18-MONTH OUTLOOK

From December 2012 to May 2014

Power to Ontario. On Demand.

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

Executive Summary

Over the next 18 months, Ontario will continue to have adequate generation and transmission capability to meet consumers' needs. Approximately 2,200 megawatts (MW) of grid-connected renewable capacity will be added to the grid throughout that period, including Ontario's first transmission-connected solar project, a 100 MW solar farm in Haldimand County. The annual energy expected from the addition of these renewable resources is approximately 7.9 terawatt-hours (TWh). By May 2014, the total wind and solar generation connected to the transmission and distribution networks in Ontario is expected to reach approximately 5,500 MW.

The refurbishment and reliable operation of two Bruce nuclear units is an integral requirement for the scheduled elimination of coal-fired capacity. Both Bruce nuclear units have now completed commissioning and once these units have shown satisfactory performance levels Ontario will be in a good position to continue the removal of coal-fired generation from the system. In the previous quarter, the coal-fired generation at Atikokan was removed from the grid and the conversion of the station to biomass has begun.

Energy demand is forecast to decrease by 1.1% in 2013 after a small 0.5% increase in 2012. Factors such as growth in embedded generation capacity, which reduces bulk power system demand, and on-going conservation initiatives will more than offset any positive impacts from population growth and economic expansion, leading to an overall decline in electricity consumption at the bulk system level.

Peak demands will be similarly impacted by the same factors. In particular, the projected growth in embedded solar capacity will have a significant impact on the apparent summer peak. Contributions from distribution-connected solar resources will effectively reduce demand for grid-supplied energy. Additionally, price impacts like time-of-use rates and the Global Adjustment Allocation will have an effect on peak demands, leading to a decline in summer peaks and a slight increase in winter peaks. The following table summarizes the forecasted seasonal peak demand numbers.

Season	Normal Weather Peak (MW)	Extreme Weather Peak (MW)
Winter 2012-13	22,014	23,250
Summer 2013	23,266	25,422
Winter 2013-14	22,096	23,329

On November 1, 2012, regular day-ahead and pre-dispatch scheduling processes incorporated the hourly centralized forecast of variable generators participating in the IESO-administered markets. The addition of the hourly centralized forecast is expected to enhance grid reliability.

With the continuing drop in electricity demand and the ongoing addition of baseload generation, surplus baseload generation (SBG) conditions are expected to continue through the outlook period. After a slight reduction over the upcoming winter period, SBG conditions are expected to return in the spring and summer of 2013 at a frequency and magnitude comparable to 2012. These SBG conditions may need to be managed through control actions, such as increased exports, minimum hydro dispatches, reduced wind dispatches and nuclear maneuvers.

Conclusions & Observations

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

Demand Forecast

- The global economy continues to struggle to find secure footing following the 2009 recession. The developed nations continue to be hampered by high debt rates and high unemployment. This has impacted the developing nations as their economies are dependent on exports to the developed world. Though Ontario boasts an advanced domestic economy, its energy-intensive industries are tied to exports. Weak export demand translates into weak industrial electricity demand.
- The growth in embedded solar capacity will put significant downward pressure on overall energy demand and summer peak demands from the bulk electric system. Combined with conservation, Global Adjustment impacts and time-of-use rates, summer peaks are expected to decline and winter peaks are expected to show a slight increase over the 18-month time horizon.
- With the forecasted peak demand levels, supply adequacy will remain robust. Although high peak demands are likely under extreme weather conditions, they are not expected to pose any province-wide reliability concerns.

Resource Adequacy

- Reserve requirements are expected to be met for all weeks in all weather scenarios.
- Bruce unit 1 and Bruce unit 2 are now in service, having recently completed commissioning.
- Atikokan G1 has been removed from the grid and has begun the process of conversion to biomass.
- Approximately 2,200 megawatts (MW) of grid-connected renewable capacity will be added to the grid throughout this outlook period, including the installation of the first grid-connected solar project.
- Decisions around the possible Pickering unit retirements and associated transmission upgrades are required within the timeframe of this Outlook to ensure supply adequacy continues beyond 2014, when coal-fired generation has ceased and some nuclear units begin to reach their expected end-of-life.

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

Transmission Adequacy

- With the planned system enhancements and scheduled maintenance outages, Ontario's transmission system is expected to supply the demand under the normal and extreme weather conditions forecast for the Outlook period.
- The IESO, OPA, Hydro One and affected distributors are considering long-term options to meet the IESO's load restoration criteria in York Region, the Ottawa area, and in the area supplying Woodbridge TS, Vaughan #3 TS and Kleinburg TS.
- Some area loads experienced modest growth requiring additional investments in local area transmission systems. Several local area supply improvement projects are underway and will be placed in service during the timeframe of this Outlook. These projects, shown in Appendix B, will help relieve loadings of existing transmission stations and provide additional supply capacity for future load growth.
- To manage the special requirements of the Northwest, Hydro One, the OPA and the IESO are currently looking at short- and long-term solutions to maintain an acceptable voltage profile.
- To improve the transmission capability into the Guelph area, Hydro One will be proceeding with the Guelph Area Transmission Refurbishment project to reinforce the supply into Guelph-Cedar TS, with an expected completion date in the second quarter of 2016.
- In the Cambridge area, to help meet the IESO's load restoration criteria following a contingency, a second 230/115 kV autotransformer is expected to be installed at Preston TS by 2015. Longer-term solutions to fully address meeting restoration criteria are being developed.
- The OPA and Hydro One are developing cost estimates and implementation schedules for transmission enhancements at Manby TS planned for 2014 to manage long-term load supply in the south-western GTA.
- In the eastern portion of the GTA, a new Clarington TS that provides 500/230 kV transformation and 230 kV switching facilities is scheduled to be in-service as soon as spring 2015 to maintain supply reliability beyond Pickering end-of-life. Clarington TS will also improve restoration capability to the loads in the Pickering, Ajax, Whitby, Oshawa and Clarington areas following transmission outages.

Operability

- The IESO is continuing with plans to move to an economic dispatch of variable generation. Regular day-ahead and pre-dispatch scheduling processes have incorporated the hourly centralized forecast of variable generators participating in the IESO-administered markets. The addition of the hourly centralized forecast is expected to improve the accuracy of predicting generation output, resulting in more accurate intertie scheduling and unit commitment, all of which will effectively enhance grid reliability.
- By the end of 2013, a 5-minute forecast for variable generation will be introduced into the real-time scheduling process and variable resources themselves will become fully dispatchable.

- The conditions for surplus baseload generation are likely to continue in 2013 following the nuclear unit restarts and with the expected increased penetration of renewable generation, combined with lower off-peak demand for electricity.
- As Ontario's coal-fired generation is shut down over the next two years, its associated operating flexibility will be lost. Therefore, future capacity additions should also possess this flexibility to help facilitate the management of maintenance outages, provide effective ramp capability, and even provide regulation when necessary.

