility to alleviate most SBG events.

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. 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. Table 6.1 shows the monthly Off-Peak WCC values (with simulated wind output and actual historic wind output up to February 28, 2014). These values are updated annually to coincide with the release of summer 18-Month Outlook.

Table 6.1: Monthly Off-Peak Wind Capacity Contribution Values

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Off-Peak WCC (% of Installed Capacity)	33.1%	33.1%	30.0%	33.0%	24.1%	15.2%	15.2%	15.2%	21.6%	28.4%	31.8%	33.1%

6.3 Intertie Capability

There is limited potential for procuring long-term firm import of clean electricity from neighboring jurisdictions, which could serve as a reliable complement to Ontario's new coal free resource mix. However, the amount of firm imports that can be reliably transferred is limited by Ontario's existing transmission capability as identified in the [Review of Ontario Interties](#). These transmission constraints will have to be addressed via transmission system upgrades and new facilities in order to increase inter-jurisdictional reliance on clean-energy transactions.

6.4 Declining Reserve Margins in Several Jurisdictions in North America

Reserve Margin is one of the metric used to measure resource adequacy. Reserve Margin is defined as the difference in available resources and demand, divided by demand. One of the key finding in the North American Electric Reliability Corporation (NERC) Long-Term Reliability Assessment - 2014 is that the reserve margins in several assessment areas in North America are trending downward, despite low load growth. The downward trend in reserve margins over the next ten years is attributed to already retired and planned retirements of coal, nuclear and petroleum units.

http://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/2014LTRA_ERATTA.pdf

6.5 Gas-Electric Interdependency

Ontario experienced a high demand for electricity during the last winter, which was challenging for all jurisdictions within the Eastern Interconnection, with prolonged periods of cold temperatures that drove up electricity demand, increased uncertainty for grid operators, and stressed available power supplies. The harsh winter weather early this year also increased the demand for natural gas for heating purposes. As a result, natural gas underground storage plummeted due to the spike in demand for natural gas. In the past several months, however, the natural gas storage levels at Enbridge and Union Gas facilities rose and now are above the five year average.

Overall, the electricity market functioned well and Ontario reliability was maintained. Adequate resources (generation and transmission) and extensive planning led to a reliable winter. But the winter highlights the need for a better understanding of natural gas market dynamics and fuel security. It also emphasizes the importance of Market and Operation coordination in gas and electric sectors and between sectors.

The majority of new generating capacity projected for the next ten years in North America will rely on natural gas as its primary fuel. With an increasing shift towards shale-gas production in North America, gas-fired generation has become a premier choice for future generating capacity, overtaking and replacing coal-fired capacity. However, increased dependence on natural gas for generating capacity can amplify the bulk power system's exposure to interruptions in natural gas fuel supply and delivery.

There are communication protocols in place between the IESO and gas pipeline and distribution system operators to manage and share information under tight supply conditions in either sector (gas or electric). Through this communication protocol the IESO will communicate directly with the gas pipeline or distributor in situations where gas supply constraints could affect either day-ahead or real-time operations. In addition to this, to prepare for the peak seasons, IESO meets with gas pipeline operators every six months (in April and October) to discuss gas supply and planned maintenance on the gas and electric systems.

The IESO has completed its own internal Gas-Electric Coordination Review and is in the process of implementing its recommendations. The review called for:

- enhancements to the existing communication protocols between the IESO and gas generators,
- the IESO to begin monitoring publically available gas infrastructure operational information and
- the IESO to provide input into the OEB 2014 Natural Gas Market Review with the goal of enhancing communication between gas pipelines and storage providers and the IESO for operational and planning needs.

The IESO expects the majority of the recommendations to be completed by the end of 2014 with the remainder completed in 2015.

