Guide to Peak vs. Average Data

1.0 Caveat Regarding Simulations

Simulations are not accurate representations of what the actual market results and response would be if the modelled change is made. Simulations only offer directional indications, i.e. price increase or decrease, and may be used to compare the relative impacts of various proposed changes with a reasonable amount of confidence. However their statistical validity is limited. The results of the simulations are not intended to imply a magnitude of price changes and are not capable of incorporating price sensitive response or behavioural changes as a result of the proposed change.

For example:

The simulations for December 13 use the bids and offers submitted on that trade day with the expected conditions (weather, outages, etc) and market outcomes (pre-dispatch prices, previous hour prices, etc). If the pre-dispatch forecast is changed to average it will change the expectations and behaviours of some market participants. An importer or exporter will be responding to a different set of price signals than those that actually existed on December 13 and will likely offer in a different manner in response to the different conditions. Any such changes in behaviour have not been modelled in these simulations.

2.0 Simulation Details

In order to simulate the effect of moving from Peak to Average demand forecast the IESO ran a simulation of a number of days to provide some indication of the possible price impacts. The following days were simulated:

Monday December 13, 2005
Tuesday October 17, 2005
Wednesday January 27, 2005
Thursday August 3, 2005
Friday April 8, 2005
Saturday July 9, 2005
Sunday May 29, 2005

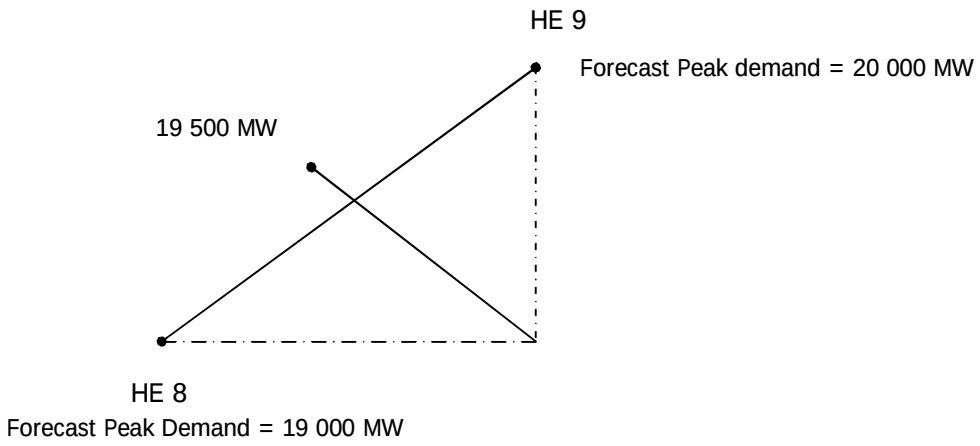
These days were selected at random throughout the year in an attempt to formulate a 'representative' week. We adopted this approach for these simulations as they are only meant to provide directional guidance.

How the simulation was performed:

- The forecast average demand was calculated from the pre-dispatch forecast peak demand

  To estimate the forecast average demand for a given hour, we calculated the average of the forecast peak demands for that hour and the previous hour. Refer to Example 2.1. (below) for a simple numerical example.

  Example 2.1: Estimating the forecast average demand forecast for HE 9



  Forecast average demand for HE 9 = (Peak of hour 8 + Peak of hour 9)/2
  = (19 000 + 20 000)/2
  = 19 500 MW

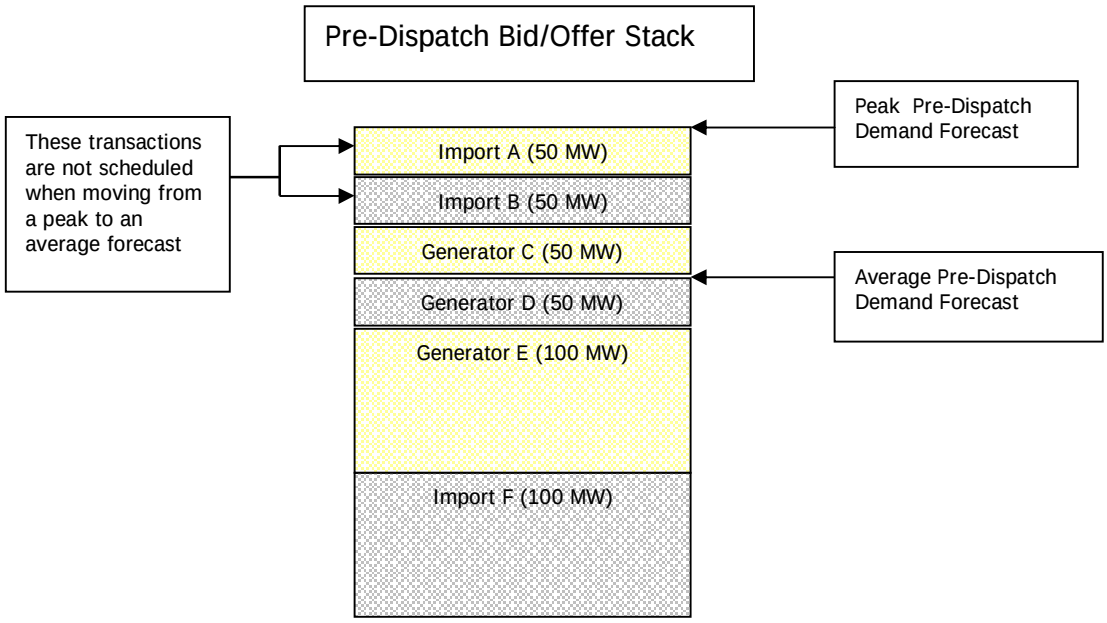
- Recreate the pre-dispatch offer curve and determine the effect on net import transactions that would not have been scheduled with a forecast average demand.

