# 18-MONTH OUTLOOK

**From June 2010 to November 2011**

ieso
Power to Ontario. On Demand.

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

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# Executive Summary

Ontario's supply outlook for the next 18 months remains positive with sufficient resources available to maintain the reliability of Ontario's electricity system, and to supply communities across the province. From June 2010 to November 2011, approximately 2,900 megawatts (MW) of new and refurbished supply are scheduled to enter commercial operation. Of that, approximately 470 MW of new generation has been announced under the Feed-in Tariff (FIT) program and 180 MW contracted under the Renewable Energy Supply III (RES III) program.

As a result of the positive supply conditions, the deregistration of four coal-fired units at Lambton and Nanticoke – representing 2,000 MW of energy supply and capacity -- has been approved by the IESO for early fall of 2010. The replacement fleet for these units has demonstrated reliable operation over the last two peak periods and the shutdown of these units is not expected to unduly impact either energy adequacy or reliability of supply in Ontario.

The return to service of two refurbished nuclear units at the Bruce A Nuclear Station is still expected within the 18-month forecast timeframe; however the expected in-service dates for the two units are now the third and fourth quarters of 2011. This additional 1,500 MW capacity will increase supply options, although Bruce-area supply will not be able to operate at full capacity until the Bruce-to-Milton transmission line is complete which is expected in 2012.

Surplus baseload generation (SBG) is expected to continue over the forecast timeframe, especially during the summers of 2010 and 2011 when baseload capacity is expected to exceed forecast minimum demand. During these times of surplus, the province relies heavily on its ability to export. Planned outages to several circuits making up the Ontario-New York interconnection at Niagara are currently being considered for November and December 2010. If approved, these outages will reduce Ontario's ability to export power, and increase the likelihood of SBG. The current forecast includes an updated export assumption recognizing the evolving conditions on Ontario's interconnections.

Over the next 18 months, the IESO continues to expect a relatively high likelihood of surplus conditions in summer off-peak periods, compared to the winter and shoulder-period months. Limited precipitation this past winter and spring has contributed to uncertainty around hydroelectric capability over the summer months and lower than forecast hydroelectric production would reduce surplus conditions.

Demand growth over the last decade has resulted in some area loads reaching or exceeding the capability of the local transmission system. To alleviate the situation, several local load supply improvement projects will come in service over the next 18

months to relieve loadings of existing transmission infrastructure and provide additional capacity for future load growth.

Throughout the Outlook period, demand will be shaped by three main factors: the economy, conservation and the growth in embedded generation from Ontario's renewable initiatives. Although the risks of Ontario's economy slipping back into recession have moderated, world economies remain fragile due to high national debt loads, high oil prices and the prospects of higher borrowing costs. While Canada has reportedly fared better than many other countries, Ontario's export-based manufacturing sector has seen its competitive position undermined by the rise in value of the Canadian dollar.

Energy demand in Ontario is expected to show modest growth in 2010 and 2011 with increases of 1.3 per cent and 1.0 per cent respectively. The growth will come from a broad-based expansion of the economy. The manufacturing sector is expected to show an increase over 2009 but is expected to lag the rest of the economy as industrial demand is not expected to return to pre-recessionary levels due to the high Canadian dollar and slow international growth. Peak demands are expected to remain fairly flat as growth is offset by targeted conservation programs.

Recently announced government targets for conservation, whose impacts are expected to show beginning January 2011, will facilitate the longer-term reduction of peak demand and moderate the growth of energy demand across the province. These conservation targets will be met through programs delivered by local utilities, and the Ontario Power Authority with oversight from the Ontario Energy Board. These efforts, in combination with improved energy efficiency and the deployment of smart meters, will result in both lower consumption and a shift in consumption patterns.

The following table summarizes the key demand numbers.

| Season | Normal Weather Peak (MW) | Extreme Weather Peak (MW) |
|---|---|---|
| Summer 2010 | 23,498 | 25,998 |
| Winter 2010-11 | 22,473 | 23,782 |
| Summer 2011 | 23,464 | 25,938 |

# Conclusions & Observations

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

**Demand Forecast**

- Electricity demand is expected to experience an increase in 2010 and 2011. Growth will be slow as Ontario's energy-intensive export-based industries lag the rest of the economy.
- Peak demands are expected to remain flat throughout the forecast. Conservation programs targeting peak demand, the growth in embedded generation and time-of-use rates will offset the increases due to population and building stock growth.
- With lower peak demand levels system reliability will remain robust. Although high peak demands are likely under extreme weather conditions they will not pose any province-wide reliability concerns.
- Low minimum demand periods remain a concern as they increase the likelihood of surplus baseload generation. This will persist throughout the forecast.

**Resource Adequacy**

- Reserve requirements are expected to be met for all but one week in both the firm and planned normal weather scenario. This is due to two major generator planned outages and one major transmission outage resulting in bottled capacity.
- A number of generating units are scheduled to return to service from planned outage before summer 2010.
- Plans to de-register four coal generation units by late 2010 will continue as announced. Plans for the return to service of two refurbished Bruce nuclear units have been delayed by a few months to the third and fourth quarters of 2011.
- This Outlook demonstrates that the initial emission limits from coal-powered generation should be achievable over the next 18-month period without impacting on reliability, although the complete strategy to achieve reductions for 2010 onwards has not been confirmed.

| | Normal Weather Scenario | Extreme Weather Scenario |
|---|---|---|
| **Planned Scenario** | • There is 1 week where reserve is lower than required | • There are 9 weeks where reserves are lower than required. |
| **Firm Scenario** | • There is 1 week where reserve is lower than required | • There are 12 weeks where reserves are lower than required. |

