# 18-MONTH OUTLOOK

**From December 2009 to May 2011**

ieso
Power to Ontario. On Demand.

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

This page intentionally left blank.

# Executive Summary

The expected addition of 1,900 megawatts (MW) of new and refurbished supply over the next 18 months will reinforce and solidify Ontario's already positive electricity supply situation.

Comprising a mix of wind, water, gas and biomass projects, most of the new supply projects are currently being commissioned or are under construction. When complete, these new clean-energy projects will supply load centres across the province, and will support the Province's sustainability goals by displacing more carbon-intensive fuel sources.

The planned return to service of two refurbished nuclear units at the Bruce Power plant has been extended to 2011. While these units will increase Ontario's electricity supply options, some of this new supply may be constrained until the Bruce-to-Milton transmission line is completed. The delay is not expected to compromise the early retirement of four coal-fired units – two units at Lambton and two units at Nanticoke – in late 2010. The coal shutdowns represent a loss of 2,000 MW of generating capacity but will have no undue impacts on energy adequacy or reliability in Ontario as output from all four units has already been subject to constraints related to transmission congestion and emissions restrictions.

Ongoing low levels of demand and high output from baseload and intermittent supply suggest surplus baseload generation (SBG) conditions will appear at various times over the next 18 months. Although SBG occurrences should be infrequent over the next few months, they are expected to return next summer, with the potential to persist into fall 2010 with low demand resulting from conservation initiatives and embedded generation. A number of mitigating actions will continue to be utilized to manage the situation, including the manoeuvring of nuclear generation, spilling water at baseload hydroelectric facilities, influencing scheduling of outages on key interfaces, maximizing export capability, and curtailing import transactions. The IESO is continuing to work with stakeholders to move forward on options to effectively manage periods of surplus generation.

Ontario's transmission system is expected to reliably meet predicted demand levels over the next months. Several transmission reinforcement projects are planned to come in service during this Outlook period to ensure reliable local supply and provide additional transmission capacity for future load growth. While in no way an exhaustive list, the new interconnection between Hawthorne transformer station (TS) in Ontario and Outaouais station in Quebec will eventually provide 1,250 MW of import/export capability; work is underway to alleviate transmission congestion out of Northern Ontario; completion of protection upgrades at the Michigan-Ontario phase angle

regulators (PARs) should alleviate resource restrictions in Southwestern Ontario; and transmission reinforcements are planned to increase the transfer capability out of Bruce area.

In its ongoing efforts to identify new operational efficiencies, the IESO has introduced a revised set of operating limits to improve the flow of power from the Bruce Peninsula to Southern Ontario, where demand levels are highest. This 12-month project has resulted in new limits that are less restrictive particularly under periods of planned transmission outages and will reduce the potential for bottled generation – all without compromising the integrity of the grid. Although highly beneficial, these improvements do not reduce the need for the Bruce to Milton reinforcement. Through the introduction of new models, tools and processes, this innovative project has automated certain elements of a predominantly manual process, with the potential for substantial cost savings. This limit change represents the first phase of a multi-year project that will yield province-wide system benefits.

The economic recovery is unlikely to stimulate a significant rebound in electricity demand. Over the coming months, industrial energy demand will continue to be hampered by the high dollar and rationalization within the manufacturing sector. After a drop of 5.7 per cent in 2009, overall, energy demand is expected to rebound slightly in 2010, growing by 0.4 per cent. Demand is expected to further increase by 0.8 per cent in 2011 as the economic recovery gains momentum within the industrial sectors.

Unlike energy demand, peak demand is expected to decline over the forecast horizon. Several factors will contribute to this decline, including increased participation in conservation and demand management programs, and wide-spread implementation of time-of-use rates for residential and small business customers.

| Season | Normal Weather Peak (MW) | Extreme Weather Peak (MW) |
|---|---|---|
| Winter 2009-10 | 22,717 | 23,883 |
| Summer 2010 | 23,608 | 25,806 |
| Winter 2010-11 | 22,447 | 23,527 |

# Conclusions & Observations

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

**Demand Forecast**

- After a sharp decline in 2009, electricity demand is expected to experience a slight increase in 2010 and 2011. Although positive, the growth in electricity demand will be small as the economic recovery is expected to be slow and the high dollar continues to hamper Ontario's manufacturing sector
- Unlike energy demands, peak demands are expected to decline throughout the forecast. Peak demands are subject to two competing forces. The economic recovery, population growth and growth in the building stock all act to boost peak demands. Conservation, the growth in embedded generation and time of use rates will all act to reduced peak demands. In the end, the combined impacts will lead to lower peak demands.
- Lower peak demand levels will act to enhance system reliability. Although high peak demands are likely under extreme weather conditions they should not pose any province-wide reliability concerns.
- Baseload demand remains low as a result of the economic downturn. The impact is particularly evident overnight when weather sensitive loads are quite small. The lower minimum demand levels can have operational impacts as they increase the likelihood of surplus baseload generation.

**Resource Adequacy**

- A number of units are scheduled to return to service from planned outage before summer. Reserve margins are at sufficient levels such that delays should have minimal impact on reliability.
- Plans to close four coal generation units by late 2010 have been announced and the return to service of two refurbished Bruce nuclear units has been moved into 2011. The full effect of the total supply reduction will not be seen in the final capacity availability, because some of the coal capacity planned for closure is not always accessible. This is due to a combination of network constraints and emission control outages.
- The Outlook demonstrates that the initial emission targets from coal-powered generation should be achievable over the next 18 month period without impacting on reliability, although the complete strategy for 2010 onwards has not been confirmed.

| | Normal Weather Scenario | Extreme Weather Scenario |
|---|---|---|
| **Planned Scenario** | • Reserves are higher than required for all weeks. | • There are 7 weeks where reserves are lower than required. |
| **Firm Scenario** | • Reserves are higher than required for all weeks. | • There are 11 weeks where reserves are lower than required. |

- Under the extreme weather scenario, periods where the forecast reserves are not sufficient to meet requirements may result in reliance on imports, the rejection of planned outages by the IESO, or the use of emergency operating procedures.

**Transmission Adequacy**

- The Ontario transmission system with the planned system enhancements and scheduled transmission maintenance outages is expected to be adequate to supply the demand under the extreme and normal weather conditions forecast for the Outlook period**.**
- The supply reliability under extreme weather conditions, in particular to the GTA, will be further improved with the addition of the Halton Hills Generating Station.
- Several projects relating to local load supply improvements will be placed in service during the timeframe of this Outlook to help relieve loadings of existing transformer stations and provide additional transformer capacity for future load growth.
- The ongoing forced outage of BP 76 on the New York – Ontario interface at Niagara will result in a reduced total Ontario - New York import and export scheduling capability until the circuit's scheduled return to service in Q3 2010.
- The new Ontario-Québec interconnection is currently undergoing commissioning tests to detect and address deficiencies before entering commercial operation. When finalized this project will allow transfers up to 1,250 MW between Ontario and Québec.
- Transmission outages scheduled in this Outlook period in the East, Northwest, Southwest, Toronto and West zones will result in small reductions to the grid transfer capability for periods of time. The resulting limit reductions along with the increase of available generation in those areas may result in bottled generation capacity.
- With the Greenfield Energy Center, St Clair Energy Center and Lambton GS availability over most of this Outlook period, transmission constraints may limit the ability to utilize resources in southwestern Ontario in conjunction with imports from Michigan. The congestion over the Sarnia/Windsor to London area 230 kV circuits could further increase as a result of transmission outages and weather conditions. The recently announced shut down of two Lambton GS units in October 2010 is expected to reduce the amount of bottled generation in western Ontario over the last part of this Outlook period. Hydro One is currently installing

additional reactive compensation in Western and Southwestern Ontario in preparation for the planned retirement of coal fired units.

