

# Issue #9: Peak versus Average - Results of Analyses

MPWG 49

May 16, 2008



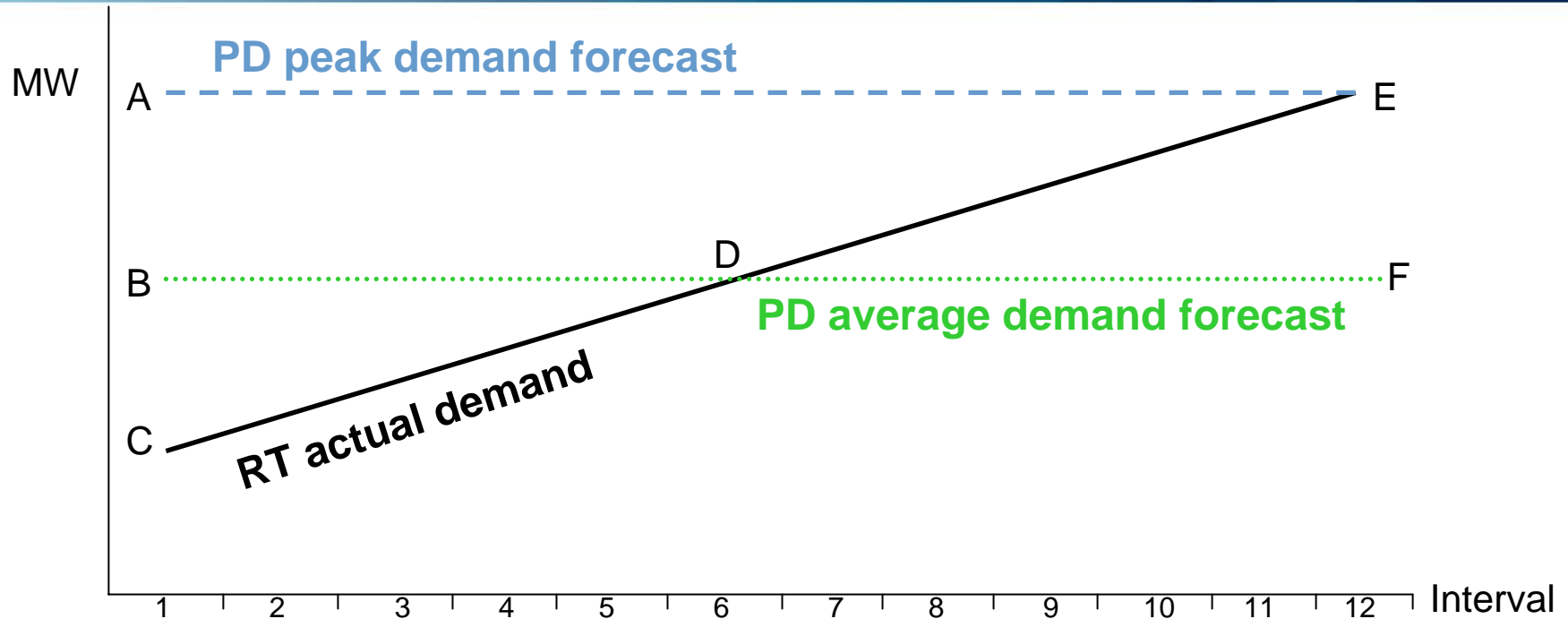
- Review of issue
- Efficiency analysis
- Reliability assessment
- Cost benefit analysis
- Price impacts
- Wealth transfer effects
- Conclusions
- Next steps

- Pre-dispatch process is based on hourly resolution
- Hourly scheduling requires the use of a single forecast demand value for the hour
  - IESO currently uses peak demand forecast to ensure adequate resources to meet peak
- Will always be possibility of real-time inefficiencies with any pre-dispatch hourly forecast

## **Purpose of the Initiative**

- To assess the economic efficiency impacts and reliability impacts of using an avg demand forecast in pre-dispatch

# Simple Example Showing Potential Inefficiencies



- Will always be inefficiencies associated with the use of a single forecast value in pre-dispatch for a one-hour period
- Triangle ACE represents the potential inefficiencies associated with the use of peak demand forecast
- Triangles BCD + DEF represent the potential inefficiencies associated with the use of average demand forecast

- Performed simulations that replicate the dispatch scheduling optimizer (DSO)
  - DSO determines the least cost solution to satisfy a given level of demand
- Generated two sets of pre-dispatch and real-time schedules
  - One set based on peak demand forecast in pre-dispatch, the other based on average demand forecast
- Compared the difference in total costs of meeting real-time demand

- No change in Ontario demand
- Generator offers are representative of production costs
- Import offers are representative of the opportunity cost of providing energy to Ontario
- Dispatchable load bids are representative of their value of consumption
- No change in offers/bids of generators, imports, dispatchable loads
- Simulations assume no change in export response