- Under the normal and extreme weather scenarios, 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 maintenance outages is expected to be adequate to supply the demand under the 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 in the third quarter of 2010. Under extreme weather conditions the long term de-rate currently on a Trafalgar autotransformer may require some load reduction measures if additional elements are out of service.
- 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 230 kV circuit BP76 forms an integral part of the Ontario - New York interface at Niagara Falls. Due to the variable nature of its flows, this interface is one of the most challenging to manage in the Eastern Interconnection, keeping system operators around the Great Lakes, which include the IESO, NYISO, PJM and MISO, fully engaged. The ongoing forced outage of the BP76 interconnection has compounded the complexities of these reliability coordination efforts, added to Ontario's surplus baseload generation (SBG) events and has materially led to increased nuclear reductions and hydroelectric spill conditions over the last year. Outages of two other lines of the Niagara interconnection (PA301 and PA302) are currently being planned for November and December 2010. These outages have the potential to reduce the scheduled transfer capability of the Niagara interconnection to zero and also impact the Ontario to Michigan transfers.
- Transmission outages scheduled in this Outlook period in the Bruce, Essa, Niagara, Northeast, Northwest, Ottawa, Southwest, Toronto and West zones will cause 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 temporarily bottled generation capacity.
- Transmission constraints over the 230 kV Sarnia/Windsor to London area may limit the ability to utilize the generation resources in southwestern Ontario in conjunction with imports from Michigan. This congestion could further increase as a result of transmission outages and weather conditions. The scheduled shutdown of two Lambton GS units in October 2010 is expected to reduce the congestion over the remainder of this Outlook period. Hydro One is currently installing additional reactive compensation in western and southwestern Ontario in preparation for the planned shutdown of the major southern Ontario coal-fired units.
- Managing grid voltages in the Northwest has always required special attention, but with the significantly lower demand, it has been increasingly difficult to maintain an acceptable voltage profile without compromising the security and reliability of the supply. The IESO has contacted Hydro One, and is also in conversations with the OPA, in efforts to examine the short and long-term solutions to this matter.
- Hydro One's plan to enhance the existing Mississagi TS and Algoma TS generation rejection schemes, scheduled for completion during the last quarter of 2014, is expected to improve the power transfer capability of the transmission corridor east of Mississagi.

- Retirement of the Northeast 25 Hz system was completed during the first quarter of 2010. There are no more 25 Hz facilities operating in the province.

**Operability**

- SBG conditions are expected in summer 2010 and 2011.
- In November and December 2010, scheduled outages on the Ontario – New York interconnection at Niagara will impact Ontario's ability to export power, and increase the risk of SBG. The export assumption has been revised to account for increased export capacity via the HVDC tie to Quebec, as well as reduced export capacity during significant planned outages to Ontario interconnections.

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**Caution and Disclaimer**

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# 1.0 Introduction

This Outlook covers the 18-month period from June 2010 to November 2011 and supersedes the last Outlook released in February 2010.

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 web site on a weekly and daily basis, and progressively supersede information presented in this report.

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

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- Tel: 905-403-6900
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# 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 February 2010. The economic outlook has been updated based on the most recent data. Actual weather and demand data for March and April have been included in the tables.

## 2.2 Updates to Resources

Installed capacity has increased by 296 MW as a result of the following changes:

- Nuclear upgrade (+20 MW)
- Retirement of Wawaitin 25 Hz (-11 MW)
- Thorold Cogeneration Project (+287 MW)
- The conversion of Fort Frances (47 MW) from gas to biomass

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 April 21, 2010.

## 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 March 25, 2010 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 April 21, 2010. The expected contribution to baseload from variable resources such as hydroelectric and wind generation has also been updated to reflect the most recent information.

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# 3.0 Demand Forecast

The IESO is responsible for forecasting electricity demand on the IESO-controlled grid. This demand forecast covers the period June 2010 to November 2011 and supersedes the previous forecast released February 2010. Tables containing supporting information are contained in the 2010 Q2 Outlook Tables spreadsheet.

Electricity demand is expected to increase over the forecast horizon as the Ontario economy experiences growth throughout 2010-11. Industrial demand will not return to pre-recession levels but will show improvement over the lows of 2009. The high dollar will continue to act as a moderator on Ontario's electrically intensive export-based industries.

Peak demands are expected to remain flat over the forecast horizon as conservation programs, the growth in embedded generation and time-of-use rates will act to offset increases from economic and demographic growth.

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) |
|---|---|---|
| Summer 2010 | 23,498 | 25,998 |
| Winter 2010-11 | 22,473 | 23,782 |
| Summer 2011 | 23,464 | 25,938 |
| **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 (Forecast) | 142.2 | 1.3% |
| 2011 Energy (Forecast) | 143.6 | 1.0% |

**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 of the impact of the drivers affecting demand.

The data contained in the Ontario Demand Forecast document are included in the 2010 Q2 Outlook Tables spreadsheet.

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# 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 2,900 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 Generation Resources as of May 5, 2010**

| Fuel Type | Total Installed Capacity (MW) | Forecast Capability at Summer Peak* (MW) | Number of Stations | Change in Installed Capacity (MW) | Change in Stations |
|---|---|---|---|---|---|
| Nuclear | 11,446 | 10,767 | 5 | 20 | 0 |
| Hydroelectric | 7,903 | 5,817 | 70 | -11 | 0 |
| Coal | 6,434 | 6,161 | 4 | 0 | 0 |
| Oil / Gas | 8,792 | 7,242 | 27 | 240 | 0 |
| Wind | 1,084 | 137 | 8 | 0 | 0 |
| Biomass / Landfill Gas | 122 | 47 | 6 | 47 | 1 |
| Total | 35,781 | 30,170 | 120 | 296 | 1 |