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1 Introduction

This Outlook covers the 18-month period from December 2012 to May 2014 and supersedes the last Outlook released in September 2012.

The purpose of the 18-Month Outlook is:

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

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

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

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

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

- Toll Free: 1-888-448-7777
- Tel: 905-403-6900
- Fax: 905-403-6921
- E-mail: customer.relations@ieso.ca.

- End of Section -

2 Updates to This Outlook

2.1 Updates to Demand Forecast

The demand forecast is based on actual demand, weather and economic data through to the end of August 2012. The demand forecast has been updated to reflect the most recent economic projections and data. Actual weather and demand data for September and October 2012 have been included in the tables.

2.2 Updates to Resources

Atikokan G1 (211 MW) has been shut down and its capacity removed from Ontario's installed capacity, shown in Table 4.1. Bruce units G1 (781 MW) and G2 (771 MW) have returned to service.

Ontario's first grid-connected solar project is expected to be in-service by Q1 2014. Monthly solar capacity contribution values[1] are used to forecast the capacity contributions at the time of weekday peak from this solar project. The value used in the spring months is 67%, in the summer months is 48% and in fall and winter months is 0%. In summer, the peak hour mostly coincides with the higher production from the solar panels, whereas in winter the peak hour occurs after sunset.

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

The assessment uses planned generator outages as submitted by market participants to the IESO's Integrated Outage Management System (IOMS). This Outlook is based on submitted generation outage plans as of October 23, 2012.

2.3 Updates to Transmission Outlook

The list of transmission projects, planned transmission outages and actual experience with forced transmission outages have been updated from the previous 18-Month Outlook. For this Outlook, transmission outage plans submitted to the Integrated Outage Management System (IOMS) as of September 25, 2012 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 Integrated Outage Management System (IOMS). This Outlook is based on submitted generation outage plans as of October 23, 2012.

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

3 Demand Forecast

The IESO is responsible for forecasting electricity demand on the IESO-controlled grid. This demand forecast covers the period December 2012 to May 2014 and supersedes the previous forecast released in September 2012. Tables of supporting information are contained in the 2012 Q4 Outlook Tables spreadsheet.

Electricity demand will increase slightly in 2012 before declining in 2013. Continued growth in embedded generation capacity and conservation programs will offset most of the need for more electricity from an expanding economy and growing population.

The impact of increased embedded generation capacity, time-of-use rates, Global Adjustment changes and conservation will put downward pressure on peak demands. Since summer peaks occur during the middle of the day, when solar output is high, they will be particularly impacted by the projected 600 MW increase in embedded solar capacity by the summer of 2013.

The following table shows the seasonal peaks and annual energy demand over the forecast horizon of the Outlook.

Table 3.1 Forecast Summary

Season	Normal Weather Peak (MW)	Extreme Weather Peak (MW)
Winter 2012-13	22,014	23,250
Summer 2013	23,266	25,422
Winter 2013-14	22,096	23,329
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 (Forecast)	142.0	0.5%
2013 Energy (Forecast)	140.4	-1.1%

Forecast Details

The companion document, the Ontario Demand Forecast, looks at demand in more detail. It contains the following:

- Details on the demand forecast
- Analysis of historical demand
- Discussion on the impact of the demand drivers

The data contained in the Ontario Demand Forecast document are included in the 2012 Q4 Outlook Tables spreadsheet.

- End of Section -

4 Resource Adequacy Assessment

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

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

Table 4.1 Existing Generation Resources as of November 8, 2012

Fuel Type	Total Installed Capacity (MW)	Forecast Capability at Winter Peak* (MW)	Number of Stations	Change in Installed Capacity (MW)	Change in Stations
Nuclear	12,998	10,552	5	1,552	0
Hydroelectric	7,947	5,659	71	0	0
Coal	3,293	2,983	3	-211	-1
Oil / Gas	9,987	9,145	29	0	0
Wind	1,511	507	12	0	0
Biomass / Landfill Gas	122	44	6	0	0
Total	35,858	28,890	126	1,341	-1

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

4.1 Committed and Contracted Generation Resources

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

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

Table 4.2 Committed and Contracted Generation Resources

Project Name	Zone	Fuel Type	Estimated Effective Date	Change	Project Status	Capacity Considered	
						Firm (MW)	Planned (MW)
Comber Wind Limited Partnership	West	Wind			Commercial Operation	166	166
Pointe Aux Roches Wind	West	Wind			Commercial Operation	49	49
Thunder Bay Condensing Turbine Project	Northwest	Biomass	2013-Q1		Construction	40	40
Conestogo Wind Energy Centre 1	Southwest	Wind	2013-Q1		pre-NTP		69
Summerhaven Wind Energy Centre	Southwest	Wind	2013-Q1		NTP		125
McLean's Mountain Wind Farm	Northeast	Wind	2013-Q2		pre-NTP		60
Leamington Pollution Control Plant	West	Oil	2013-Q2		Construction		2
Becker Cogeneration Plant	Northwest	Biomass	2013-Q4		Construction		8
Atikokan conversion to biomass	Northwest	Biomass	2013-Q4		Construction		205
Bow Lake Phase 1	Northeast	Wind	2013-Q4		pre-NTP		20
Incremental capacity at Sir Adam Beck with the third Niagara tunnel	Niagara	Water	2014-Q1		Construction		30
Dufferin Wind Farm	Southwest	Wind	2014-Q1		Pre-NTP		100
Amherst Island Wind Project	East	Wind	2014-Q1		Pre-NTP		75
Niagara Region Wind Farm	Niagara	Wind	2014-Q1		Pre-NTP		230
Nigig Power Corporation	Essa	Wind	2014-Q1		Pre-NTP		300
Haldimand Wind Project	Southwest	Wind	2014-Q1		Pre-NTP		150
Haldimand Solar Project	Southwest	Solar	2014-Q1		Pre-NTP		100
Port Dover and Nanticoke Wind Project	Southwest	Wind	2014-Q1		Pre-NTP		105
South Kent Wind Project	West	Wind	2014-Q1		Pre-NTP		270
New Third Unit at Little Long	Northeast	Water	2014-Q2		Pre-NTP		71
Total						**254**	**2,174**

Notes on Table 4.2:

1. The total may not add up due to rounding. Total does not include in-service facilities.
2. Project status provides an indication of the project progress. The milestones used are:
    a. Connection Assessment - the project is undergoing an IESO system impact assessment
    b. Approvals & Permits - the proponent is acquiring major approvals and permits required to start construction (e.g. environmental assessment, municipal approvals etc.)
    c. Construction - the project is under construction
    d. Commissioning - the project is undergoing commissioning tests with the IESO
    e. Pre-NTP/NTP - Feed-in Tariff (FIT) projects are categorized as Notice to Proceed (NTP) or pre-NTP. OPA issues NTP when the project proponent provides necessary approvals and permits, finance plan, Domestic Content Plan and documentation on impact assessment required by the Transmission System Code or the Distribution System Code.
    f. Commercial Operation – the project has achieved commercial operation under OPA criteria.