- Hydro One's plan to enhance the existing Mississagi TS and Algoma TS generation rejection schemes scheduled for completion on the first quarter of 2011 will improve the power transfer capability of the transmission corridor east of Mississagi and reduce the bottling of resources west of Mississagi.
- Retirement of the Northeast 25 Hz system is expected to be finalized during the first quarter of 2010. These are the last 25 Hz facilities operating in the province.

**Operability**

- Surplus baseload supply situations were less frequent this fall compared to the spring and summer of 2009. Higher overnight demand forecasted for the winter months, and scheduled planned outages next spring, will continue to mitigate the risk of surplus conditions until summer 2010, at which point SBG conditions are forecast to reappear.

**- End of Section -**

## Caution and Disclaimer

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

# Table of Contents

# List of Tables



# List of Figures

# 1.0 Introduction

This Outlook covers the 18-month period from December 2009 to May 2011 and supersedes the last Outlook released in August 2009.

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 in

put assumptions, and are encouraged to use their own judgment in considering possible future scenarios.

The reader should be aware that Security and Adequacy Assessments are published on the IESO web site on a weekly and daily basis that progressively supersedes 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 -**

This page intentionally left blank.

# 2.0 Updates to This Outlook

## 2.1 Updates to Demand Forecast

The demand forecast was based on actual demand, weather and economic data through to the end of September 2009. The economic outlook has been updated based on the most recent data. Actual weather and demand data for October has been included in the tables.

## 2.2 Updates to Resources

Installed capacity has increased by 12 MW as a result of the following changes:

- Healey Falls registered as a Market Participant (17 MW)
- Fort Frances gas turbine deregistered (-57 MW)
- Some hydroelectric generators at Beck 2 (68 MW) were uprated.
- Capacity of two gas generators was reduced by 16 MW to correctly reflect their capability
- East Windsor Cogeneration (83 MW) became operational

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 27, 2009.

## 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 September 25, 2009 were used.

## 2.4 Updates to Operability Outlook

A forecast of surplus baseload generation (SBG) conditions for the next 18 months has been updated with submitted generation outage plans as of October 27, 2009. The expected contribution to baseload from variable resources such as hydroelectric and wind generation has also been updated to reflect the most recent information.

**- End of Section -**

This page intentionally left blank.

# 3.0 Demand Forecast

The IESO is responsible for forecasting electricity demand on the IESO-controlled grid. This demand forecast covers the period December 2009 to June 2011 and supersedes the previous forecast released August 2009. Tables containing supporting information are contained in the 2009 Q4 Outlook Tables spreadsheet.

Electricity demand is expected to show a slight increase over the forecast horizon as the economy recovers from the recent recession. Modest improvement in the industrial sector will stabilize demand. However, the high dollar will act as a brake on growth.

Unlike energy demand, peak demands are expected to decline over the forecast horizon. Conservation programs, the growth in embedded generation and the full-scale introduction of time of use rates will act to reduce peak demand.

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 2009-10 | 22,717 | 23,883 |
| Summer 2010 | 23,608 | 25,806 |
| Winter 2010-11 | 22,447 | 23,527 |
| **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 (Forecast) | 140.5 | -5.7% |
| 2010 Energy (Forecast) | 141.1 | 0.4% |
| 2011 Energy (Forecast) | 142.3 | 0.8% |

### 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 drivers affecting demand

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

**- End of Section -**

This page intentionally left blank.

# 4.0 Resource Adequacy Assessment

This section provides an assessment of the adequacy of resources to meet the forecast demand. The key messages are:

- 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 surpluses of reserves to a large extent.

In recognition of the uncertainty that exists regarding the future availability of resources, two resource scenarios are described in this section: the Firm Scenario and the Planned Scenario

Over the course of the Outlook period about 1,900 MW of new and refurbished supply is scheduled to come into service. Most of the new supply projects have started their commissioning phase or are in the construction phase.

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

**Table 4.1 Existing Installed Generation Resources as of November 4, 2009**

| Fuel Type | Total Capacity (MW) | Number of Stations | Change in Capacity (MW) | Change in Stations |
|---|---|---|---|---|
| Nuclear | 11,426 | 5 | 0 | 0 |
| Hydroelectric | 7,911 | 70 | 85 | 1 |
| Coal | 6,434 | 4 | 0 | 0 |
| Oil / Gas | 8,535 | 27 | 10 | 1 |
| Wind | 1084 | 8 | 0 | 0 |
| Biomass / Landfill Gas | 75 | 5 | 0 | 0 |
| Total | 35,465 | 119 | 95 | 2 |

## 4.1 Committed and Contracted Generation Resources

Table 4.2 summarizes generation that is scheduled to come into service, be upgraded or retired within the Outlook period. This includes generation projects in the IESO's Connection Assessment and Approval Process (CAA) that are under construction and projects contracted by the OPA. Details regarding the IESO's CAA process and the status of all projects in the CAA queue can be found on the IESO's web site at http://www.ieso.ca/imoweb/connassess/ca.asp.

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 retired from service. 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**

| Proponent/Project Name | Zone | Fuel Type | Estimated Effective Date | Change | Project Status | Capacity Considered | |
|---|---|---|---|---|---|---|---|
| | | | | | | Firm (MW) | Planned (MW) |
| Conversion of Fort Frances Steam Turbine to burn biomass | Northwest | Biomass | 2009-Q4 | | Commissioning | 47 | 47 |
| Nuclear Upgrade | N/A | Uranium | 2010-Q1 | | Construction | 27 | 27 |
| Retirement of Wawaitin 25 Hz generation to convert to 60 Hz | Northeast | Water | 2010-Q1 | | Connection Assessment | -11 | -11 |
| Thorold Cogeneration Project | Niagara | Gas | 2010-Q2 | | Construction | | 236 |
| Raleigh Wind Energy Centre | West | Wind | 2010-Q3 | | Approvals & Permits | | 78 |
| Healey Falls G1 | East | Water | 2010-Q3 | | Construction | | 16 |
| Halton Hills Generating Station | Southwest | Gas | 2010-Q3 | | Construction | | 632 |
| Retirement of Lambton G1 and G2 | West | Coal | 2010-Q4 | | | -970 | -970 |
| Retirement of Nanticoke G3 and G4 | Southwest | Coal | 2010-Q4 | | | -980 | -980 |
| Island Falls | Northeast | Water | 2010-Q4 | | Approvals & Permits | | 16 |
| Byran Wind Project | East | Wind | 2010-Q4 | | Approvals & Permits | | 65 |
| Return of Sandy Falls as 60 Hz plant | Northeast | Water | 2010-Q4 | | Construction | | 5 |
| Return of Lower Sturgeon as 60 Hz plant | Northeast | Water | 2010-Q4 | | Construction | | 14 |
| Return of Wawaitin as 60 Hz plant | Northeast | Water | 2010-Q4 | | Construction | | 15 |
| Hound Chute | Northeast | Water | 2010-Q4 | | Construction | | 10 |
| Bruce Unit 2 | Bruce | Uranium | *2011-Q1 | Delayed | Construction | | 750 |
| **Total** | | | | | | **-1,887** | **-50** |

*Bruce Power made an announcement close to publication of this report and the commissioning of Unit 2 may be extended into mid 2011.