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

## 4.1 Committed and Contracted Generation Resources

Table 4.2 summarizes generation that is scheduled to come into service, be upgraded or shut down 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 these projects 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 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**

| Proponent/Project Name | Zone | Fuel Type | Estimated Effective Date | Change (Previous Reported Date) | Project Status | Capacity Considered | |
|---|---|---|---|---|---|---|---|
| | | | | | | Firm (MW) | Planned (MW) |
| Halton Hills Generating Station | Southwest | Gas | 2010-Q3 | | Commissioning | 632 | 632 |
| Shutdown of Lambton G1 and G2 | West | Coal | 2010-Q4 | | | -970 | -970 |
| Shutdown of Nanticoke G3 and G4 | Southwest | Coal | 2010-Q4 | | | -980 | -980 |
| 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 |
| Grid-connected FIT Projects | West | Wind | 2010Q4 | | At Various Stages | | 166 |
| Raleigh Wind Energy Centre | West | Wind | 2011-Q1 | | Construction | | 78 |
| Leamington Pollution Control Plant | West | Oil | 2011-Q1 | | Approvals & Permits | | 2 |
| Bruce Unit 2 | Bruce | Uranium | 2011-Q3 | 2011-Q1 | Construction | | 750 |
| Grid-connected FIT Projects | Northeast | Wind | 2011-Q1 | | At Various Stages | | 60 |
| Grid-connected FIT Projects | West | Wind | 2011-Q1 | | At Various Stages | | 49 |
| Grid-connected FIT Projects | Southwest | Wind | 2011-Q2 | | At Various Stages | | 69 |
| Becker Cogeneration | Northwest | Biomass | 2011-Q3 | | Approvals & Permits | | 15 |
| Bruce Unit 1 | Bruce | Uranium | 2011-Q4 | 2011-Q3 | Construction | | 750 |
| Grid-connected FIT Projects | Southwest | Wind | 2011-Q3 | | At Various Stages | | 125 |
| Kruger Energy Chatham Wind Project | Southwest | Wind | 2011-Q4 | | Approvals & Permits | | 101 |
| **Total** | | | | | | **-1,318** | **890** |

**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 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 3 months. Both scenarios recognize that resources that are in service are not available during times for which the generator has submitted planned outages. What is also considered for both scenarios is the generator planned shutdown or retirement which has high certainty of happening in the future. The Firm and Planned Scenarios also differ in their assumptions regarding the amount of demand measures and generation capacity.

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 2010.
- 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%.

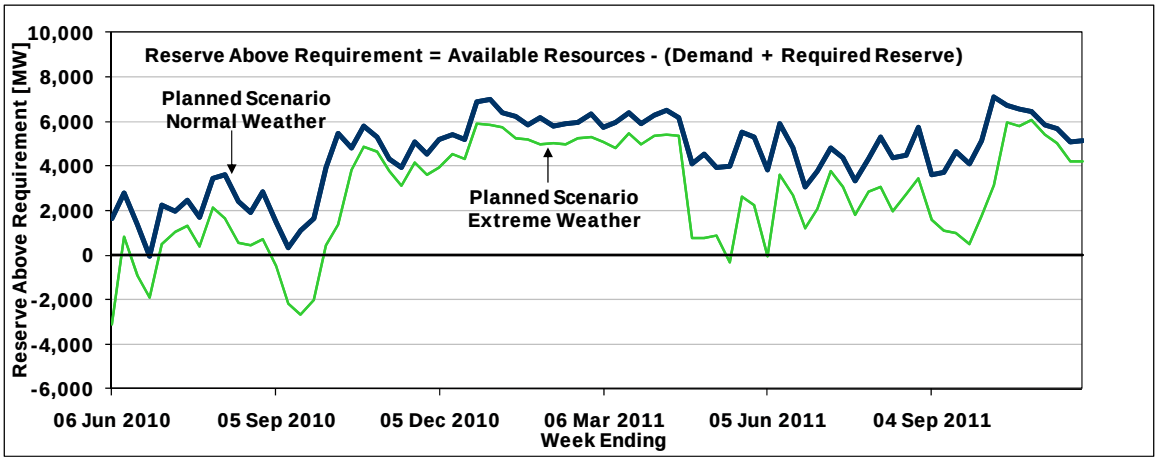
**Table 4.3 Summary of Scenario Assumptions**

| Assumptions | | Planned Scenario | Firm Scenario |
|---|---|---|---|
| Resource | Existing Installed Resources | Total Capacity | Total Capacity |
| | | 35,781 MW | 35,781 MW |
| | New Generation and Capacity Changes | All | Only Capacity Changes, Generator shutdowns or retirements, Commissioning Generators and Generators starting in the first 3 months |
| | | 890 MW | -1,318 MW |
| Demand Forecast | Conservation | Incremental | |
| | | Incremental growth of 150 MW on peak | |
| | Embedded Generation | Incremental | |
| | | Incremental growth of 128 MW on peak | |
| | Demand Measures | Incremental | Existing |
| | | 1114 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.

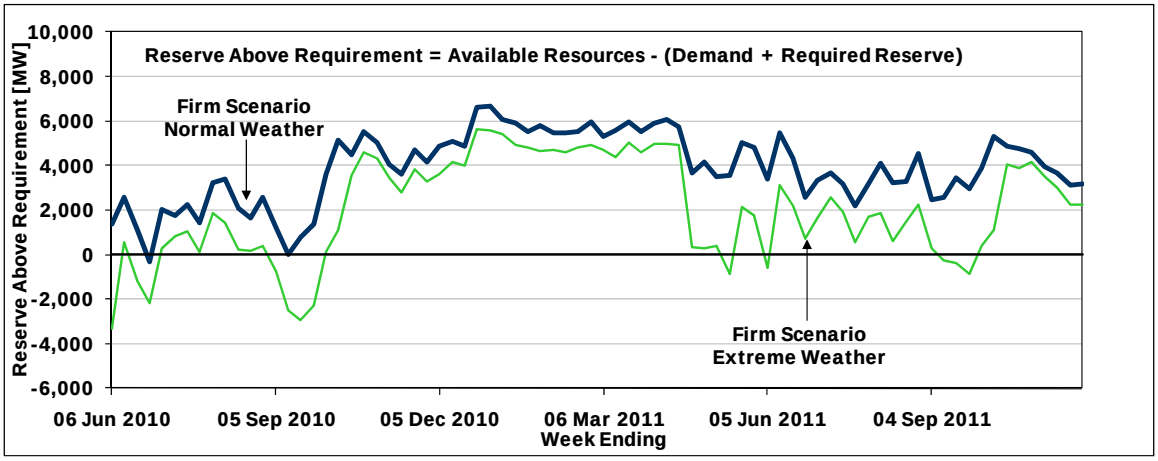
**Figure 4.1 Reserve Above Requirement: Planned Scenario with Normal vs. Extreme Weather**