  In Example 2.2 (below) a move from peak to average demand would result in a pre-dispatch demand that is lower by 150 MW. The lower demand forecast will result in a lower pre-dispatch price and 100 MW fewer imports would be scheduled for this hour.

  At times there are export transaction that are made economical by the change from peak to average demand forecasting. For example, suppose the change from peak to average lowers the pre-dispatch price from $100 to $50. All exports with bids greater then $50 and less than $100 would become economic as a result of the change. There are only 18 hours where exports would increase in the dates included in this study with the majority of these

events, 12 of 18, occurring on May 29, 2005. This result can be expected for that time of year. Ontario is typically a net exporter in the spring months due to increased hydroelectric output and low domestic demand.

Example 2.2: Determining import schedules with average demand



- Adjust the real time market demand by the change in net imports

  To simulate the impact of a change in pre-dispatch forecasting on real time price we increased the real-time non-dispatchable load demand by the MW amount of the reduction in net imports. In example 2.2, moving to an average forecast caused 100 MW fewer imports to be scheduled. To simulate the effect of this change on real time prices the real-time market demand was increased by 100 MW (all else equal, a decrease in non-dispatchable supply is equivalent to an increase in demand).

- Simulate the market results with the modified market demand

  The simulator calculates market clearing prices in the same way as the unconstrained sequence of the DSO, using actual real time bid and offer data from the given trade date.

3.0 Data Description

You will notice that for each trade date examined there are two tables, 'Average for All hours', and 'Average for Specific Hours Only'. The 'Average for Specific Hours Only'

simulation only uses the forecast average demand in specific hours i.e. HE 1 through HE 5, HE 11 through HE 16 and HE 22-24. The IESO believes that using a forecast average demand for those hours poses less of a reliability concern than in the other hours. As this is only a preliminary analysis the hours denoted as being acceptable for use of an average demand forecast are subject to change.

On the included spreadsheets you will see the following headings:

Avg Demand (Mw)	Peak Demand (Mw)	Difference (Peak-Avg) (Mw)	Decrease in Net Imports (Mw)	Simulated HOEP Peak Demand Forecast	Actual HOEP	Simulated HOEP Avg Demand Forecast	Price Difference (Peak-Avg)

Avg Demand (MW)	The estimated average demand forecast for the hour
Peak Demand (MW)	The actual forecast peak demand that was used to schedule intertie transactions for the hour.
Difference (Peak-Avg):	The MW difference between the estimated average and actual peak demand.
Decrease in Net Imports (MW)	The MW of imports that would not be scheduled if an average demand forecast was used in pre-dispatch. A positive number indicates the import MW's that would not be scheduled. Occasionally this number is negative which represents the fact that more exports will become economical as a result of a lower pre-dispatch price. See Example 2.2 for a how this number was calculated. This MW number is used to increase the real-time non-dispatchable demand.
Simulated HOEP Peak Demand Forecast	The simulated HOEP using the real time un-modified market demand.
Actual HOEP	The HOEP from actual market operations on the given day. This HOEP is provided to demonstrate the accuracy of the simulator in simulating actual market prices. Occasional differences between the Actual HOEP and the Simulated HOEP with a Peak Demand Forecast are expected. The simulator is not able to recreate real time events that will have an effect on the actual HOEP (e.g. forced outage).
Simulated HOEP Avg Demand Forecast	The simulated HOEP with the increased real-time market demand
Price Difference (Peak – Average)	The price difference between simulated prices using the forecast peak demand and simulated prices using the forecast average demand.