**Notes to Table 4.2:**

1. Shading indicates a change from the previous Outlook.
2. The total may not add up due to rounding. Total does not include In-Service facilities.
3. 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

## 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. Both scenarios' starting point is the existing installed resources shown in Table 4.1.

Under both scenarios, all existing resources and resources that are scheduled to come into service are assumed to be available over the study period, except for those units scheduled to retire and those for which the generator has submitted planned outages.

The generation capability assumptions are as follows:

- Hydroelectric capability (including energy and operating reserve) is based on median historical values during weekday peak demand hours from May 2002 to March 2009.
- Thermal generators' capacity and energy contributions are based on market participant submissions, including planned outages, expected forced outage rates and seasonal deratings.
- For wind generation the monthly Wind Capacity Contribution (WCC) values are used at the time of weekday peak, while total energy contribution is assumed to be 30%.

The Firm and Planned Scenarios differ in their assumptions regarding the amount of demand measures and generation capacity. These differences are summarized in the following table.

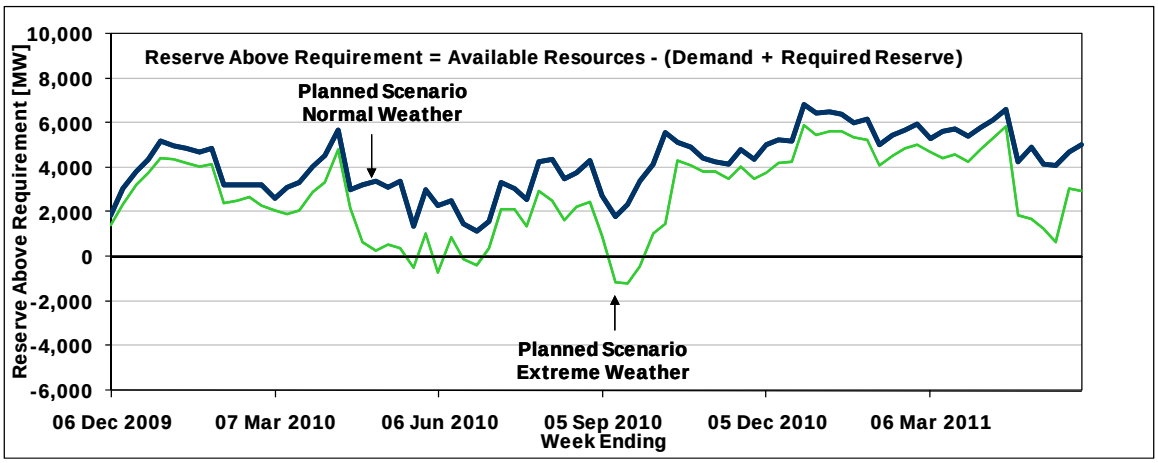
**Table 4.3 Summary of Scenario Assumptions**

| Assumptions | | Planned Scenario | Firm Scenario |
|---|---|---|---|
| Resource | Existing Installed Resources | Total Capacity | Total Capacity |
| | | 35,465 MW | 35,465 MW |
| | New Generation and Capacity Changes | All | Only Capacity Changes, Commissioning Generators and Generators starting in the first 3 months |
| | | -50 MW | -1887 MW |
| Demand Forecast | Conservation | Incremental | |
| | | Incremental growth of 132 MW at time of peak | |
| | Embedded Generation | Incremental | |
| | | Incremental growth of 117 MW at time of peak | |
| | Demand Measures | Incremental | Existing |
| | | 1,114 MW | 699 MW |

## 4.3 Planned Scenario with Normal and Extreme Weather

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

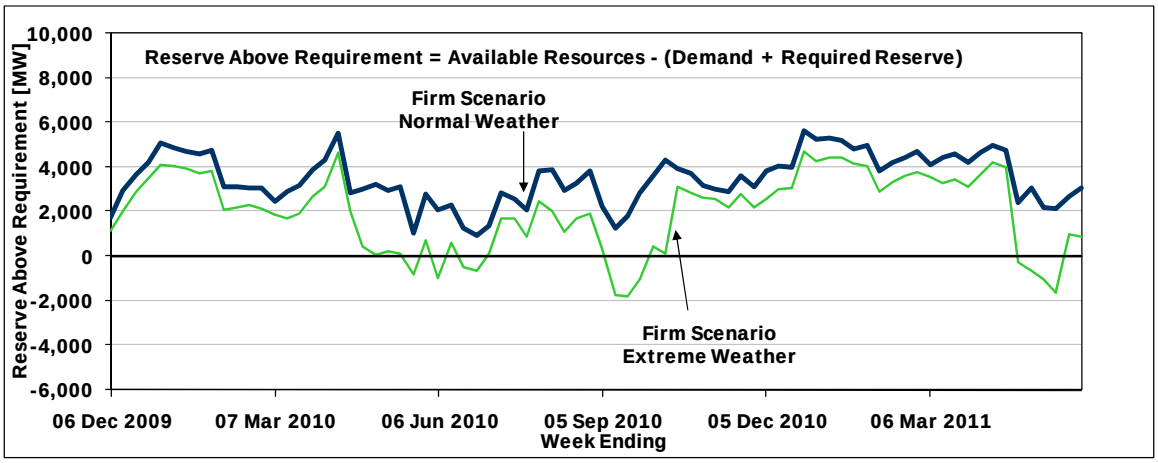
**Figure 4.1 Reserve Above Requirement: Planned Scenario with Normal vs. Extreme Weather**




## 4.4 Firm Scenario with Normal and Extreme Weather

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: Firm 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 2009 Q4 Outlook Tables Appendix A, Table A7.

**Table 4.4 Summary of Available Resources**

| Notes | Description | Winter Peak 2009 | | Summer Peak 2010 | | Winter Peak 2010 | |
|---|---|---|---|---|---|---|---|
| | | Firm Scenario | Planned Scenario | Firm Scenario | Planned Scenario | Firm Scenario | Planned Scenario |
| 1 | Installed Resources (MW) | 35,539 | 35,539 | 35,528 | 35,843 | 33,578 | 34,665 |
| 2 | Imports (MW) | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 | Total Resources (MW) | 35,539 | 35,539 | 35,528 | 35,843 | 33,578 | 34,665 |
| 4 | Total Reductions in Resources (MW) | 5,240 | 5,240 | 6,419 | 6,496 | 3,894 | 4,066 |
| 5 | Demand Measures (MW) | 699 | 859 | 699 | 951 | 699 | 1,042 |
| 6 | Available Resources (MW) | 30,998 | 31,158 | 29,808 | 30,297 | 30,383 | 31,641 |

**Notes to 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. Imports: The amount of external capacity considered to be delivered to Ontario.
3. Total Resources: The sum of Installed Resources (line 1) and Imports (line 2).
4. 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.
5. Demand Measures: The amount of demand available to be reduced.
6. Available Resources: Equals Total Resources (line 3) minus Total Reductions in Resources (line 4) plus Demand Measures (line 5).