## 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 2010 Q2 Outlook Tables Appendix A, Table A7.

**Table 4.4 Summary of Available Resources**

| Notes | Description | Summer Peak 2010 | | Winter Peak 2011 | | Summer Peak 2011 | |
|---|---|---|---|---|---|---|---|
| | | Firm Scenario | Planned Scenario | Firm Scenario | Planned Scenario | Firm Scenario | Planned Scenario |
| 1 | Installed Resources (MW) | 35,781 | 35,781 | 34,463 | 34,751 | 34,463 | 35,805 |
| 2 | Imports (MW) | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 | Total Resources (MW) | 35,781 | 35,781 | 34,463 | 34,751 | 34,463 | 35,805 |
| 4 | Total Reductions in Resources (MW) | 7,435 | 7,435 | 3,986 | 4,264 | 5,646 | 6,203 |
| 5 | Demand Measures (MW) | 699 | 951 | 699 | 1,042 | 699 | 1,114 |
| 6 | Available Resources (MW) | 29,045 | 29,297 | 31,176 | 31,529 | 29,516 | 30,716 |

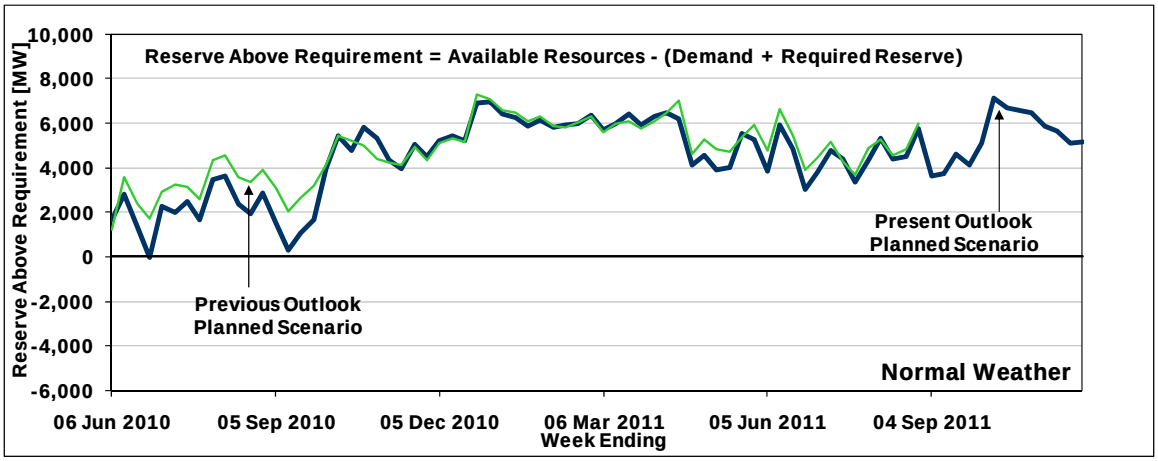
**Notes to Table 4.4:**

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 February 23, 2010. The difference is mainly due to the changes to outages, in-service delays and the change in the demand forecast.

**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).

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# 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 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.

These needed reinforcements were confirmed by the IESO during related connection assessments. Several of these projects are currently under construction and planned for in service during the period of this Outlook.

## 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 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 March 25, 2010.

## 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.

The Ontario generation mix is changing rapidly with the addition of new forms of resources and the planned shutdown of coal resources. The transmission system needs to evolve to accommodate the supply mix changes and the incorporation of new generation while maintaining the reliable delivery of electricity to the consumers. Over the last few years, Hydro One, the OPA and the IESO have been collaborating in the development of a number of transmission enhancements required to accommodate these changes. Some of these transmission enhancements are scheduled to come into service during the period of this Outlook.

The IESO works 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 practical, especially those addressing reliability needs for peak demand periods of this Outlook. We have also been working closely with the OPA to specify the transmission enhancements location, timing and 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 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 ensuring 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 500/230 kV autotransformers at Trafalgar, Claireville, Parkway and Cherrywood and Pickering units in service at rated capabilities. For the summer 2010 forecasted peak demand, all 500/230 kV autotransformers are expected to be in service. The projected loadings on the Trafalgar, Claireville, Parkway and Cherrywood 500/230 kV autotransformers, under normal weather conditions, are expected to be within their capability during these planned outages. Under extreme weather conditions, due to a long term de-rated

Trafalgar autotransformer, some load reduction measures may be required to manage additional contingencies.

The capability of the GTA 500/230 kV autotransformers is sufficient to supply the summer 2010 normal and extreme weather demand. If any one GTA 500/230 kV autotransformer is forced out of service, the capability of the remaining transformers will suffice as long as at least four Pickering units are in service at the time of the contingency. Similarly, at least five Pickering units would need to be in service to offset the loss of two 500/230kV autotransformers. Subsequent autotransformer, generation outages or de-rates could result in mitigating measures being required to reduce the remaining GTA 500/230 kV autotransformers loadings within their capability.

Portlands Energy Centre provides loading relief mainly to the 230/115 kV Leaside autotransformers but also to the Cherrywood 500/230 kV autotransformers. Goreway Station provides significant loading relief to the Claireville 500/230 kV autotransformers, especially in case of multiple autotransformer outages. The planned addition of Halton Hills GS in the third quarter of 2010 will further reduce the peak loading of the Trafalgar 500/230 kV autotransformers and allow for more operational flexibility.