4.2 Summary of Scenario Assumptions

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

Both scenarios' starting point is the existing installed resources shown in Table 4.1. The Planned Scenario assumes that all resources that are scheduled to come into service are available over the study period while the Firm Scenario only assumes those scheduled to come into service over the first three months and generators that have started commissioning. Both scenarios recognize that resources that are in service are not available during times for which the generator has submitted planned outages. Also considered for both scenarios are generator-planned shutdowns or retirements which have 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 2012. Adjustments may be made, periodically, when outage or water conditions drive expectations of higher or lower output that varies from median values by more than 500 MW. Manual adjustments to affected months have been made during this outlook period to account for specific scheduled hydroelectric outages and low water conditions.
- Thermal generators' capacity and energy contributions are based on market participant submissions, including planned outages, expected forced outage rates and seasonal deratings.
- For wind generation the monthly Wind Capacity Contribution (WCC) values, which can be found in the Methodology to Perform Long Term Assessments, are used at the time of weekday peak, while total energy contribution is assumed to be 29% of installed wind capacity.

Table 4.3 Summary of Scenario Assumptions

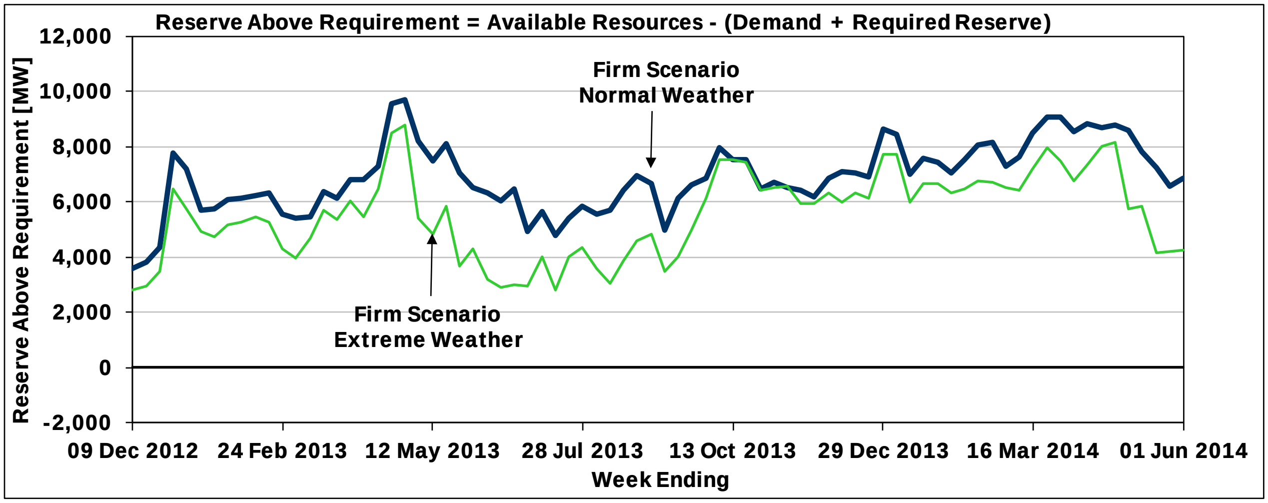
Assumptions		Planned Scenario	Firm Scenario
Resources	Total Existing Installed Resource Capacity (MW)	35,858	
	New Generation and Capacity Changes (MW)	All Projects	Generator shutdowns or retirements, Commissioning Generators and Generators starting in the first 3 months
		2,174	254
Demand Forecast at Winter Peak	Conservation (MW)	Incremental growth of 70 MW	
	Embedded Generation (MW)	Incremental growth of 82 MW	
	Demand Measures (MW)	Exisiting + Incremental	Existing
		779	697

4.3 Firm Scenario with Normal and Extreme Weather

The firm scenario incorporates capacity coming in service in the first three months of the Outlook period and generation being removed from service during the 18 months. This will include the addition of 215 MW of wind and 40 MW of biomass capacity.

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

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

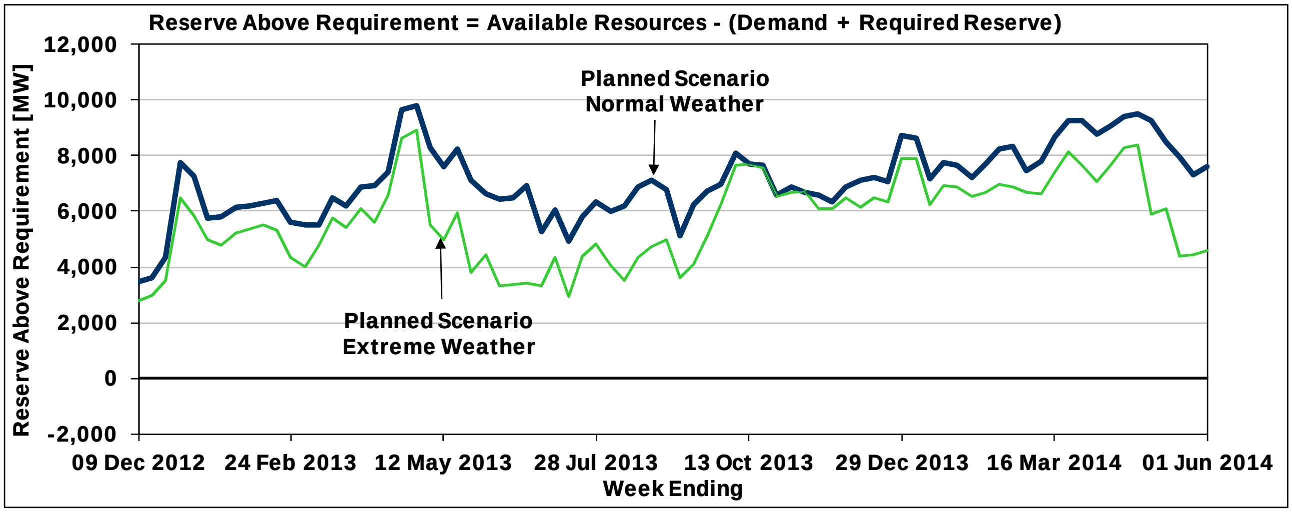


4.4 Planned Scenario with Normal and Extreme Weather

The planned scenario incorporates all capacity coming in service and being removed from service over the Outlook period. This will include the capacity changes in the firm scenario as well as approximately 1,900 MW of grid-connected renewables added to the system.