4.0 Simulation Results

Figure 4.1: Summary Statistics for Study Period

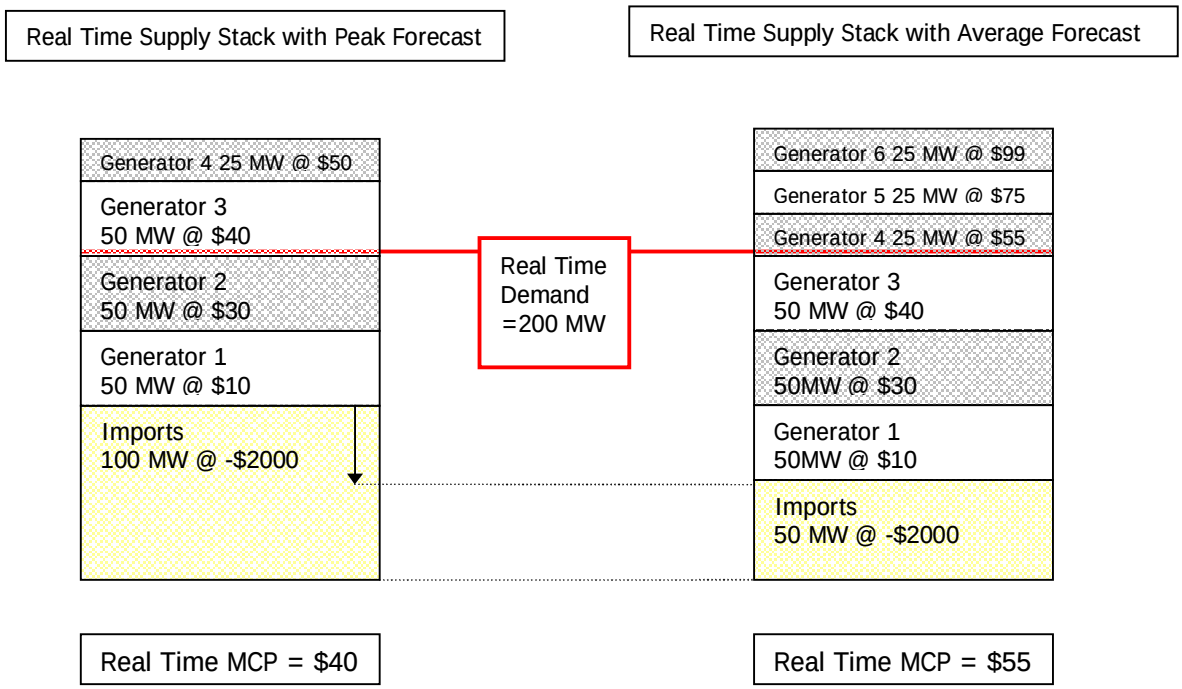
	HOEP			
	Actual	Simulated Using Forecast Peak Demands	Simulated Using Forecast Average Demands for All Hours	Simulated Using Forecast Average Demands for Specific Hours Only
Min	$17	$17	$17	$17
Max	$388	$388	$402	$402
Median	$58.03	$58.03	$65.64	$63.82
Mean	$75.20	$74.97	$84.71	$80.86
Standard Deviation	$48.97	$49.94	$62.09	$58.21

Figure 4.2: Histogram of HOEP for study period

Price Impact

The simulation results indicate that the HOEP would increase as a result of a change from peak to average demand forecasting. This increase in price can be attributed to scheduling fewer imports in pre-dispatch. Recall that import transactions scheduled in pre-dispatch are inserted into the real-time offer stack at -$2000 and in many intervals will have a lowering effect on real-time price (MCP). As can be seen in example 4.1, when fewer imports are scheduled in pre-dispatch more domestic resources are required to meet the real time demand.

Example 4.1: Increases to Real Time Price



Impact on Price Volatility

Associated with the increase in real time price is an increase to the volatility of the real time. As can be seen in figure 4.1 the standard deviation of using the forecast average demand for all hours ($62) is approximately 25 % greater than the standard deviation using the forecast peak demand ($50). This can be attributed to scheduling fewer imports in pre-dispatch and having fewer resources available in real time, pushing us further up the supply stack to satisfy demand in real time. By moving further along the supply stack we enter the steeper portion of the curve where small changes in demand will have a larger impact on price than the same demand changes further down the supply curve. This effect is illustrated in example 4.2 which uses the results of the previous example (4.1). When the demand is 200 MW the market clearing prices are $40

for a peak demand forecast and $55 for an average demand forecast. If demand were to increase by 30 MW prices for the peak forecast scenario would not change and prices for the average forecast scenario would increase by $20. In this example, any demand fluctuations in the 200-230 MW range will exhibit this price volatility. If demand were to increase from 200 to 250 MW the price change would be $10 for the peak forecast and $59 for the average forecast.