The 230 kV transmission corridor between Trafalgar TS and Richview TS which supplies Brampton, Mississauga and parts of Caledon and Halton Hills could become loaded very close to its capability during summer 2010 under extreme weather conditions. The new Hurontario switching station and the expansion of the 230 kV lines from Cardiff TS that was recently placed in service will relieve the loading of this corridor and alleviate this problem.

The York region load-serving capability will be 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 to southern Ontario transmission interface 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. The near-term transmission reinforcements required to accommodate the extra generation are on schedule with the installation of one additional capacitor at Buchanan.

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 include the installation of additional dynamic voltage control facilities at Nanticoke and Detweiler, scheduled to go in service during the second quarter of 2011 and when necessary, maximizing the available reactive power from the remaining Nanticoke units. These measures together with the new shunt capacitors, the modifications of the existing Bruce special protection system and planned shutdown of four coal-fired units in October 2010 will further reduce the potential for constrained generation. In the longer-term, the proposed 500 kV line from Bruce to Milton will 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, scheduled to be completed during the second quarter of 2011, 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, allow future load growth and yield a more flexible configuration. 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 the fourth quarter of 2012.

The existing 115kV transmission facilities in the Guelph area are operating close to capacity and there is limited capability available to supply additional load. Hydro One, the affected transmitter, and the OPA are reviewing various options for enhancing the overall supply capability to the Guelph area and a decision on the preferred solution is expected in the fall of 2010.

A solution also remains required in the Cambridge area, as existing transmission infrastructure is unable to meet the IESO's load restoration criteria following a contingency. The OPA is reviewing a proposal to install gas-fired generation capacity at Cambridge-Preston TS.

### 5.3.3 Niagara Zone and the New York Interconnection

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

The 230 kV circuit BP76 forms an integral part of the Ontario - New York interface at Niagara Falls. Due to the variable nature of its flows, this interface is one of the most challenging to manage in the Eastern Interconnection, keeping system operators around the Great Lakes, which include the IESO, NYISO, PJM and MISO, fully engaged. The long term forced outage of the BP76 interconnection has compounded the complexities of these reliability coordination efforts, added to Ontario's surplus baseload generation (SBG) events and materially led to increased nuclear reductions and hydroelectric spill conditions over the last year. Planned outages of two other lines of the Niagara interconnection (PA301 and PA302) are currently being planned for November and December 2010. These outages have the potential to reduce the scheduled transfer capability of the Niagara interconnection to zero and also impact the Ontario to Michigan transfers. In order to help facilitate these potential outages, the IESO recently directed Hydro One to schedule and complete the construction of a bypass until the failed R76 voltage regulator is replaced. The expected return to service of BP76 with R76 replaced is currently December 2012.

### 5.3.4 East Zone and Ottawa Zone

Some outages planned over this Outlook period in the Ottawa area will reduce its supply capability but no load reduction measures are expected to be required.

### 5.3.5 West Zone and the Michigan Interconnection

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. The planned shutdown of two Lambton GS coal-fired units will reduce, but not eliminate the amount of bottled generation in this zone.

Phase angle regulators (PARs) are installed on the Ontario-Michigan interconnection at Lambton TS, representing two of the four interconnections with Michigan, but are not currently operational until completion of agreements between the IESO, the MISO, Hydro One and International Transmission Company. The expected in service date is not known at this time. The operation of these PARs along with the PAR on the Ontario-Michigan interconnection near Windsor will control flows to a limited extent, and assist in the management of system congestion.

The capability to control flows on the Ontario-Michigan interconnection between Scott TS and Bunce Creek is unavailable. The PAR installed at Bunce Creek in Michigan has failed and is scheduled for replacement by the beginning of Q3 in 2010.

### 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 become operational.

Hydro One is planning to implement in the fourth quarter of 2012 some of the modifications recommended by the IESO to the existing Mississagi generation rejection scheme that has the potential to alleviate, in the near term, the constrained generation west of Mississagi.

To further reduce the congestion in northern Ontario and improve the transfer capability, Hydro One is planning to install additional dynamic reactive compensation facilities at Porcupine TS, in the fourth quarter of 2010 and Kirkland Lake TS, in the first quarter of 2011. In preparation for additional renewable generation in northern Ontario, Hydro One is planning to increase the north-south transfer capability by installing series compensation at Nobel SS, proposed to go in service in the last quarter of 2010.

During 2010, extensive work on the transmission circuits in the Kenora - Fort Frances area is scheduled. The associated 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.

Managing grid voltages in the Northwest has always required special attention; with the significantly lower demands, it is increasingly difficult to maintain an acceptable voltage profile without compromising the security and reliability of the supply.

Over the past year it has become more difficult to manage voltages throughout the transmission system in north-western Ontario. On several occasions normal dispatch actions were exhausted, and exceptional voltage control measures were required, including the temporary removal of one or more transmission circuits from service during light load or low transfer conditions to maintain voltages within acceptable ranges. This reduced the grid's ability to withstand

disturbances and subsequently undermined the customer's supply reliability. Additional reactive compensation is required for voltage control in the zone.

The IESO has contacted Hydro One, and is also in conversations with the OPA, in an effort to examine the short and long-term solutions to this matter.

### 5.3.7 Ontario 25 Hz System

The 25 Hz system in northeastern Ontario was decommissioned during the first quarter of 2010. There are no more 25 Hz facilities operating in the province.