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

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



4.5 Comparison of Resource Scenarios

Table 4.4 shows a snapshot of the forecast available resources, under the two scenarios, at the time of the summer and winter peak demands during the Outlook. The monthly forecast of energy production capability, as provided by market participants, is included in the 2012 Q4 Outlook Tables Appendix A, Table A7.

Table 4.4 Summary of Available Resources

Notes	Description	Winter Peak 2013		Summer Peak 2013		Winter Peak 2014	
		Firm Scenario	Planned Scenario	Firm Scenario	Planned Scenario	Firm Scenario	Planned Scenario
1	Installed Resources (MW)	36,072	36,072	36,112	36,368	36,112	36,631
2	Total Reductions in Resources (MW)	6,044	6,044	5,244	5,465	4,657	5,040
3	Demand Measures (MW)	697	774	500	582	697	779
4	Available Resources (MW)	30,726	30,802	31,368	31,485	32,153	32,370

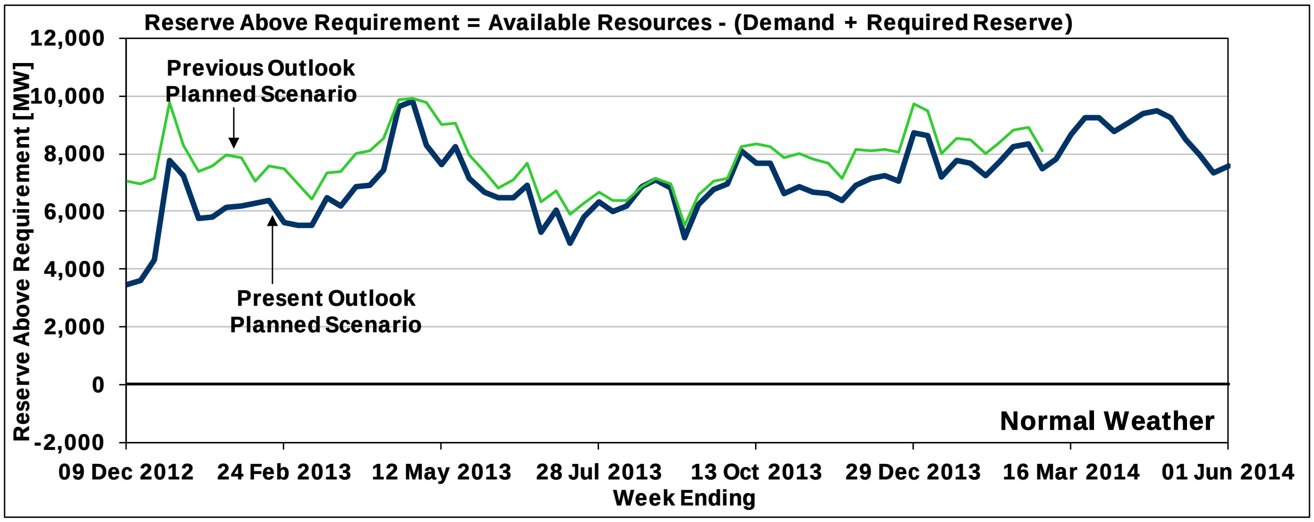
Notes on Table 4.4:

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

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

Figure 4.3 provides a comparison between the forecast Reserve Above Requirement values in the present Outlook and the forecast Reserve Above Requirement values in the previous Outlook published on September 12, 2012. The difference is mainly due to the changes to outages and changes in the demand forecast.

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



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

- End of Section -

5 Transmission Reliability Assessment

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

- Identify all major transmission and load supply projects that are planned for completion during the Outlook period and identify their reliability benefits;
- Forecast any reduction in transmission capacity brought about by specific transmission outages. For a major transmission interface or interconnection, the reduction in transmission capacity due to an outage condition can be expressed as a change in its base flow limit;
- Identify equipment outages that could require contingency planning by market participants 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 the 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 of existing transmission and provide additional supply capacity for future load growth.

5.2 Transmission Outages

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

This Outlook contains transmission outage plans submitted to the IESO as of July 4, 2012.

5.3 Transmission System Adequacy

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

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

5.3.1 Toronto and Surrounding Area

The Greater Toronto Area (GTA) electricity supply is expected to be adequate to meet the normal weather forecasted demand. The OPA and Hydro One are developing cost estimates and implementation schedules for transmission enhancements at Manby TS planned for 2014 to manage long-term load supply in the south-western GTA. For the short term, day-to-day operating procedures are available to manage the forecasted transmission loading during periods of high demand.

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

Hydro One is continuing with the work of replacing 115 kV breakers at Hearn TS, Manby TS and Leaside TS. The new equipment is expected to be in-service by 2015 and will allow for more flexibility during day-to-day operation.

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

5.3.2 Bruce and Southwest Zones

In the Guelph area, the existing 115kV transmission facilities are operating close to capacity and have limited margin to accommodate additional load. To improve the transmission capability into the Guelph area, Hydro One will be proceeding with the Guelph Area Transmission Refurbishment project to reinforce the supply into Guelph-Cedar TS, with an expected completion date in the second quarter of 2016. Additionally, a second 230/115 kV autotransformer is expected to be installed at Preston TS in order to help improve the capability of existing transmission infrastructure in the Cambridge area to meet the IESO's load restoration criteria following a contingency. Longer-term solutions to fully address compliance with restoration criteria are being developed.

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

5.3.3 Niagara Zone

The completion date for transmission reinforcements from the Niagara region into the Hamilton-Burlington area continues to be delayed. Completion of this project will increase the transfer capability from the Niagara region to the rest of the Ontario system.

Until the project is in service, the supply needs in Southern Ontario will continue to be met through the existing system. The failed R76 voltage regulator and the BP76 circuit are expected to return to service by December 2012. The bypass will remain available for use if required until the R76 voltage regulator returns.

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 2013 and will allow for the incorporation of additional generation in the area.

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

5.3.4 East Zone and Ottawa Zone

Hydro One is working to replace existing 115 kV breakers at Hawthorne TS. The new equipment is expected to be in-service by the end of 2013 and will improve the reliability of the 115 kV system supplying the Ottawa area, while enabling the incorporation of generation in the Ottawa area.

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

5.3.5 West Zone

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

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

5.3.6 Northeast and Northwest Zones

To further improve the north-south transfer capability Hydro One installed shunt capacitors at Hanmer TS and Porcupine TS. The shunt capacitor at Pinard TS has a planned in-service date during this Outlook period.

Managing grid voltages in the Northwest has always required special attention. With significantly lower demands over the past few years, it has become increasingly difficult to maintain an acceptable voltage profile without compromising the reliability of supply, in particular during times of low east-west transfers.