Example 4.2: Increases to Real Time Price as the result of a demand change using the results of example 4.1

Demand increase	Real time Price Increase as a result of the stated demand increase	
Demand (MW)	Peak pre-dispatch demand forecast	Avg pre-dispatch demand forecast
30	0	20
50	10	59

5.0 Expected Market Place Response

In general, it is expected that the potential increase to the real time price will be mitigated to some extent by the actions of importers and exporters. Importers are expected to offer lower and/or more MW to capture the higher expected real time price and exporters are expected to bid lower or less MW to avoid the expected higher real time price.

The table below attempts to explain the impact of the proposed change on the various groups of stakeholders in the province.

Stakeholder	Response
Consumers	Given the current bidding behaviour of dispatchable loads in Ontario there is no expected response from those consumer market participants. Periods of substantial price increase may result in reduced consumption from price-sensitive consumers that are not dispatchable loads or market participants. An increase in HOEP will tend to increase the global adjustment credit as generators are earning more revenue through the energy price and would not need to receive the global adjustment revenue guarantees.

Importers	As can be seen from the provided data, a move to average demand forecast in the pre-dispatch run would be expected to lower pre-dispatch prices and reduce the number of imports scheduled. However, this is before a response from importers. Depending upon the price spread between Ontario and its neighbours, importers may offer lower (if they are economically able) to be scheduled in Ontario to capture the higher expected real time price. If the price spread between jurisdictions is not large enough to allow importers to economically lower their offers a reduction in import volume will be experienced and HOEP will increase as expected. This will tend to lower the price in neighbouring jurisdictions as it is lowering their respective export demand. This in turn will naturally make more imports economical in future hours. If the price spread between Ontario and at least one of its neighbours is great enough for an importer to make a business case for lowering their offers, Ontario will likely not see a decrease in import supply and the set of imports that are scheduled will be lower priced, thus mitigating to some extent the expected price increase.
Exporters	The change in pre-dispatch demand forecasting itself will have no impact on exporter behaviour. Exporters pay HOEP and as such will bid according to their expectation of HOEP given a set of indicators (weather, primary demand, previous hour prices, etc). Pre-dispatch prices are not likely to be an important indicator for exports as they are only able to see the 3 hour ahead pre-dispatch price before the bidding window closes. It is expected that exports will decrease in response to the expected increase in HOEP as a result of moving to average demand forecasting. As was recently discussed at the MPWG, with a 10% increase in HOEP an 18% reduction in the average export is anticipated. This applies downward pressure on HOEP, mitigating to some extent the expected price increase. However, if export volume from Ontario is reduced in response to the expected HOEP increase, other jurisdictions will experience a price increase as there is a reduction in relatively lower priced supply. This in turn will make exports from Ontario economical in future hours. The exporter response to the increase in HOEP is expected to mitigate, to an unknown extent, any price increase.

Generators	The change to average demand forecast in the pre-dispatch would require more domestic resources available in real time. This would require an increase to the output of Ontario's generators to meet load that was previously being met by imports. The generators would also be receiving a higher HOEP price on the increased output. Again, it is expected that the importers and exporters will respond to the increase in HOEP mitigating the potential impact to Ontario resources. For the generators in the province who have a CES style contract with the OPA, the potential increase in revenues is mitigated by the fact that they will receive less revenue through the global adjustment mechanism as their energy market revenues would be closer to covering their monthly net revenue requirement.

6.0 Expected Impact on CMSC and IOG

IOG

IOG is expected to decrease. Moving from peak to average demand forecast would lower the pre-dispatch price, all else equal, and increase the HOEP. Both of these actions work to lower the IOG. Importers are being deemed economic on a lower pre-dispatch price and earning a higher real time price. The potential increase in HOEP in combination with the reduction in pre-dispatch prices reduces the likelihood that the importers offer price will be greater than HOEP requiring an IOG top up.

In addition to the effects that price has on IOG there is another effect through the decrease in import volume. It is expected with lower pre-dispatch demand that import volume will decrease and a decrease in import volume will naturally lower IOG.

The reduction in IOG is expected to take place even after intertie trade has mitigated the increase in HOEP. Using average in the pre-dispatch schedule will more closely align the pre-dispatch and real time results, reducing IOG.

CMSC

It is difficult to estimate the effects of this change on the cost of CMSC uplift to the market. There are situations where CMSC will increase and other situations where it will decrease. The net effect is not known.