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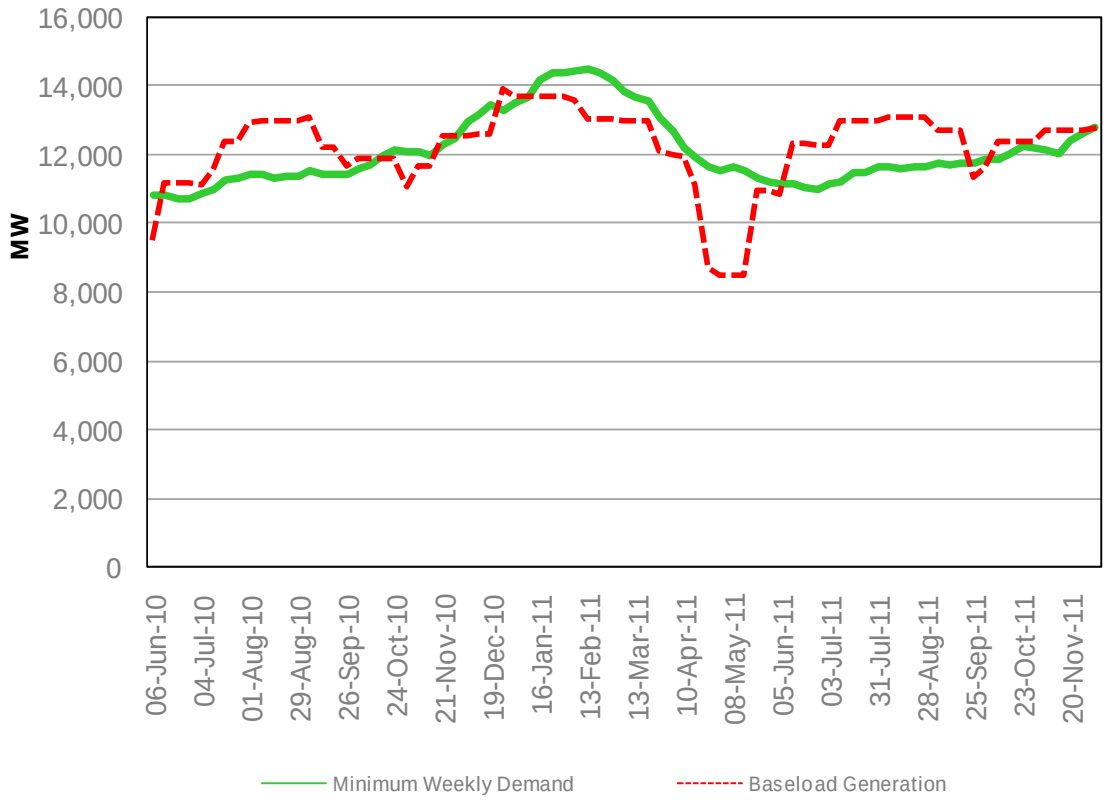
# 6.0 Operability Assessment

The IESO monitors existing and emerging operability issues that could potentially impact system reliability. In March 2010, unseasonably warm temperatures contributed to lower than forecast minimum demands. This resulted in isolated surplus baseload generation (SBG) events, notably over the Easter long weekend.

A forecast for SBG conditions over the next 18 months is presented below. Forecast minimum demand continues to trend lower than in previous years. Over the next 18 months, the IESO expects the risk of experiencing SBG conditions will be most relevant over the summer periods.

Figure 6.1 shows projected weekly minimum demand against the expected level of baseload generation. Baseload generation assumptions have been updated to include exports, 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. Output from commissioning units is explicitly excluded from this analysis due to uncertainty and highly variable nature of commissioning schedules.

**Figure 6.1 Minimum Demand and Baseload Generation**




Notable events involving Ontario's interconnections occurred in 2009, including lengthy planned outages on the Ontario-New York interface that significantly limited intertie capacity to both New York and Michigan. At the same time, a new 1,250 MW tie to Quebec facilitated increased intertie capacity towards the end of the year. As a result of these developments, and in light of similar planned outages to the Ontario-New York interface currently being assessed for

November and December 2010, the 1,000 MW export assumption that was used in previous Outlooks is being revised.

Going forward, a nominal export assumption of 1,500 MW will be applied as a decrement to baseload generation under limited, or no interconnection planned outages. Under more significant interconnection planned outages[1], such as the New York PA301 and PA302 outages scheduled for November and December 2010, an export assumption of 1,200 MW will be applied to reflect the reduced export capability associated with these planned outages. These revised net export assumptions were derived from an examination of historical net export data during periods of low Ontario demand from 2008 and 2009, at various levels of aggregate export capability and are also reflective of external markets' ability to absorb energy at that time. In recognition of changing market and surplus baseload conditions, and their associated impact on net export volumes, the IESO intends to review and revise as required the net export assumptions on an annual basis.

**- End of Section -**

[1] The 1,200 MW export assumption will be applied when forecast planned outages are expected to limit Ontario's aggregate export capacity to between 1,400MW and 2,600 MW. For forecast planned outages that further limit export capacity to below 1,400 MW, an export assumption value of 700 MW will be used. See Appendix C of the 18-Month Outlook Tables for forecast reduction to major transmission interface limits, including interconnection interfaces.

# 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 February, March and April has been recorded. Overall, the weather experienced over those three months has been milder than normal.

For the first four months of 2010 actual energy demand has been 2.7% lower than the previous year. On a weather-corrected basis energy demand has grown by 0.5% as the first four months of 2010 were milder than normal. For 2010, economic factors continue to impact demand. This has been evidenced in the wholesale customers' consumption, which has dropped 2.6% compared to the first four months of 2009.