On several occasions in the Northwest, 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. This reduced the grid's ability to withstand disturbances and impacted customers' supply reliability.

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

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

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

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

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

- End of Section -

6 Operability Assessment

The IESO monitors existing and emerging operability issues that could potentially impact system reliability. Over the next 18 months, Ontario expects to have a sufficient supply of electricity to meet its projected needs, with some occurrences of surplus baseload generation (SBG). During that period, the IESO also expects to implement changes with respect to variable generation dispatch to enhance grid reliability.

A number of factors like low demand, high baseload resources and high winds can combine to result in situations when output from baseload resources may exceed demand, making balancing generation and load more difficult. As a result, the IESO may need to curtail low-cost dispatchable resources that otherwise would be expected to run. How effectively the IESO can manage this going forward will depend on making full use of the flexibility of all resources in the supply mix and continued market-to-market transactions with neighbouring power systems.

On November 1, 2012, regular day-ahead and pre-dispatch scheduling processes incorporated the hourly centralized forecast of variable generators participating in the IESO-administered markets. The addition of the hourly centralized forecast is expected to improve the accuracy of predicting generation output, resulting in more accurate intertie scheduling and unit commitment, all of which will effectively enhance grid reliability. Further improvements are expected by the end of 2013 with the introduction of a 5-minute forecast for variable generation into the real-time scheduling process along with variable resources themselves becoming fully dispatchable.

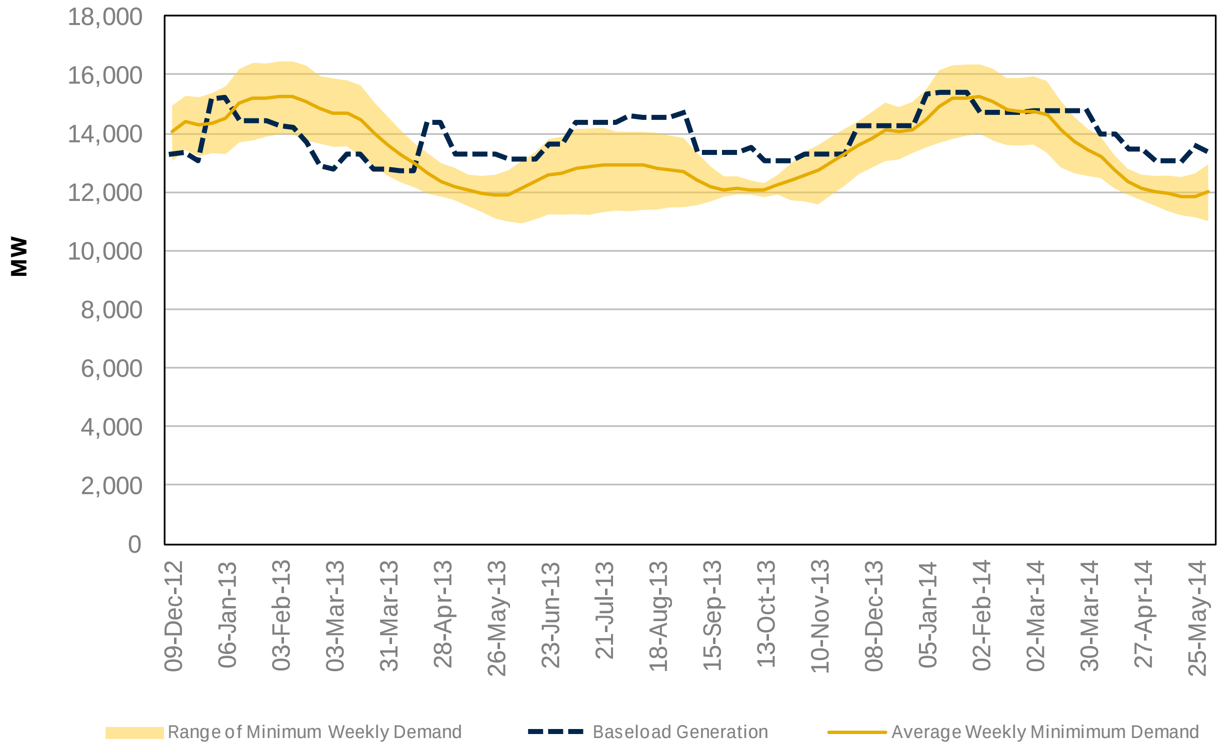
In the spring, summer and fall of 2013, SBG events are expected to return at a similar frequency and magnitude as in 2012. These events will need to be managed in the short term until variable generation becomes fully dispatchable and nuclear refurbishment programs begin. A lack of direct control over a number of factors that contribute to SBG, such as temperature, other weather parameters, consumption, and lack of generation and load response to market prices, poses challenges in handling SBG situations. With the anticipated level of SBG in 2013, we foresee an increase in minimum hydro dispatches, reduced wind dispatches, and nuclear maneuvering in order to manage any surplus that cannot be relieved through exports.

The expected SBG for the next 18 months can be seen in Figure 6.1. The baseload generation assumptions include market participant-submitted minimum production data, the latest planned outage information, projected forced outage rates, in-service dates for new or refurbished generation, and reliable export capability[1]. The expected contribution from self-

[1] Under conditions which allow Ontario's aggregate export capability to be higher than 2,600 MW, export assumption of 1,500 MW is used. When forecast planned outages are expected to limit Ontario's aggregate export capacity to between 1,400 MW and 2,600 MW, the export assumption value will be reduced to 1,200 MW. For forecast planned outages that further limit export capacity to below 1,400 MW, the export assumption value will be reduced to 700 MW. See Appendix C of the 18-Month Outlook Tables for forecast reduction to major transmission interface limits, including interconnection interfaces.

scheduling and intermittent generation has also been updated to reflect the latest data. Output from commissioning units is explicitly excluded from this analysis due to uncertainty and the highly variable nature of commissioning schedules.

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



The IESO continues to work towards the elimination of coal-fired generation from the Ontario grid. Recently, the 211 MW Atikokan coal-fired facility was removed from service and began conversion to a biomass generation plant. As Ontario's coal-fired generation is shut down over the next two years, its associated flexibility, such as quick ramping and operating reserve, will be lost. Therefore, future capacity additions should also possess this flexibility to help facilitate the management of maintenance outages, provide effective ramp capability, supply operating reserve and even provide regulation when necessary.

- End of 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 in June 2012, actual demand and weather data have been reported for the past summer.