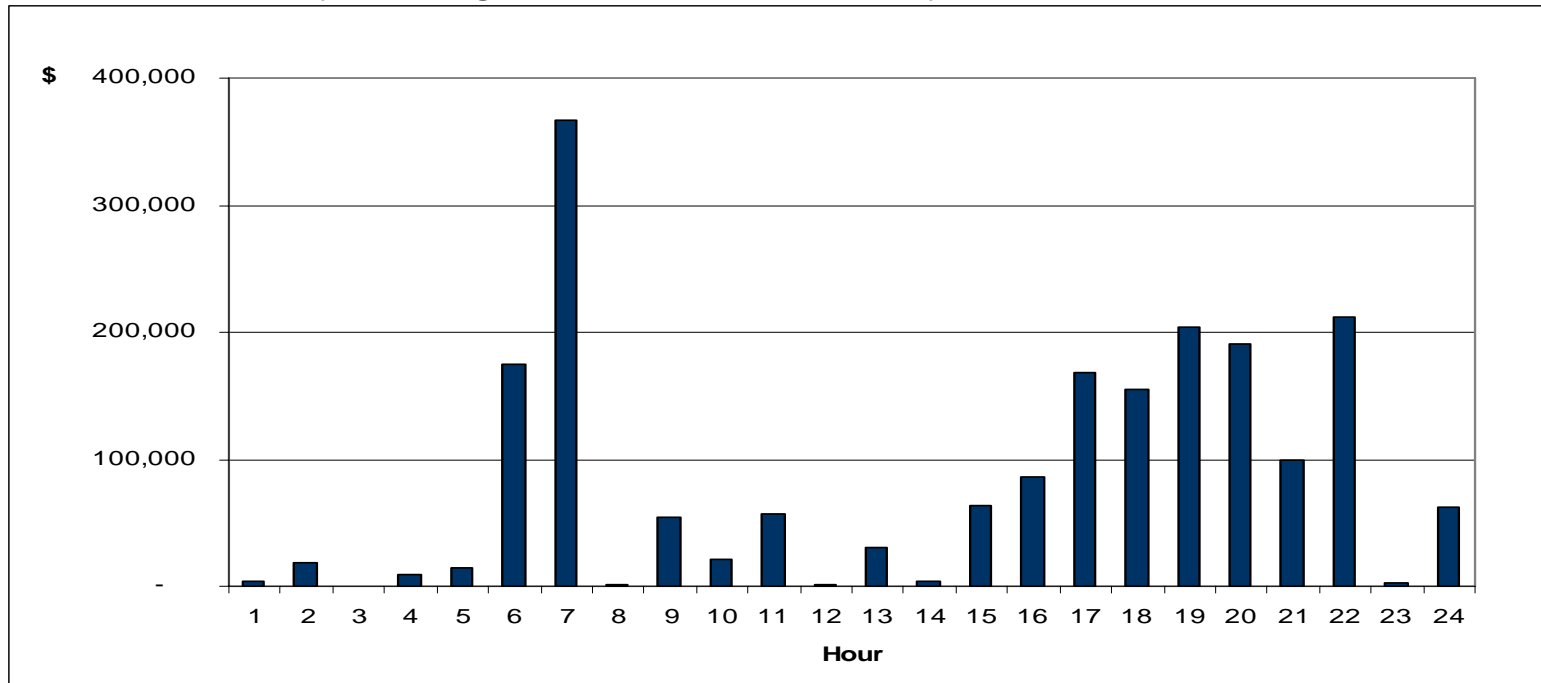
- Export price responsiveness based on previous elasticity estimates: -5.6% on-peak, -2.8% off-peak
  - Export elasticity is the %  $\Delta$  in export volume resulting from a 1%  $\Delta$  in real-time HOEP
- Expected upward pressure on real-time price would lead to fewer exports
  - Fewer exports would further reduce import levels
- Modified simulation data using algebraic relationships to arrive at equilibrium values for  $\Delta$  exports and  $\Delta$  imports

- Use equilibrium values to estimate change in total surplus
- Change in total surplus equivalent to change in avoided cost of imports + change in export surplus – increase in domestic production costs

## Efficiency Analysis Results (\$ million)

Period	$\Delta$ avoided cost of import	$\Delta$ export surplus	$\Delta$ domestic production costs	$\Delta$ total efficiency (for the sample)	$\Delta$ total efficiency (annualized)
All hours	17.6	-10.8	4.8	<b>2.0</b>	<b>8.7</b>
On-peak	14.1	- 8.7	3.7	<b>1.7</b>	<b>7.4</b>
Off-peak	3.5	- 2.1	1.1	<b>0.3</b>	<b>1.3</b>