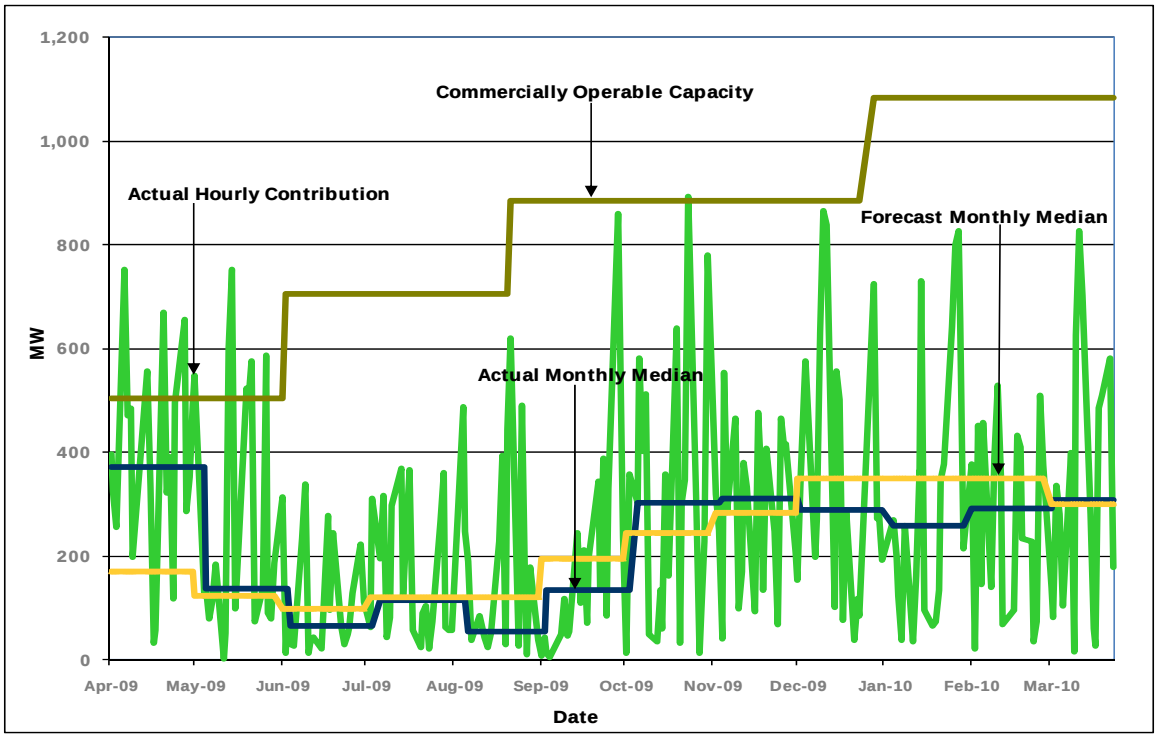
## 7.2 Hourly Resource Contributions at Time of Weekday Peak

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 April 1, 2009 to March 23, 2010 was analyzed. Holiday data was not considered in the analysis since hydro peaking generation and interchange data during this timeframe is 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. Wind generation continued to increase from the previous year however that can be directly attributed to the increase in installed capacity which is expected to further increase with wind generation procured under the RES III and FIT programs. 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 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. Milder temperatures in November caused the usual increase in hydro production, associated with high winter demand, to occur later in the year than expected.

**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**

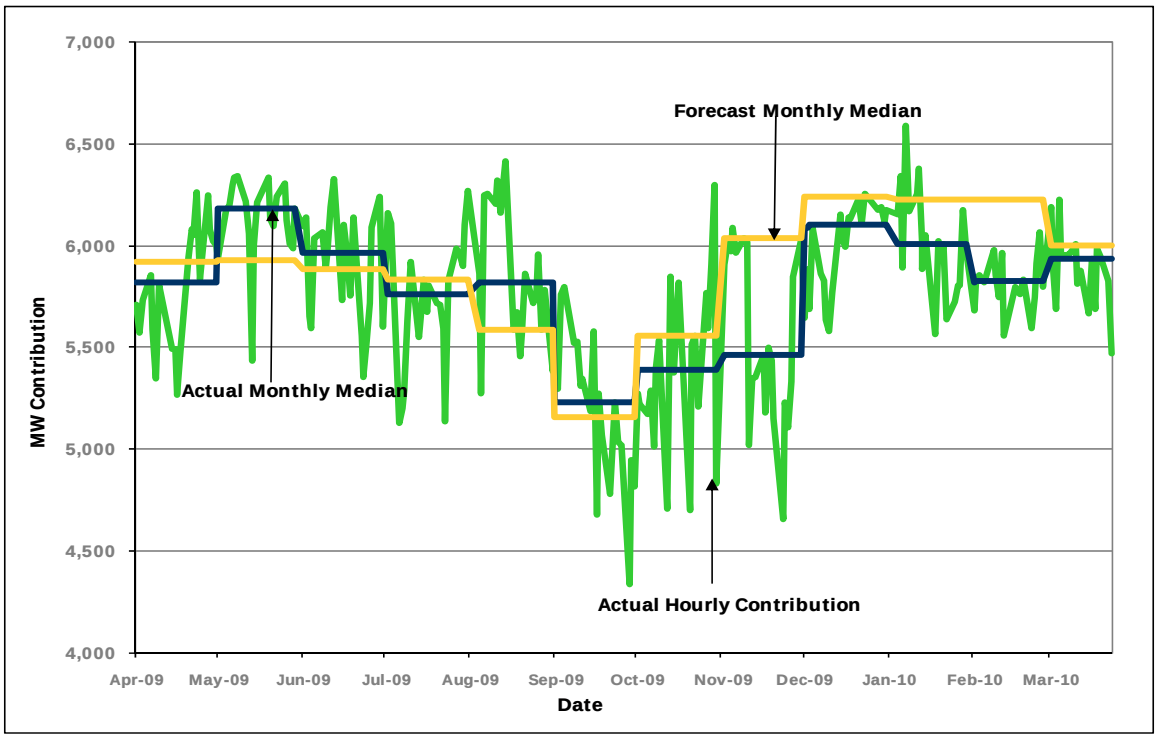


Figure 7.2.3 shows imports into Ontario at the time of weekday peak. This year Ontario experienced a significant reduction in demand. Lower demands and surplus conditions created lower prices in Ontario which made importing into the province less attractive which is why imports were lower than previous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