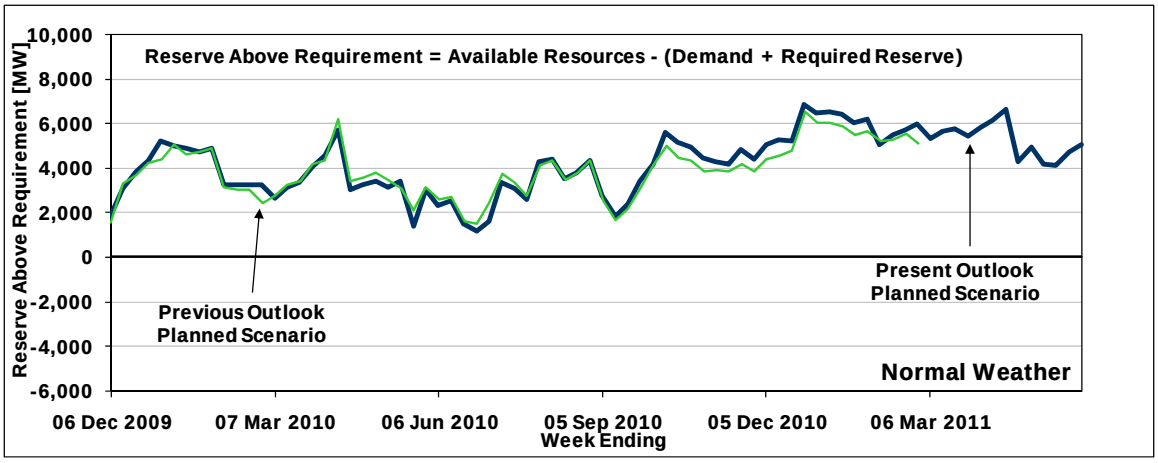
### Comparison of the Weekly Adequacy Assessments for the Planned Scenario

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 August 25, 2009. The difference is mainly due to the changes to generator retirements, outages, in-service delays and the change in the demand forecast.

It is notable that despite about 3500 MW of delayed and closed generation since the previous outlook, Reserve Above Requirement has not reduced and at times is higher than the previous outlook. A number of factors contribute to this,

- lower demand
- revised limits due to new IESO tools and processes contributing to lower locked in capacity which has a positive effect on Reserve Above Requirement
- revised emissions outage program due to coal generation closures
- Bruce 2 may previously have been counted as locked in capacity until the Bruce to Milton 500 kV line comes into service, beyond the outlook period.

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




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

**- End of Section -**

# 5.0 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:

- To identify all major transmission and load supply projects that are planned for completion during the Outlook period and to present their reliability benefits.
- To 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 the base flow limit associated with the interface or interconnection.
- To identify equipment outage events on the grid 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 transmission 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 are planned for service during the Outlook period. Major transmission and load supply projects planned to be in service are shown in the Outlook – Tables spreadsheet, Appendix B. Projects that are in service or whose completion has been deferred well beyond the period of this Outlook are not shown. The list includes only the transmission projects that represent major modifications or are considered to provide significant improvement to system reliability. Minor transmission equipment replacements or refurbishments are excluded.

Demand growth over the last decade has resulted in some area loads reaching or exceeding the capability of the local transmission system. To address this problem and provide additional transmission capacity for future load growth, Ontario transmitters and distributors have initiated plans to build new or replace existing transformer stations and reinforce the transmission system as necessary.

Connection assessments performed by the IESO concluded that these proposed projects will provide relief to existing transformer stations, some of which are presently overloaded, and will improve the supply to various load areas. In some of these assessments the IESO found that the local transmission system may be reaching its maximum capability and identified the need for installation of local voltage support equipment. As a result, Hydro One has initiated the installation of low voltage capacitor banks at a number of transformer stations in the system.

Transmission assessments performed by transmitters in collaboration with distributors also identified transmission reinforcements required to ensure load supply reliability. These needed reinforcements were confirmed by the IESO during related connection assessments. Several of these transmission reinforcements are currently under construction or are to start construction soon.

## 5.2 Transmission Outages

The assessment of transmission outages is limited to those with a scheduled duration of greater than five days or to those outages that are part of a project where the combined scheduled duration is greater than five days. As the start time of the outage approaches, actual outage schedule and additional outage requirements, as well as outages with a scheduled duration of five days or less could impose further transmission capacity restrictions. Prior to approving and releasing an outage, the IESO will reassess the outage for potential system impacts, taking into account all current and forecasted conditions.

The IESO's assessment of the transmission outage plans is shown in the Outlook – Tables spreadsheet, Appendix C, Tables C1 to C10. In these tables, each element is assessed individually by indicating the possible impacts and the reduction in transmission interface and interconnection limits. Where multiple outages are scheduled during the same period, the combined effect of all outages on the reduction in transmission interface and interconnection limits is presented. Where multiple outages are scheduled during the same period and reliability is affected, the IESO will request the transmitter to reschedule some of the outages. 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).

The planned transmission outages are reviewed in correlation with major planned resource outages and scheduled completion dates of new generation and transmission projects. This allows the IESO to identify transmission system reliability concerns and to highlight those outage plans that need to be adjusted. A change to an outage may include rescheduling the outage, reducing the scheduled duration or reducing the recall time.

This assessment will also identify any resources that have potential or are forecast to be constrained due to transmission outage conditions. Transmitters and generators are expected to have a mutual interest in developing an ongoing arrangement to coordinate their outage planning activities. Transmission outages that may affect generation access to the IESO controlled grid should be coordinated with the generator operators involved, especially at times when deficiency in reserve is forecast. Under the Market Rules, where the scheduling of planned outages by different market participants conflicts such that both or all outages cannot be approved by the IESO, the IESO will inform the affected market participants and request that they resolve the conflict. If the conflict remains unresolved, the IESO will determine which of the planned outages can be approved according to the priority of each planned outage as determined by the Market Rules detailed in Chapter 5, Sections 6.4.13 to 6.4.18. This Outlook contains transmission outage plans submitted to the IESO as of September 25, 2009.

## 5.3 Transmission System Adequacy

Generally, IESO Outlooks identify the areas of the IESO controlled grid where the projected extreme weather loading is expected to approach or exceed the capability of the transmission facilities for the conditions forecast in the planning period. Where the loading is projected to exceed the capability of the transmission facilities, there is also an increased risk of load interruptions.

IESO continues to work with Hydro One and other Ontario transmitters, to identify the highest priority transmission needs, and to ensure that those projects whose in service dates are at risk are given as much priority as is practical, especially those addressing reliability needs for peak demand periods of this Outlook. IESO has also been working closely with the OPA to specify the

transmission enhancements location, timing and minimum requirements to satisfy reliability standards.

Within the context of this approach, the Ontario transmission system with the planned system enhancements and known transmission outages is expected to be adequate to supply the demand under the extreme and normal weather conditions forecast for the Outlook period.