A major initiative is underway by the Eastern Interconnection Planning Collaborative (EIPC), in the form of the Gas-Electric System Interface Study. This study is being jointly conducted by six Participating Planning Authorities (PPAs) including IESO, to identify the adequacy and resilience of the natural gas infrastructure to serve the needs of the electric power sector over the course of the next decade. The key findings of study work completed to date concluded that:

- Throughout the Eastern Interconnection, existing and future supply constraints for natural gas are a result of congestion on the existing pipeline infrastructure rather than an issue with the amount of natural gas production overall.
- Compared to other PPAs, Ontario benefits from a unique position where many gas-fired generators within the province have firm contracting entitlements to meet some or all of their fuel requirements.
- The supply diversity of gas into Ontario, in comparison with other PPAs, is seen as favourable due to access to Western Canada's reserves through TransCanada and to shale-gas reserves located throughout the Appalachian Basin. Ontario's gas storage infrastructure is also favourable due to access to the large storage facilities located in southern Ontario.

- Simulations for various regular and high gas demand scenarios show that the risk of gas curtailment to gas-fired generators within Ontario is low.

Future EIPC study work will build on the analysis already completed. To resolve gas constraints and potential resultant supply gaps, analysis will also focus on identifying pipeline expansion costs versus the costs associated with the installation of dual-fuel capable generation.

Full details pertaining to the EIPC effort, including study results and future activity plans can be found via the following link:

http://www.eipconline.com/Gas-Electric_Documents.html

- End of Section -

7 Historical Review

This section provides a review of past power system operation, including the most recent months of operation, to identify noteworthy observations, emerging problems and variations from forecast.

7.1 Weather and Demand Historic Review

Since the last full Outlook document was released actual demand and weather data have been reported for the past summer.

For the period May 2014 through October 2014, the weather was significantly milder than normal. In particular, the key summer months of June, July and August were all mild without any sustained heatwave. After correcting for weather, none of the months showed year over year growth. For the ten months ending in October, actual demand is 0.1% lower compared to 2013 as the mild summer was offset to some degree by the colder winter and spring (-0.8% weather corrected). Over the same period, wholesale customers have shown growth of 3.4%, showing that the reductions are occurring on the distribution systems where conservation and embedded generation impacts are having a large impact. Demand is still 6.1% below that of the pre-recession levels of 2008 (-7.0% weather corrected), the result of conservation, embedded generation and structural economic changes.

7.2 Hourly Resource Contributions at Time of Weekday Peak

Figures 7.1 to 7.4 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 2013 to September 2014. 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 7.1 indicates the amount of wind generation compared to the forecast. The forecast methodology takes into account seasonal variances in wind patterns, among other factors. The wind generation amounts before being dispatched are used to derive the values in the chart below.