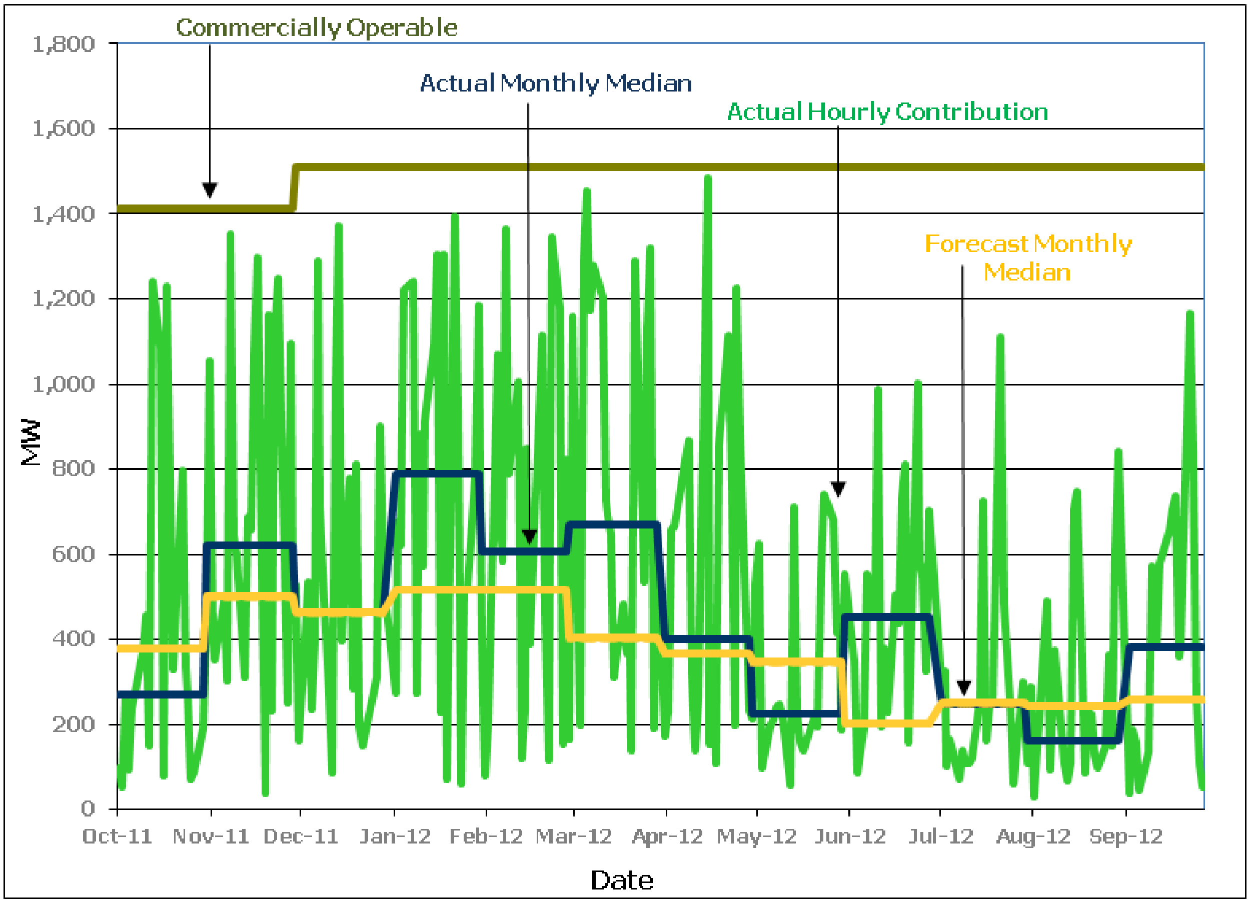
For the period May 2012 through November 2012, the weather was generally warmer than normal. In particular, the key summer months of June and July were especially warm. For the months of May to August, both the actual and weather-corrected demand numbers were higher than in the same months a year earlier. The numbers dropped slightly in September before rebounding in October. Overall for the six months (May to October) demand was 1.7% higher than the year before (1.4% weather-corrected). Demand is still 2.1% lower (3.8% weather corrected) than in the same timeframe in 2008 (prior to the recession).

7.2 Hourly Resource Contributions at Time of Weekday Peak

Figures 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 the weekday peak. The period analyzed is from October 2011 to September 2012. 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 contributions. The forecast methodology takes into account seasonal variances in wind patterns, among other factors. Installed wind capacity is expected to grow with wind generation procured under the FIT programs.

Figure 7.2.1 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 consists of the median contribution of hydroelectric energy at the time of weekday peak since 2002. The hydroelectric production at the hour of weekday peak summer months were lower than forecasted. The lower summer values for 2012 are due to a decrease in precipitation levels from previous years

Figure 7.2.2 Hydro Contributions (Energy and Operating Reserve) at the Time of Weekday Peak