### 5.3.1 Toronto and Surrounding Area

The Greater Toronto Area (GTA) electricity supply is mainly provided by the Trafalgar, Claireville, Parkway and Cherrywood 500/230 kV autotransformers, Pickering generation station (GS) and other local resources as depicted in Figure 5.1. The availability of these facilities is critical to ensure reliable electricity supply for Toronto and surrounding area.

**Figure 5.1 Greater Toronto Area Electricity System**


The reliable supply of demand in the GTA under extreme weather conditions forecasted for the Outlook period requires a minimum number of autotransformers at Trafalgar, Claireville, Parkway and Cherrywood and Pickering units in service at rated capabilities. For summer 2010, all autotransformers and Pickering units are expected to be in service. The projected loadings on the Trafalgar, Claireville, Parkway and Cherrywood autotransformers are expected to be within their continuous capability with all transmission facilities and resources in the GTA in service.

The presence of Portlands Energy Center and Goreway Station reduce the loadings of all GTA autotransformers and thereby, increase their spare capability. The planned addition of Halton Hills GS in the third quarter of 2010 will further reduce the peak loading of the GTA autotransformers and allow for more operational flexibility.

Under summer 2010 normal and extreme weather conditions, loadings on the autotransformers are not expected to exceed their long term emergency capability following either the forced outages of any one GTA autotransformer and two Pickering units, or the forced outages of one Pickering unit and any two autotransformers. Goreway Station is providing significant loading relief to Claireville TS in the case of multiple autotransformer outages.

Subsequent autotransformer, generation outages or deratings could result in mitigating measures being required to reduce the remaining GTA autotransformers loadings within their long term emergency rating but under the current set of forecast conditions the chances are very low.

The 230 kV transmission corridor between Trafalgar TS and Richview TS which supplies Brampton, Mississauga and parts of Caledon and Halton Hills may become loaded above capability during summer 2010 under extreme weather conditions. The new Hurontario switching station and the expansion of the 230 kV lines from Cardiff TS are planned for service before the summer and will relieve the loading of this corridor and alleviate this problem.

The new Holland transformer station that went in service in 2009 improved the load serving capability in the York region. This area will be subsequently reinforced with the addition of York Energy Centre that is scheduled to go in service at the end of 2011.

Outages for the Claireville TS enhancement work continue during the current Outlook period. Some outages will result in small reductions on southern Ontario transmission interfaces limits.

### 5.3.2 Bruce and Southwest Zones

Planned refurbishments at the Bruce generation station and new wind power resources in southwestern Ontario will increase generation capacity in the Bruce and Southwest zones. In the near term, in addition to the four high voltage capacitors recently installed at Middleport, a series of other transmission reinforcements are planned to increase the transfer capability out of Bruce including the up-rating of the Hanover to Orangeville 230 kV circuits and the installation of three additional high voltage shunt capacitors at Buchanan and Nanticoke.

In addition to the near-term reinforcements described above, interim measures are being planned for the time when Bruce is operated with seven and eight units before the proposed 500 kV double-circuit line between Bruce and Milton is available. The interim measures would include the installation of additional voltage control facilities at Nanticoke and when necessary, maximizing the available reactive power from the remaining Nanticoke units. These measures together with the new shunt capacitors, the deployment of the existing Bruce special protection system and planned retirement of four coal fired units at the end of October 2010 will further reduce the potential for constrained generation. In the longer-term, the proposed 500 kV line from Bruce to Milton would provide the required transmission capability to deliver the full benefits of the Bruce refurbishment project and the development of new renewable resources in southwestern Ontario.

To prevent low voltage conditions in the 115 kV transmission system in the Woodstock area during summer extreme weather conditions. Hydro One is planning to add a new transformer station and a second supply point by extending the 230 kV transmission lines from Ingersoll to

Woodstock area and installing a new 230/115 kV transformer station. These plans will provide an increased level of supply reliability, and support further load growth in the area.

Hydro One is currently undertaking major upgrade work at Burlington TS which will resolve limitations in the station's ability to supply the Burlington 115 kV area loads. The remaining work which includes the replacement of all 115 kV breakers and the replacement of limiting bus sections is scheduled to be completed by the end of Q2 in 2012. Hydro One has also identified deratings associated with some of their 115 kV load supply transformer stations in the Guelph area which resulted in load transfers to the Burlington and Detweiler 115 kV areas further aggravating the load supply reliability. Hydro One, the affected distributors and the IESO are actively working on mitigating both the short-term issues and implementing a long term solution to these problems.

### 5.3.3 Niagara Zone and the New York Interconnection

The completion date for transmission reinforcement from Niagara region into the Hamilton-Burlington area continues to be delayed and to affect the use of both the available Ontario generation in the Niagara area and imports into the province, particularly during hot weather and high demand periods.

The forced outage to the circuit BP76 on the Ontario-New York interconnection at Niagara continues to reduce the total Ontario-New York import and export capability until its scheduled return to service in Q3 of 2010.

### 5.3.4 East Zone and Ottawa Zone

The new interconnection between Hawthorne transformer station (TS) in Ontario and Outaouais station in Québec is currently in the commissioning phase that's intended to detect and eventually address any possible deficiencies before entering commercial operation. When completed, this new interconnection will provide 1,250 MW interchange capability with Québec. The Special Protection System (SPS) associated with the new interconnection and also the required modifications to the existing St. Lawrence SPS that will allow simultaneous imports from Québec and New York to be maximized were completed during 2009 Q3.

Work at Gardiner TS for connecting Wolfe Island wind was complete and the wind farm entered commercial operation in June 2009.

### 5.3.5 West Zone and the Michigan Interconnection

With the availability of Greenfield, St Clair and Lambton resources in the second quarter of the 2009, transmission constraints in this zone may restrict resources in southwestern Ontario and imports from Michigan. This is evident in the bottled generation amounts shown for the Bruce and West zones in Tables A3 and A6 of the Outlook – Tables spreadsheet. The planned retirement of two Lambton GS coal fired units will reduce, but not eliminate the amount of bottled generation in this region.

Phase angle regulators are installed on three of the four Michigan to Ontario interconnections. One phase angle regulator, on the Keith to Waterman 230 kV circuit J5D, is in service and regulating. The other two available phase angle regulators, on circuits L51D and L4D at Lambton TS, are currently bypassed during normal operations, but are available for use during emergency operations. The fourth phase angle regulator, on the 230 kV circuit B3N, is scheduled for

replacement in 2010. They will become operational once agreements between the IESO, the Midwest ISO, Hydro One and the International Transmission Company, are finalized. The operation of the phase angle regulators will assist in the management of system congestion and control of circulating flows.

### 5.3.6 Northeast and Northwest Zones

The transmission corridor east of Mississagi TS has been experiencing increased congestion due to the addition of new resources and lack of transmission reinforcements. It is expected that congestion will increase even further when projects currently under construction in the area will become operational.

For the near–term, the IESO has recommended that the existing Mississagi generation rejection scheme be enhanced as soon as possible to alleviate constrained generation west of Mississagi and to reduce congestion over the North-South transmission corridors. Hydro One is planning to implement the required modifications by the first quarter of 2011.

To further reduce the congestion in northern Ontario and improve the transfer capability, Hydro One is installing dynamic reactive compensation facilities at Lakehead, Porcupine and Kirkland Lake by the end of 2010. In preparation for additional renewable generation in northern Ontario, Hydro One is planning to increase the north-south transfer capability by installing series compensation on the transmission lines. This enhancement is proposed to go in service in the last quarter of 2010.