Figure 7.1: Wind Contributions at the Time of Weekday Peak

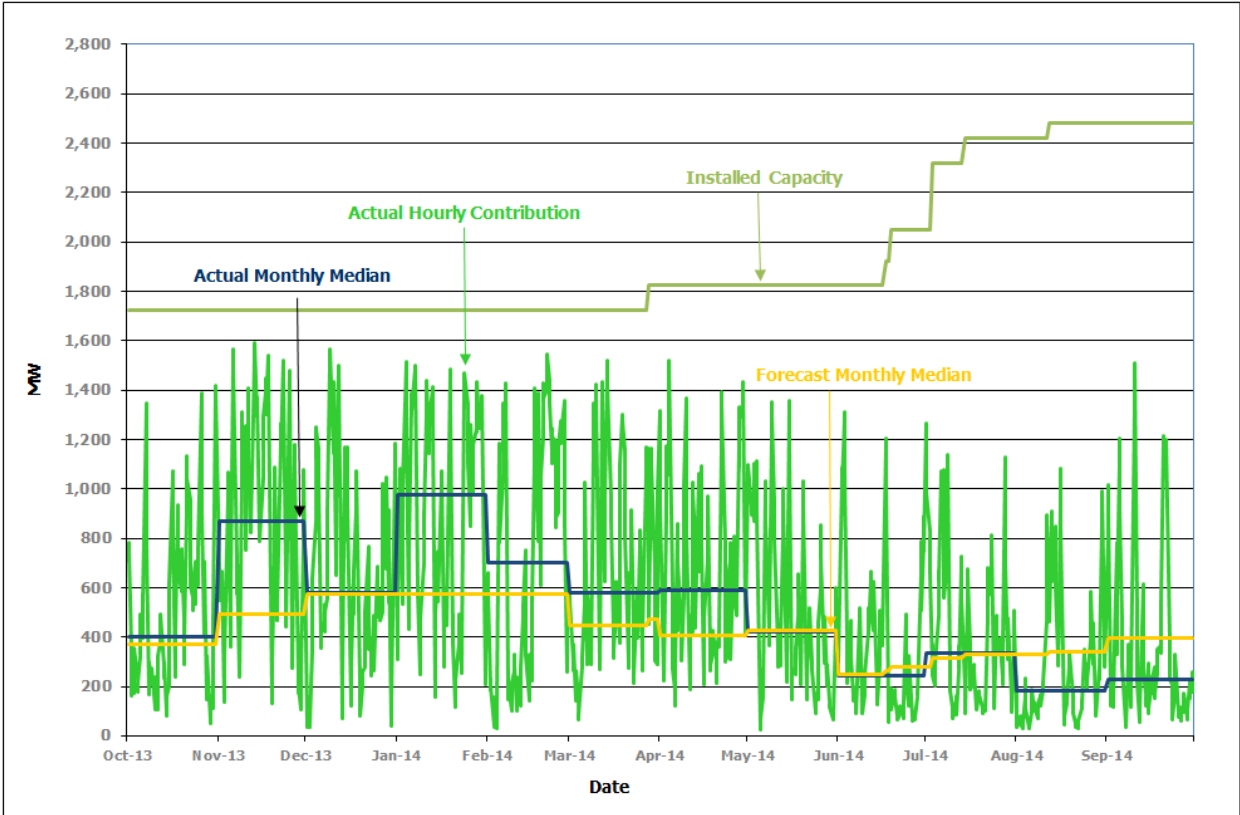


Figure 7.2 indicates the amount of hydroelectric contributions to energy and operating reserve markets at the time of weekday peak, excluding weekends and holidays, compared to the forecasted contributions. The forecasted monthly median is typically the median contribution of hydroelectric energy at the time of weekday peak since 2002. However, if low water persists, the forecast is adjusted accordingly to reflect the observed trend.