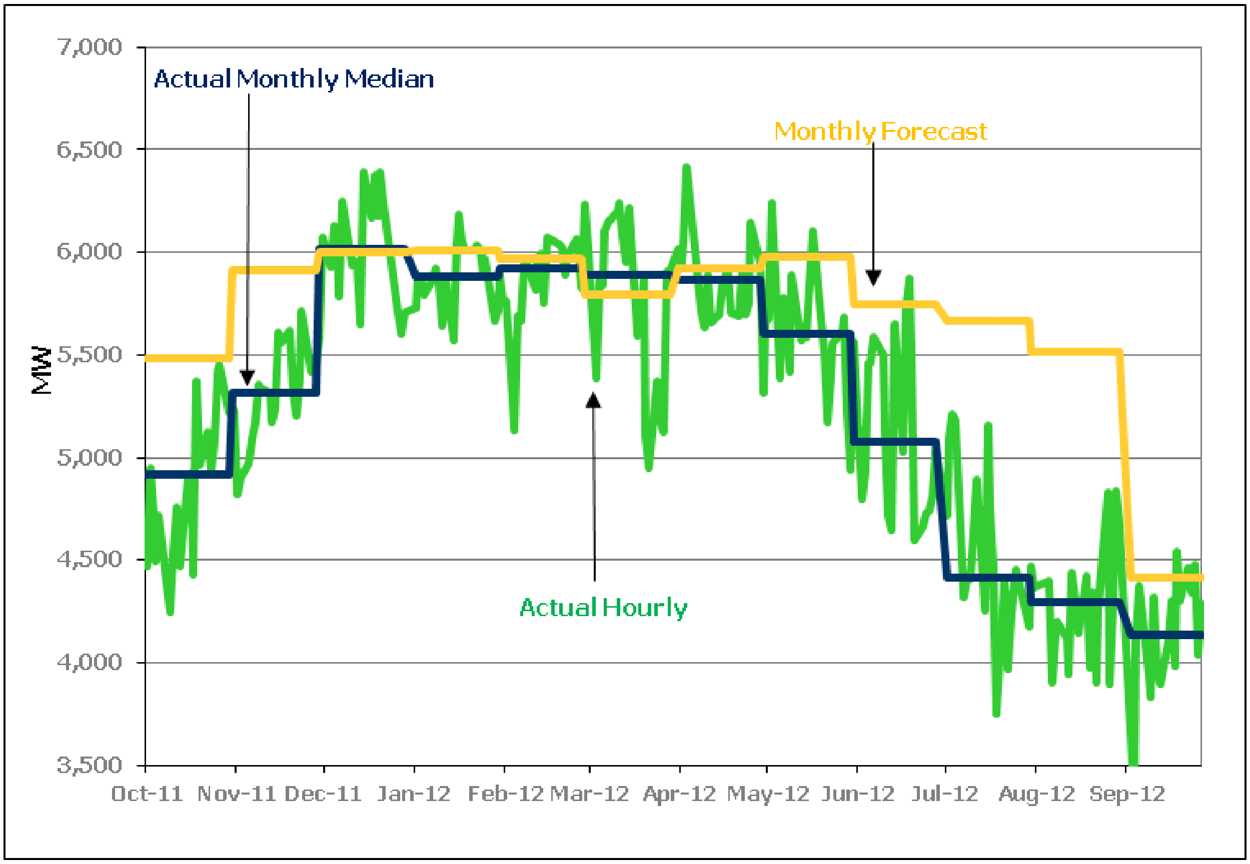


Figure 7.2.3 shows imports into Ontario at the time of weekday peak. Summer 2012 imports were noticeably higher than the rest of the reporting period, which is expected in summer months. The extremely high temperatures in July and August contributed to high demands and consequently an increase in imports. In contrast, the mild winter of 2012 followed by record-breaking high temperatures in March contributed to low demand and therefore lower imports.

Figure 7.2.3 Imports into Ontario at the Time of Weekday Peak

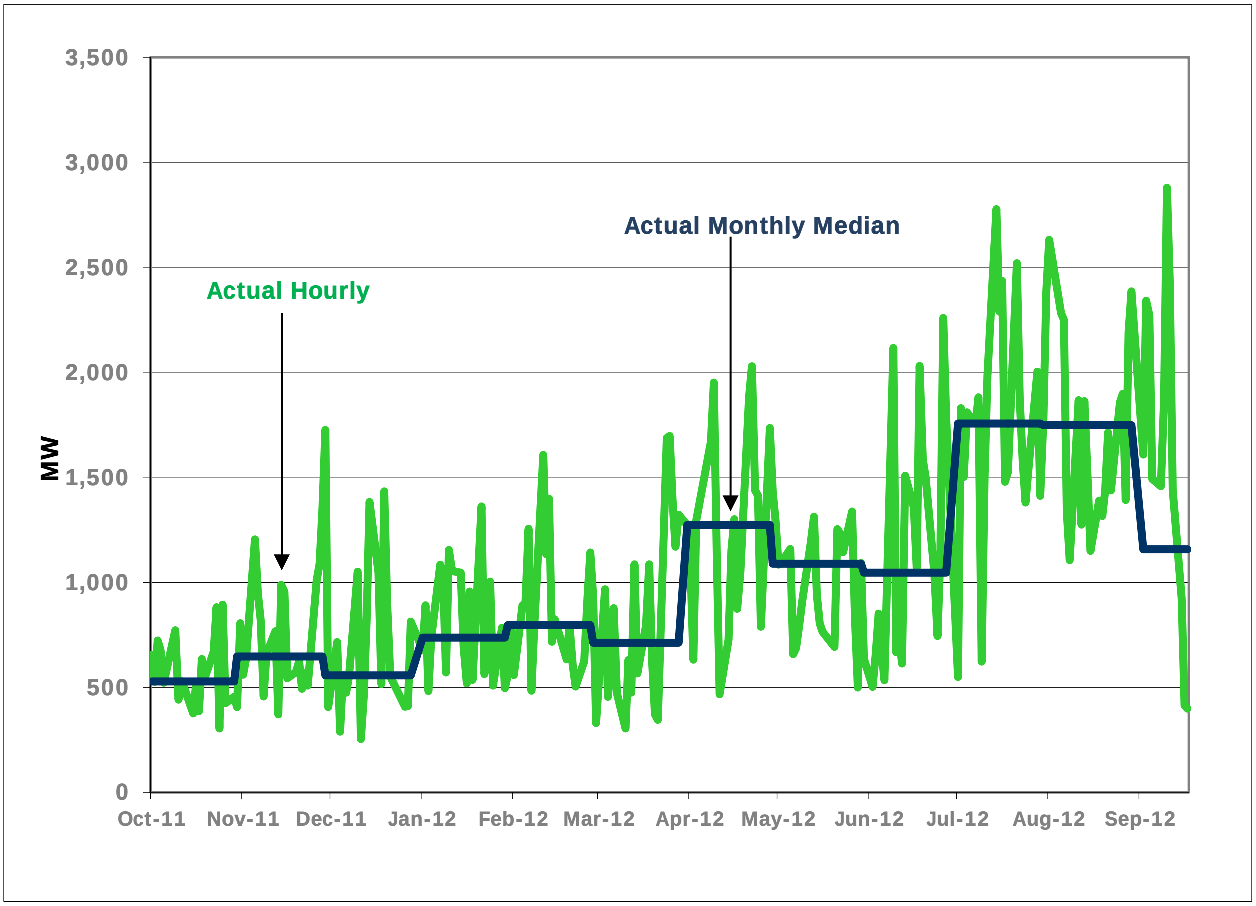
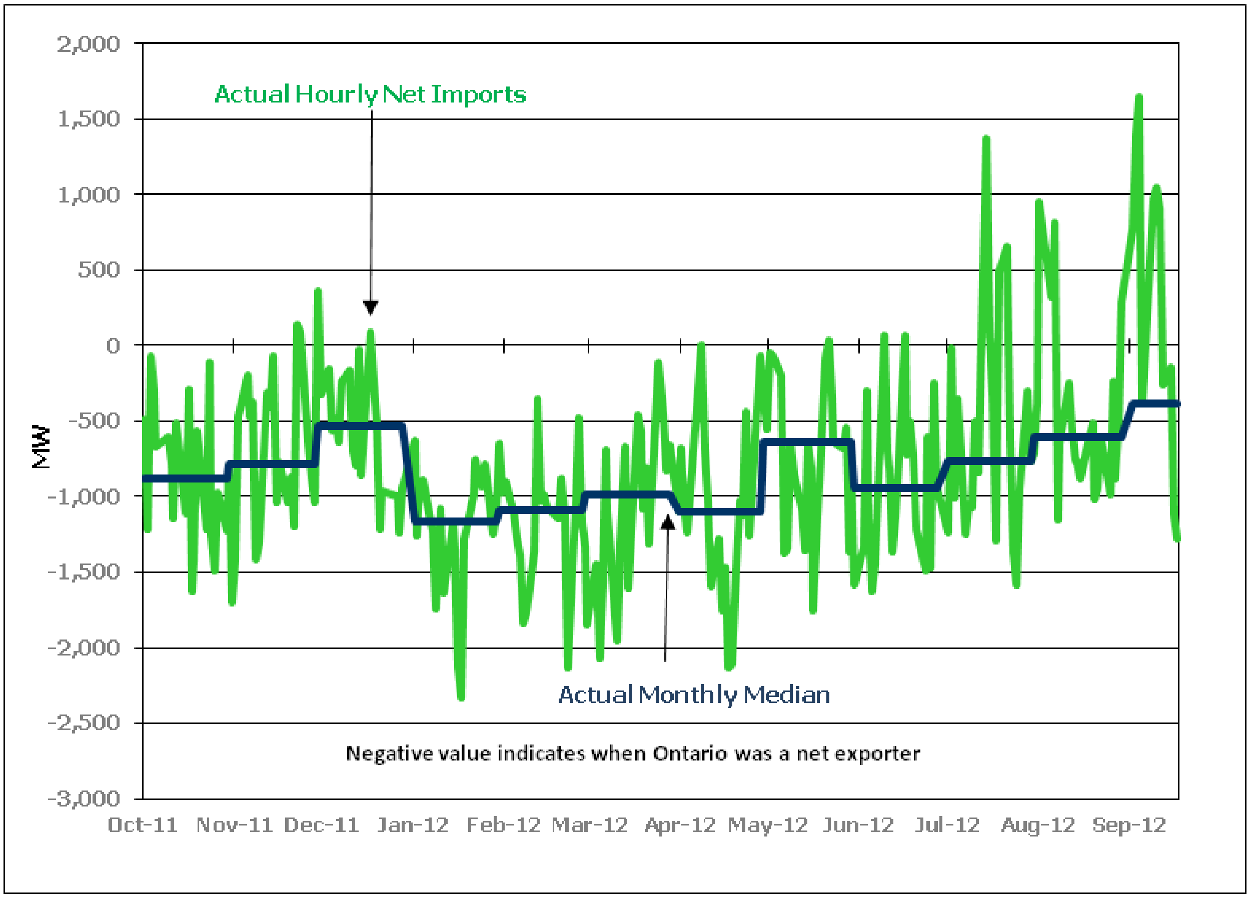