Towards the end of 2009, extensive line work on 230 kV transmission circuits around Fort Frances is scheduled. The outages will reduce the Ontario-Manitoba and Ontario-Minnesota interconnection transfer capacity and also the East-West transmission interface capability. The reduction of the East-West Transfer East (EWTE) limit is expected to contribute to the increased amount of bottled generation in the Northwest zone.

At the beginning of March 2009 one 500/230 kV autotransformer failed at Porcupine TS. The replacement unit went in service in August 2009.

### 5.3.7 Ontario 25 Hz System

The 25 Hz system in northeastern Ontario is scheduled to be decommissioned during the first quarter of 2010.

**- End of Section -**

# 6.0 Operability Assessment

The IESO monitors existing and emerging operability issues that could potentially impact system reliability. A forecast for surplus baseload generation (SBG) conditions over the next 18 months is presented below. The risk of experiencing SBG is expected to be low heading in to the winter months and into next spring. However, SBG conditions are expected to return next summer, with the potential to persist into fall 2010.

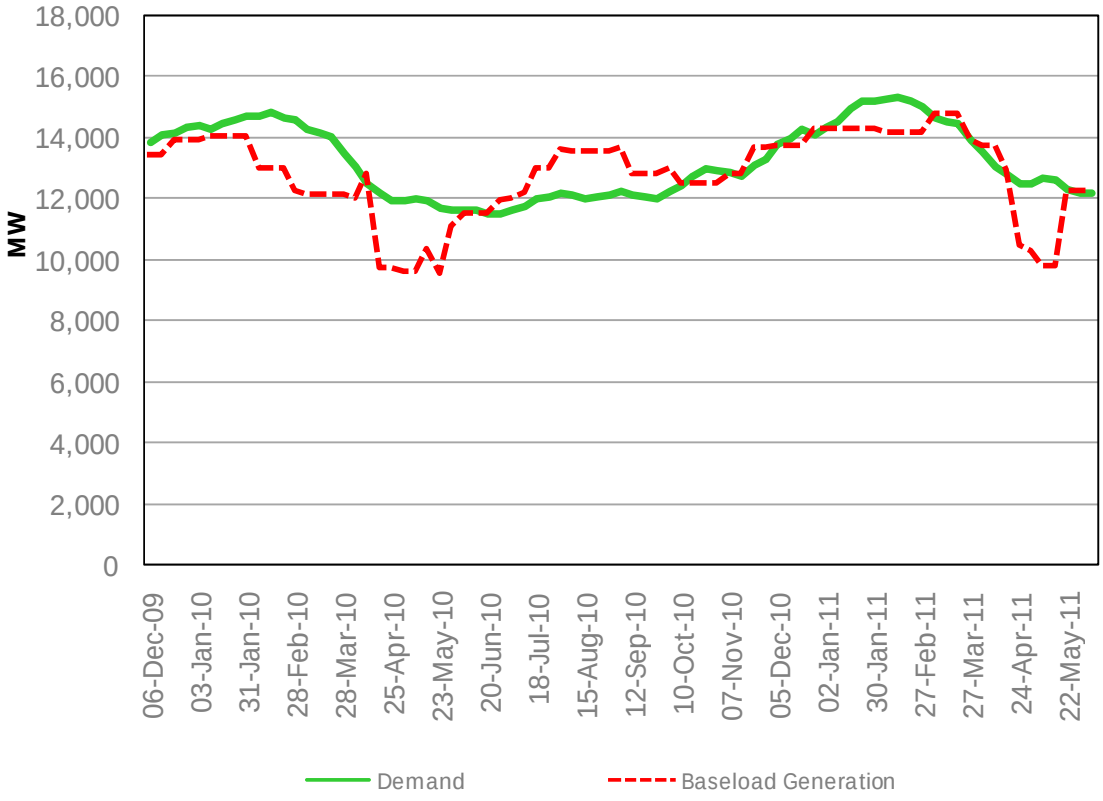
This past September and October, overnight and weekend demands continued to trend lower than forecast, resulting in sporadic periods of SBG. Although not nearly as frequent or severe as those experienced during the summer, mitigating actions were required to manage these periods of low demand. These actions included: the maneuvering of nuclear generation, spilling water at baseload hydroelectric facilities, and curtailing import transactions. Through stakeholder engagement (http://www.ieso.ca/imoweb/consult/consult_se57.asp), the IESO continues to explore options to effectively manage periods of low demand.

Looking ahead, Figure 6.1 shows projected weekly minimum demand against the expected level of baseload generation. Baseload generation assumptions have been updated to include the latest planned outage information, and in-service dates for new or refurbished generation. The expected contribution from self-scheduling and intermittent generation has also been updated to reflect the latest data. A 1000MW export assumption represented as a decrement to baseload generation is included in the diagram. Output from commissioning units is explicitly excluded from this analysis due to uncertainty and highly variable nature of commissioning schedules.

From Figure 6.1, the IESO expects a reduced risk of experiencing SBG over the winter months, as winter is typically characterized by relatively high minimum demand associated with overnight heating. Lower minimum demand in the spring should be offset by scheduled planned outages that will reduce the amount of available baseload generation. By June 2010, as this generation returns to service in preparation to meet the summer peak, overnight minimums are expected to remain low resulting in an increased risk of SBG. The potential for SBG is forecast to persist through the fall of 2010, as demand is further reduced by conservation initiatives and embedded generation.

In addition to the relationship between baseload supply and minimum demand, transmission line outages can affect SBG by reducing or eliminating the flow of electricity on key circuits, at times impacting Ontario's ability to export surplus generation. The IESO assesses the impact of scheduled planned outages on interconnection transmission capabilities. Sometimes, the impact of transmission outages can be large enough to limit Ontario's aggregate export capability to below the 1000MW assumption used to in Figure 6.1. These types of outages will be taken into consideration in assessing forecast SBG conditions.

**Figure 6.1 Minimum Demand and Baseload Generation**




**- End of Section -**

# 7.0 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 Historical Review

Since the last forecast the actual demand and weather data for August, September and October has been recorded. Overall, the weather experienced over those three months has been near normal. October did not have any high temperatures like it usually experiences but the peak and energy demand is typically driven by the colder weather.

For the first ten months actual energy demand has been 6.7% lower than the previous year. On a weather-corrected basis that figure is -6.4%. The decline is slightly overstated due to the fact that 2008 was a leap year and had an extra day's worth of electricity demand. After adjusting for the extra day weather corrected demand is down 6.1%. For 2009, economic factors have had the largest impact on demand. This has been evidenced in the wholesale customers' consumption which has dropped 26% compared to the first ten months of 2008.