## Total Efficiency Changes for the Sample, by Hour



- Increase in the risk of having to use control actions used as a proxy for the increased reliability risk
- Review of historical data suggests that supply cushion <5% combined with other events increases the risk of control action use
- For the 12-week sample, calculated the change in the supply cushion using and average demand forecast in pre-dispatch

## Sample statistics for supply cushion below 5%

Supply cushion below 5%	Peak Forecast	Average Forecast	Delta
# hours	370	399	29
% of all hours in sample	19.3%	20.8%	1.5%
average supply cushion during those hours	2.9%	2.7%	-0.2%

## Number of hours where supply cushion was below 5%

Hour	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Peak	0	0	0	0	0	0	8	22	26	33	34	29	25	17	15	16	18	37	39	31	17	2	1	0
Avg	0	0	0	0	0	0	8	24	27	34	36	30	27	18	15	16	20	42	43	33	20	5	1	0
Delta	0	0	0	0	0	0	0	2	1	1	2	1	2	1	0	0	2	5	4	2	3	3	0	0

- IESO has concluded there would be an unacceptable risk of adverse reliability events of using average in periods where demand is increasing significantly
  - Conclusion based on experience and considering the supply cushion data for the 12-week sample

- In advance of implementing any proposed change, IESO would define and publish “ramp-up periods”
- Definition of “ramp-up” hours would change at least quarterly (based on seasons)
- IESO would also use peak demand forecast in any hour if:
  - Supply cushion for that hour is below 5% in the day-ahead commitment run
  - IESO identifies any reliability concern with using average for that hour

# Potential Benefits of Using Average Demand Forecast in Pre-Dispatch

- Annual efficiency improvements in the range of \$3.4 million
- Improved convergence between pre-dispatch and real-time prices
- Reduction in excess baseload generation (EBG)
- Reduction in volatility of dispatch instructions
- Improved transparency in charges to market participants

# Potential Costs of Using Average Demand Forecast in Pre-Dispatch

- Reliability impacts
  - Unacceptable reliability risk of using an average demand forecast in hours where demand is increasing significantly
  - Using an average demand forecast in all remaining hours not expected to have a material impact on reliability
- Implementation costs
  - No IESO implementation costs
  - Change would be seamless to participants so no participant implementation costs expected

- Average increase in HOEP estimated at \$1.08/MWh for the hours that use an average demand forecast in pre-dispatch
- This translates into an average annual increase in HOEP of approximately \$0.72/MWh
- Hedge against price changes provided by global adjustment is approximately 80%
- Therefore, the effective increase in HOEP is estimated to be \$0.14/MWh

- Wealth transfer from consumers to producers
  - Change in effective HOEP x MW consumed = \$21.6 M
- Decrease in IOG payments of approximately \$4.3 M annually
- No material change in CMSC payments
- Net wealth transfer from consumers to suppliers estimated to be \$17.3 M annually

- Using an average demand forecast in pre-dispatch expected to improve economic efficiency in all hours
- IESO has determined the potential risk to reliability of using an average demand forecast is unacceptable in hours where demand is increasing significantly
- Economic efficiency increase estimated at \$3.4 M annually by using an average forecast in all hours except ramp-up periods
- Annual average increase in HOEP estimated at \$0.72/MWh
- Effective annual increase in HOEP estimated at \$0.14/MWh
- Wealth transfer from consumers to suppliers in the range of \$17M annually

- Seeking MPWG feedback on the analysis methodology and results
  - Please send written feedback to [IESOMarketPricingWorkingGroup@ieso.ca](mailto:IESOMarketPricingWorkingGroup@ieso.ca) by May 27, 2008
- Follow-up discussion on June 5 with MPWG regarding comments received about the analysis and results
- IESO recommendation by end of 2008
- Prior to making a recommendation, IESO will consult with stakeholders (through MPWG and SAC) on the criteria for trading off efficiency gains and wealth transfers



1. Change in HOEP is a function of the change in net exports

$$\Delta \text{HOEP} = k_1 \times (\Delta \text{ex} - \Delta \text{im}),$$

where  $k_1$  represents the slope of the real-time supply curve

- Change in HOEP is a function of the export elasticity ( $\epsilon$ )

$$\Delta \text{HOEP} = \underbrace{[(\text{HOEP}/\text{ex}) \times 1/\epsilon]}_{k_2} \times \Delta \text{ex}$$

$k_2 \rightarrow$  represents slope of export demand curve

3. Change in market demand is equal to the change in market supply

$$\Delta \text{im} = k_3 [\Delta \text{Ont demand} + \Delta \text{ex}]$$

$$\Delta \text{internal gen} = (1 - k_3) [\Delta \text{Ont demand} + \Delta \text{ex}]$$

where  $k_3$  represents the proportion of market demand change met by imports