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

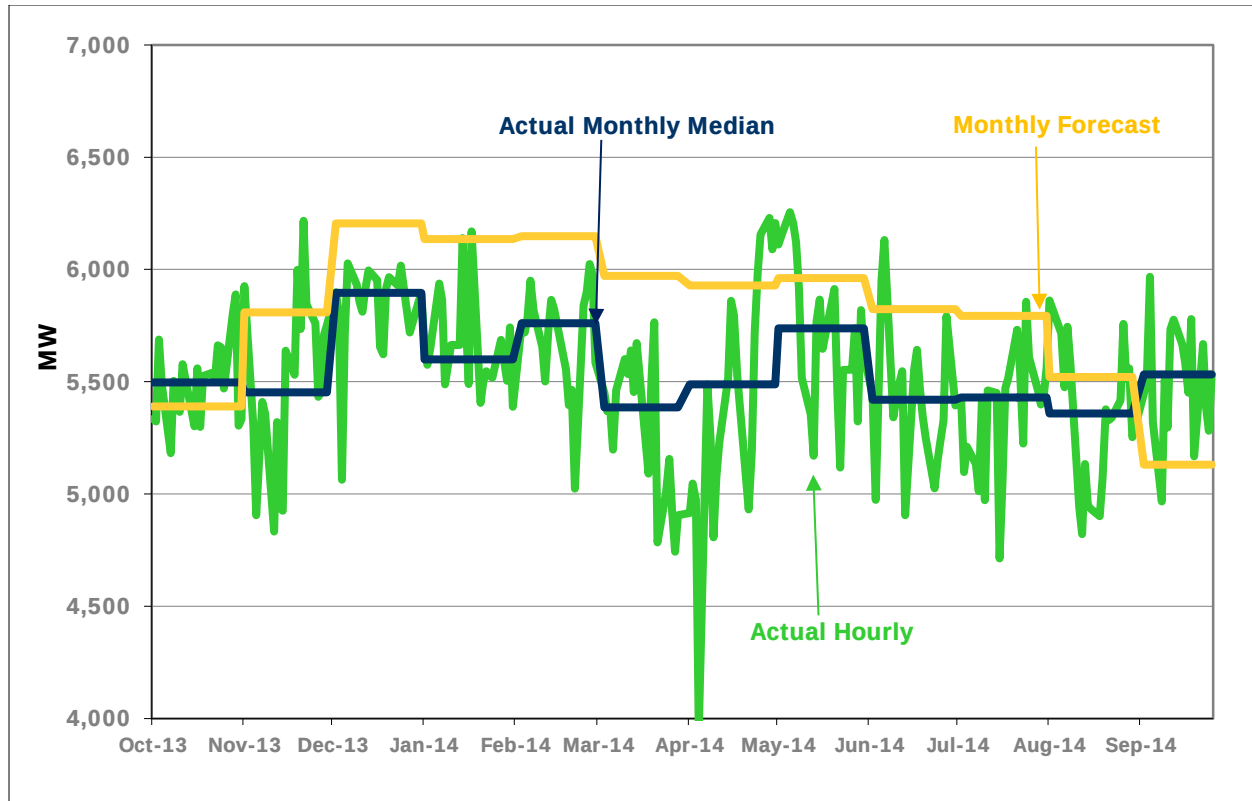


Figure 7.3 shows imports into Ontario at the time of weekday peak. High imports periods correlate to a yearly period with high demands, high prices and consequently an increase in imports.