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

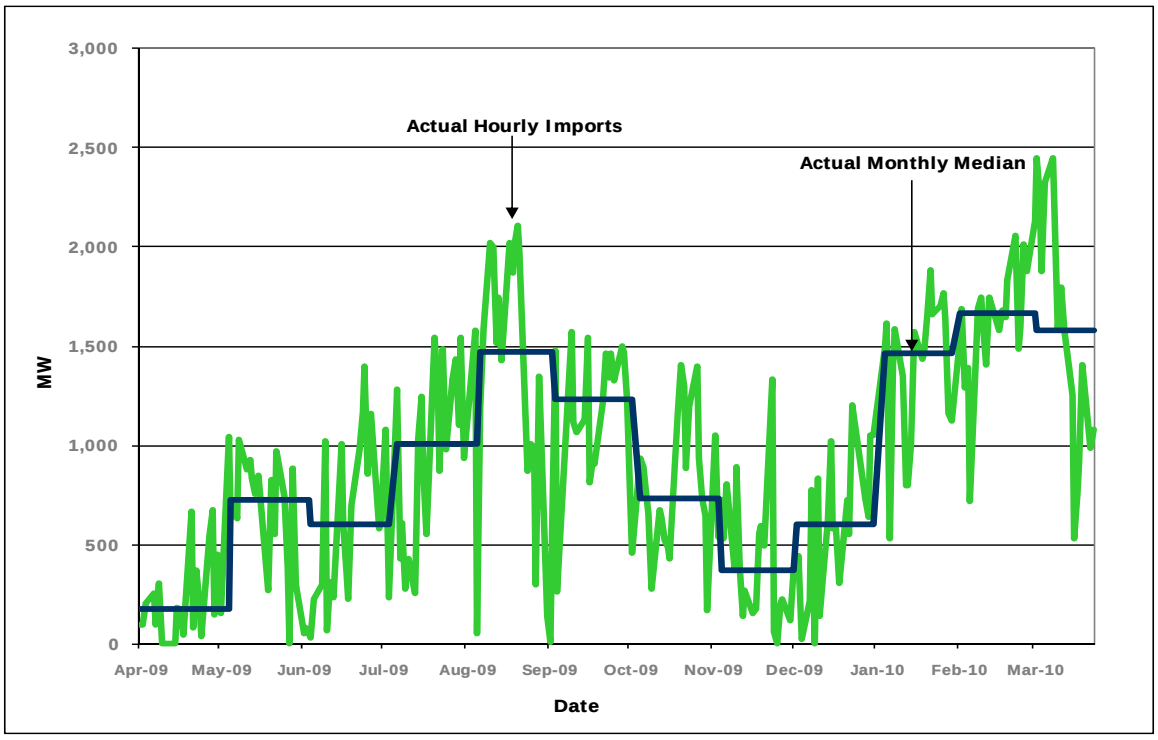
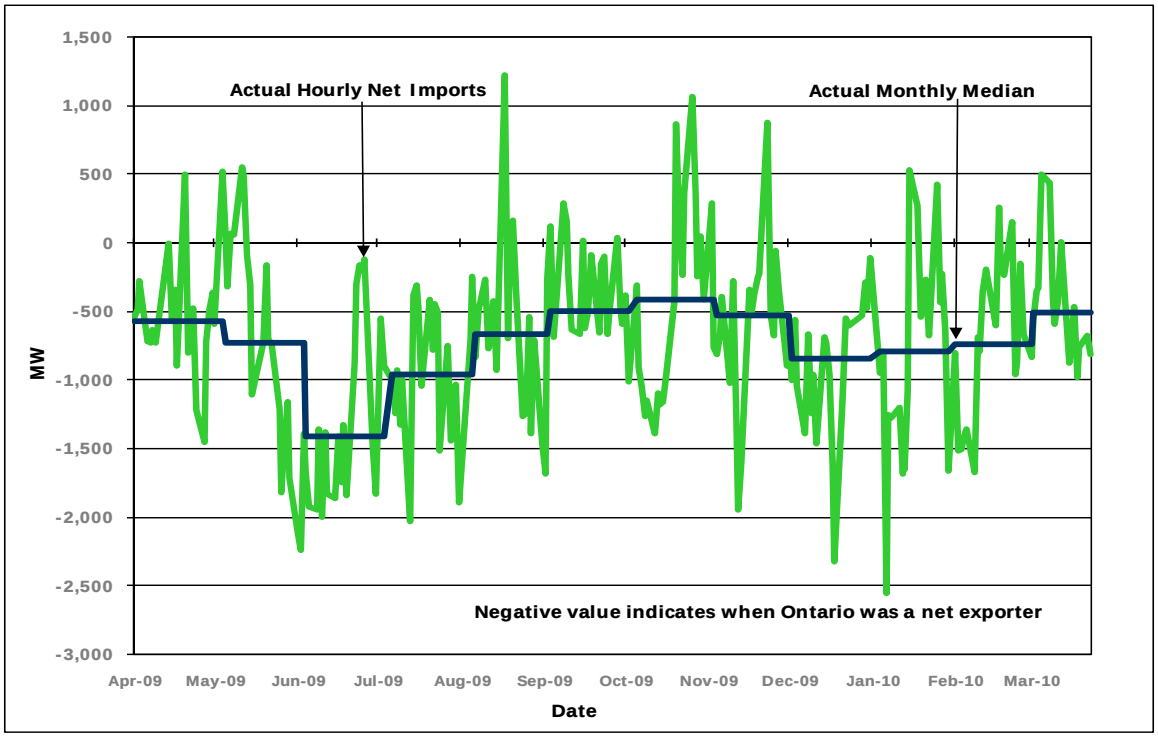



Figure 7.2.4 shows the amount of net imports into Ontario at the time of weekday peak, excluding weekends and holidays. Net Interchange is the difference between total imports into Ontario and total exports out of Ontario. Ontario was, on average, a net exporter for the entire study period. As stated 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

Since November 2009, the IESO's resource scheduling in the near-term time frame has been based on the average, rather than the peak, demand forecast for all hours where demand does not typically change dramatically. This change in methodology is an attempt to assist in reducing SBG through more efficient resource commitments.

Centralized wind forecasting is an initiative designed to allow for better forecasting of wind production to ensure a more accurate unit commitment occurs. Pilot implementation is expected to commence by the end of 2010.

## 7.4 Variation from Previous Year

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

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