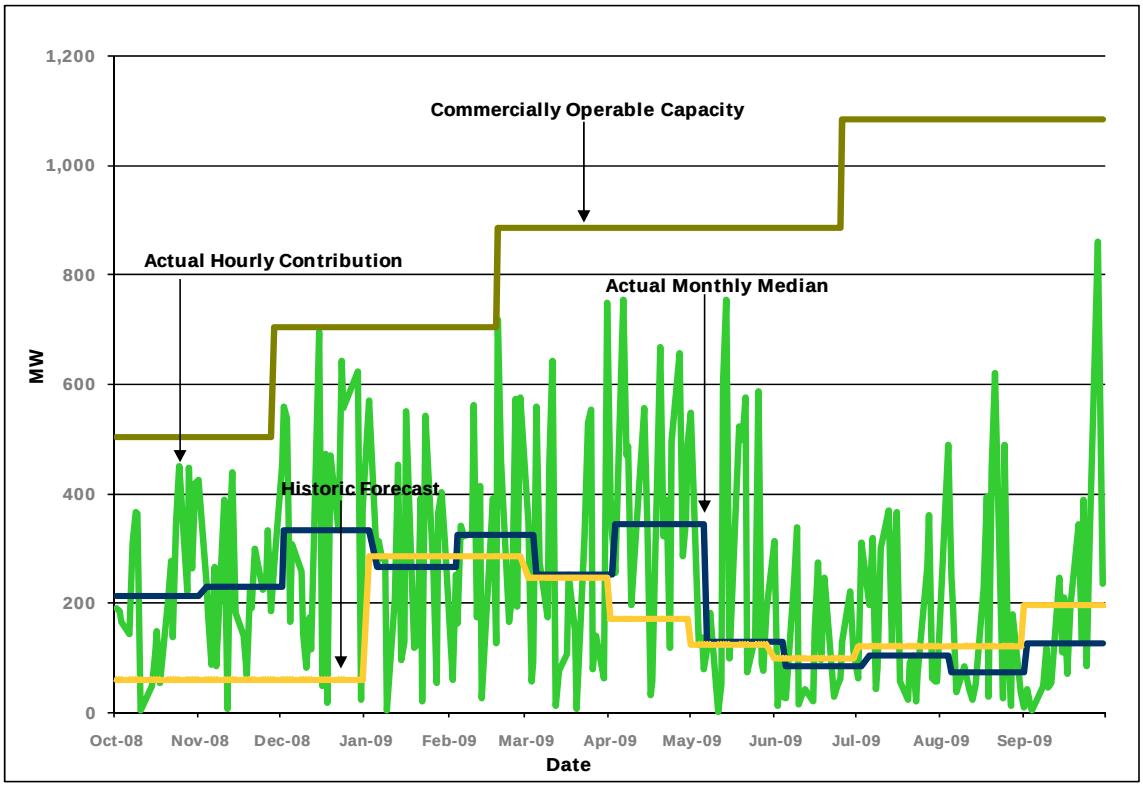
## 7.2 Hourly Resource Contributions at Time of Weekday Peak

The figures from 7.2.1 to 7.2.4 show the contributions made by wind generators, hydro generators, imports, and net interchange into Ontario at the time of weekday peak. The period from October 1, 2008 to September 30, 2009 was analyzed. Holiday data was not considered in the analysis since hydro peaking generation and interchange data during this timeframe is not typical of periods of time when Ontario may be challenged from a supply adequacy perspective.

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. For the time period of April 1, 2008 to December 31, 2008 the IESO forecast available wind generation as 10 percent of installed capacity, assuming a constant contribution over a yearly basis. The forecast methodology has since been revised effective January 1, 2009 to take into account seasonal variances in wind patterns, among other factors. Wind generation continued to increase from the previous year however that can be directly attributed to the increase in installed capacity. The reduction of wind production over the summer months is consistent with its forecast, as those months often have reduced wind speeds.

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 for most of the summer months (except July) of 2009 was higher than forecast. Heavy snowfall during the winter months of 2008 and heavy rainfall during the spring of 2009 provided hydroelectric generation with significant amounts of fuel for production over a period when hydro production usually decreases.

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

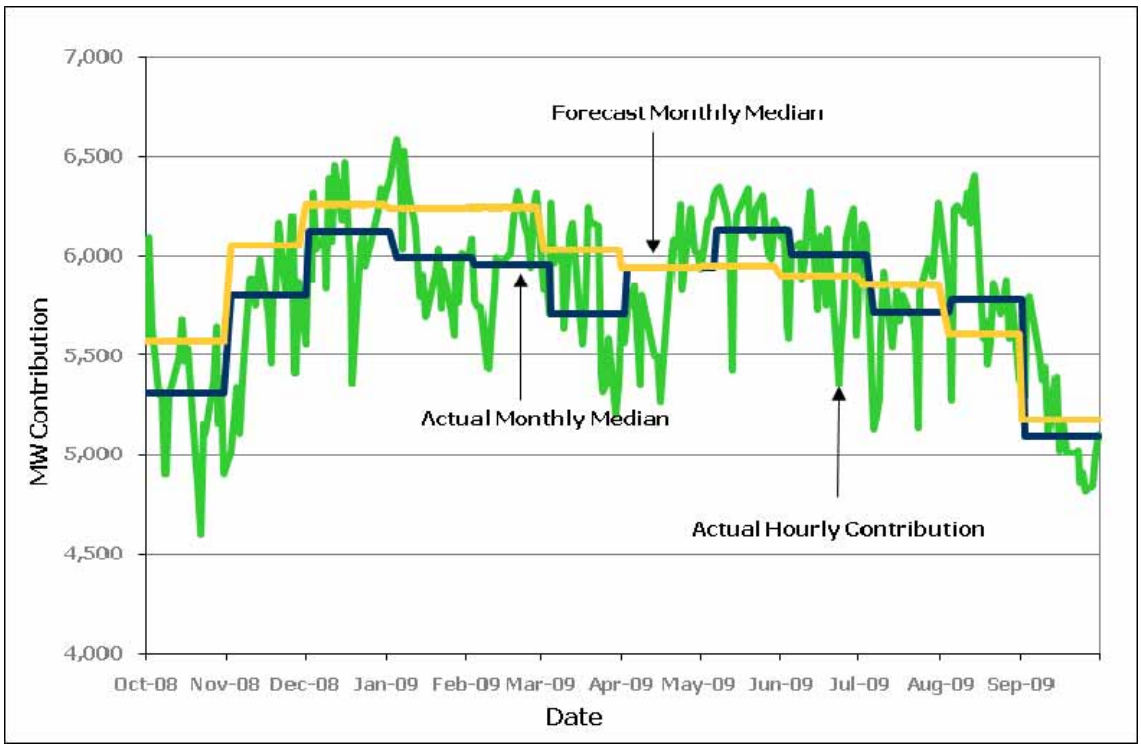


Figure 7.2.3 shows imports into Ontario at the time of weekday peak. This year Ontario experienced a significant reduction in demand. Lower demands and surplus conditions created lower prices in Ontario which made importing into the province less attractive which is why imports were lower than previous historic values.