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

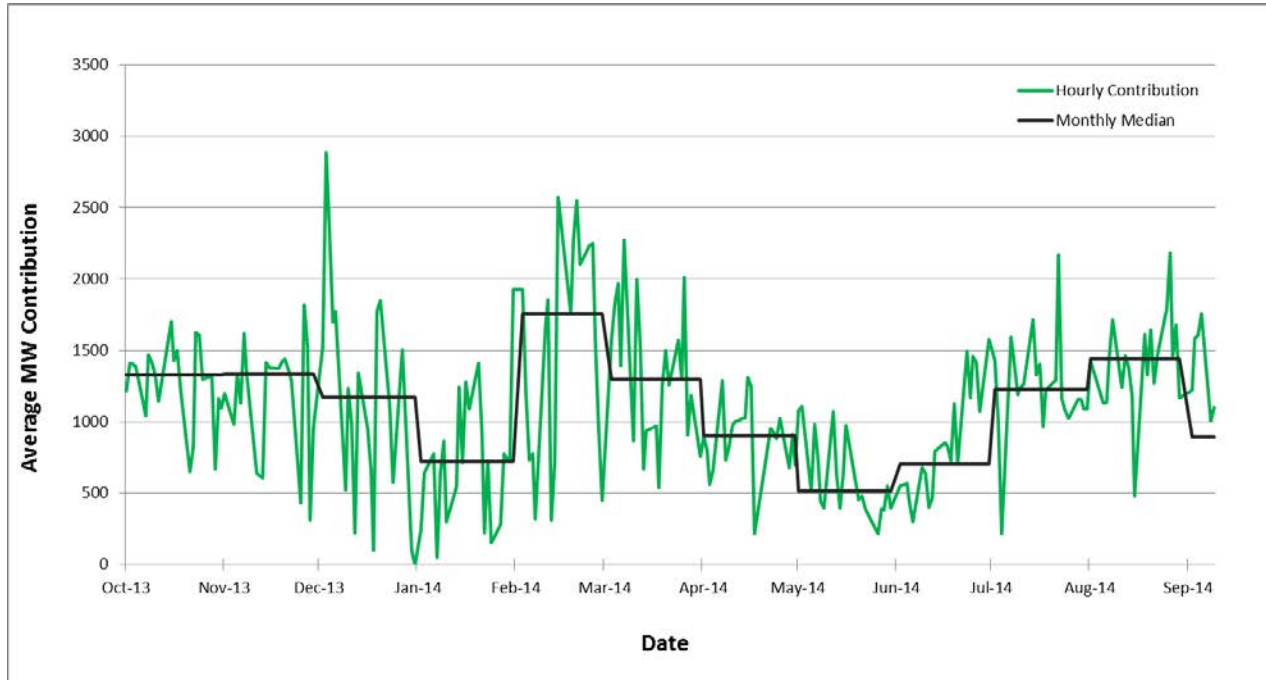
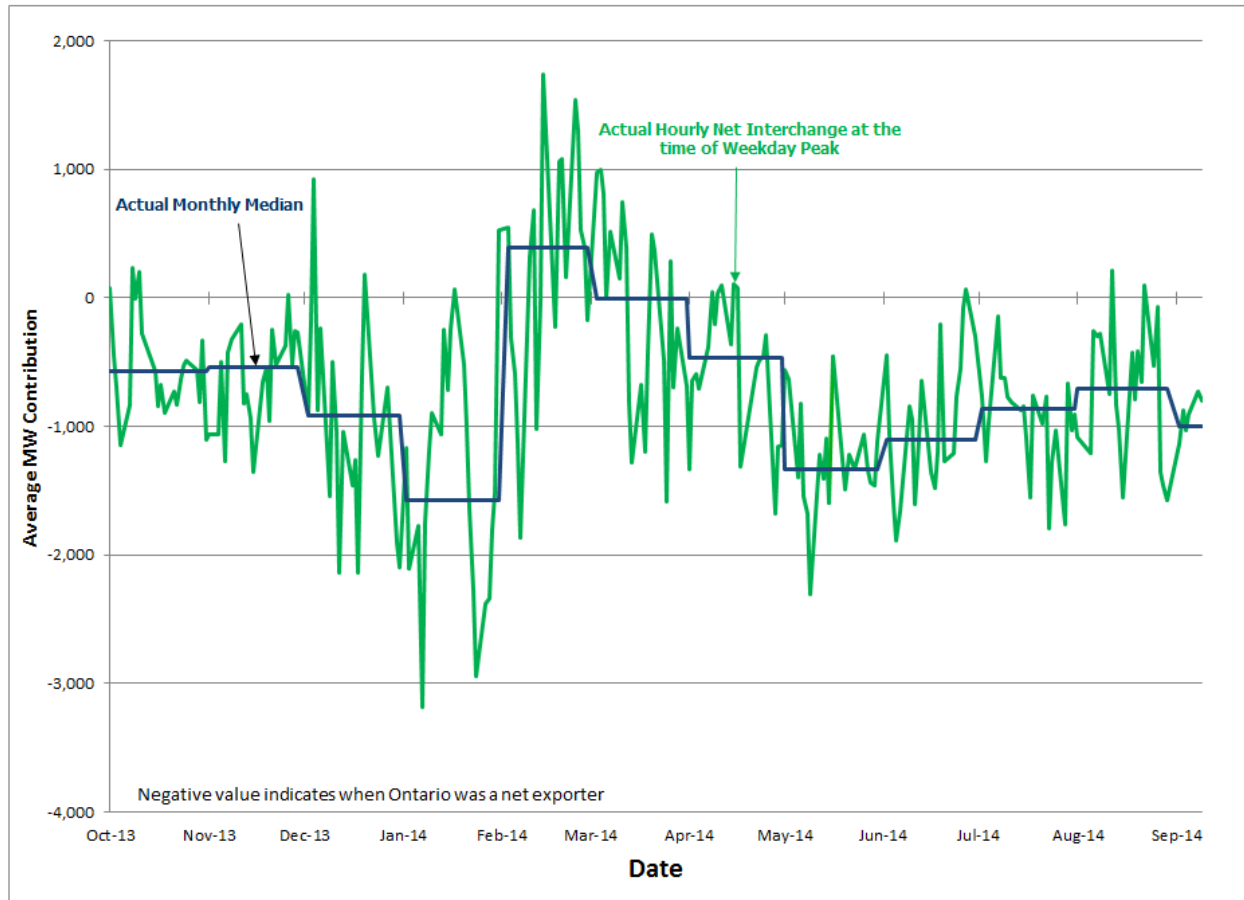


Figure 7.4 shows the amount of net interchange at the time of weekday peak, excluding weekends and holidays. Net Interchange is the difference between total imports into Ontario and total exports out of Ontario. The trend below illustrates the typical economics of spare capacity in Ontario with respect to external jurisdictions.

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



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