Figure 7.2.4 shows the amount of net interchange at the time of weekday peak, excluding weekends and holidays. Net Interchange is the difference between total imports into Ontario and total exports out of Ontario. An average net export situation prevailed, which can be in part attributed to the continued export capability with Quebec. Additionally, surplus baseload generation conditions caused by ample generation and lower demands further contributed to Ontario being a net exporter for most of the reporting period.

Figure 7.2.4 Net Interchange into Ontario at the Time of Weekday Peak



7.3 Report on Initiatives

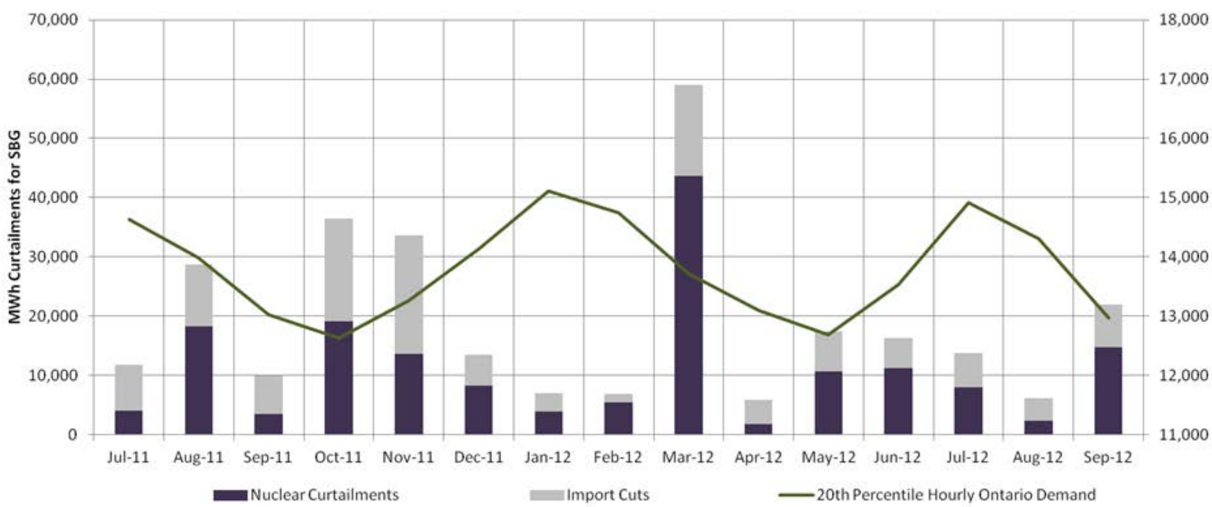
On November 1, 2012, regular day-ahead and pre-dispatch scheduling processes incorporated the hourly centralized forecast of variable generators participating in the IESO-administered markets. The addition of the hourly centralized forecast is expected to improve the accuracy of predicting generation output, resulting in more accurate intertie scheduling and unit commitment, all of which will effectively enhance grid reliability. Further improvements are expected by the end of 2013 with the introduction of a 5-minute forecast for variable generation into the real-time scheduling process along with variable resources themselves becoming fully dispatchable.

7.4 Surplus Baseload Generation (SBG)

Figure 7.4.1 shows the volume of nuclear and import curtailments due to surplus baseload conditions versus the bottom 20% hourly Ontario demand. 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 and is typically mitigated through exports. However, when output from the baseload fleet is expected to exceed Ontario demand plus scheduled exports, nuclear or import curtailments are often needed to eliminate the excess. When variable generation becomes dispatchable at the end of 2013, additional flexibility will be available to diminish the frequency of out-of-market control actions for SBG. These actions usually occur in the spring and fall, when Ontario demand is lowest, and seldom occur in extreme heat or extreme cold conditions when air conditioning or heating keeps demand high. The correlation between Ontario demand and surplus baseload curtailments is inverse, that is, when Ontario demand is low, curtailments for SBG are typically high.

As a result of a drier summer in 2012, we saw less SBG during August of 2012 than in August of 2011. However, a nuclear unit began commissioning in September of 2012, so the IESO saw an increase in SBG over September of 2011. The amount of nuclear and import curtailments for SBG in Q3 of 2012 came out to be only 9 GWh higher than the amount in Q3 of 2012.

Figure 7.4.1 MWh Curtailments for SBG versus Ontario Demand



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