**Figure 7.2.3 Imports into Ontario at the Time of Weekday Peak**

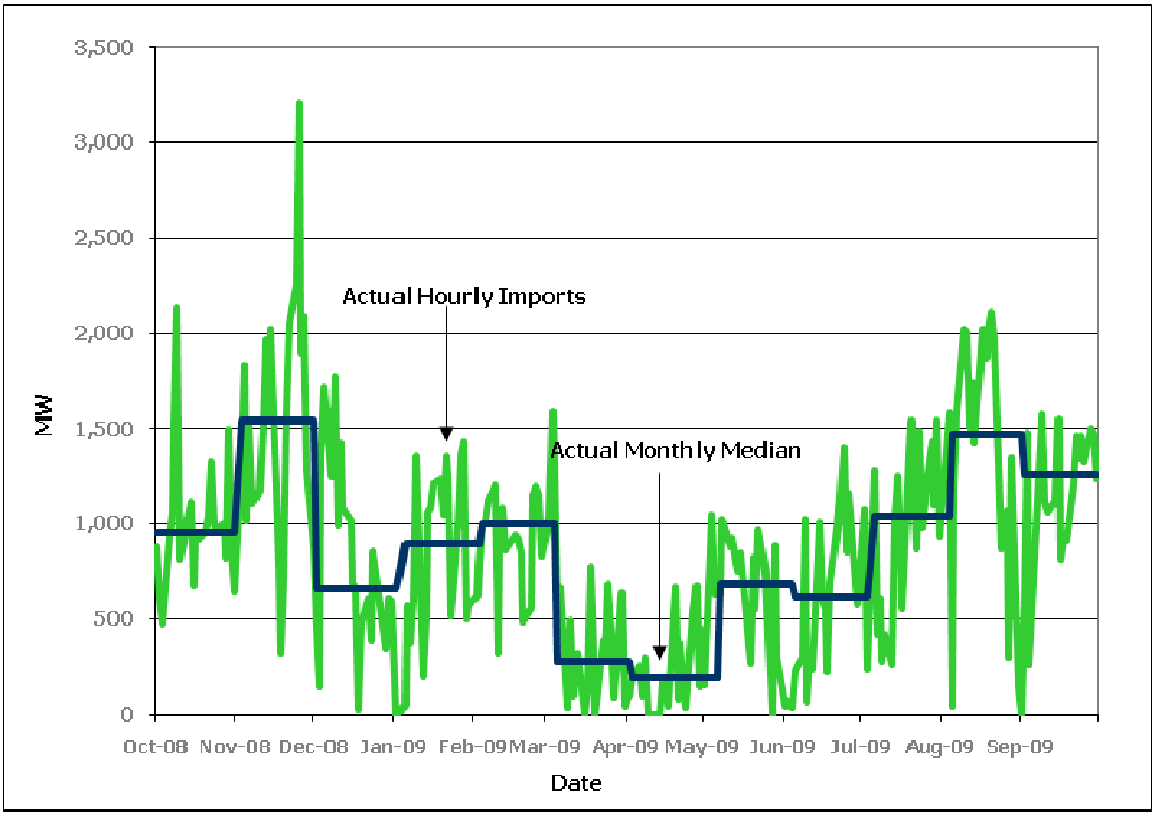
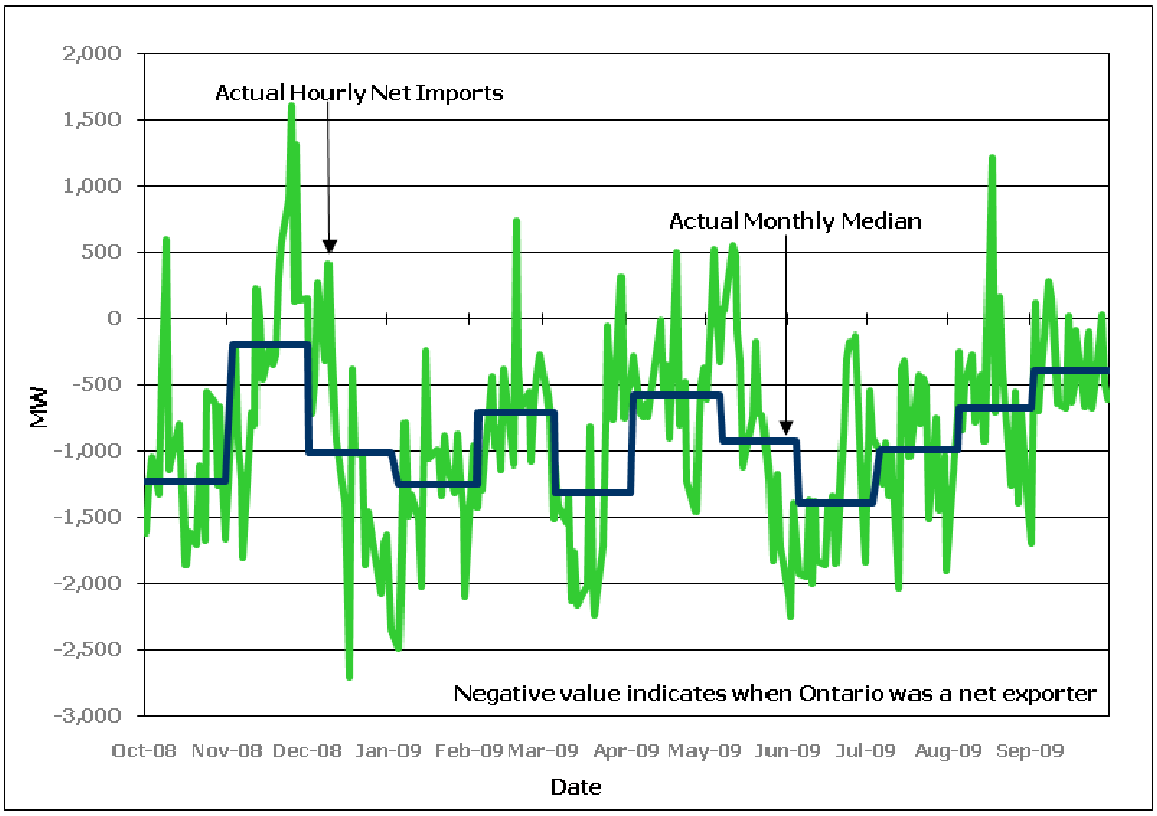



Figure 7.2.4 shows the amount of net imports into Ontario at the time of weekday peak, excluding weekends and holidays. Net Interchange is the difference between total imports into Ontario and total exports out of Ontario. Ontario was, on average, a net exporter for the entire study period. As stated above, the drivers which influenced lower imports also incent greater trade out of the province. Under surplus baseload generation conditions, the market's influence on exporting becomes a significant mitigating factor. Unfortunately when Ontario is experiencing surplus, our neighbours are usually also experiencing a surplus condition, making exporting difficult.

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




## 7.3 Report on Initiatives

The southern Ontario limits were revised in October 2009. These new limits are less restrictive and will reduce the potential for bottled generation in southern Ontario.

A MISO protocol has been implemented to help reduce the volume of imports failing from Michigan, Manitoba and Minnesota as a result of a failure to acquire MISO transmission. This new scheduling protocol began in September 2009.

The OPA's DR2 program is planned to commence in November 2009. This program is designed to shave peak demand by shifting production from peak periods.

Centralized wind forecasting is an initiative designed to allow for better forecasting of wind production to ensure a more accurate unit commitment occurs. This is expected to be in service by mid-2010.

## 7.4 Variation from Previous Year

The biggest variation from the previous year is that in 2009 Ontario experienced a significant increase in instances of surplus baseload generation conditions. The two major factors that contributed to this variation are:

- Higher hydroelectric production than the previous year as a result of heavy snowfall and rainfall
- Lower demands due to moderate summer temperatures as well as the economic declines of many industrial loads

**- End of Document -**