

Draft Efficiency Analysis Proposal: Peak vs Average Pre-Dispatch Demand Forecast

MPWG

July 19, 2007

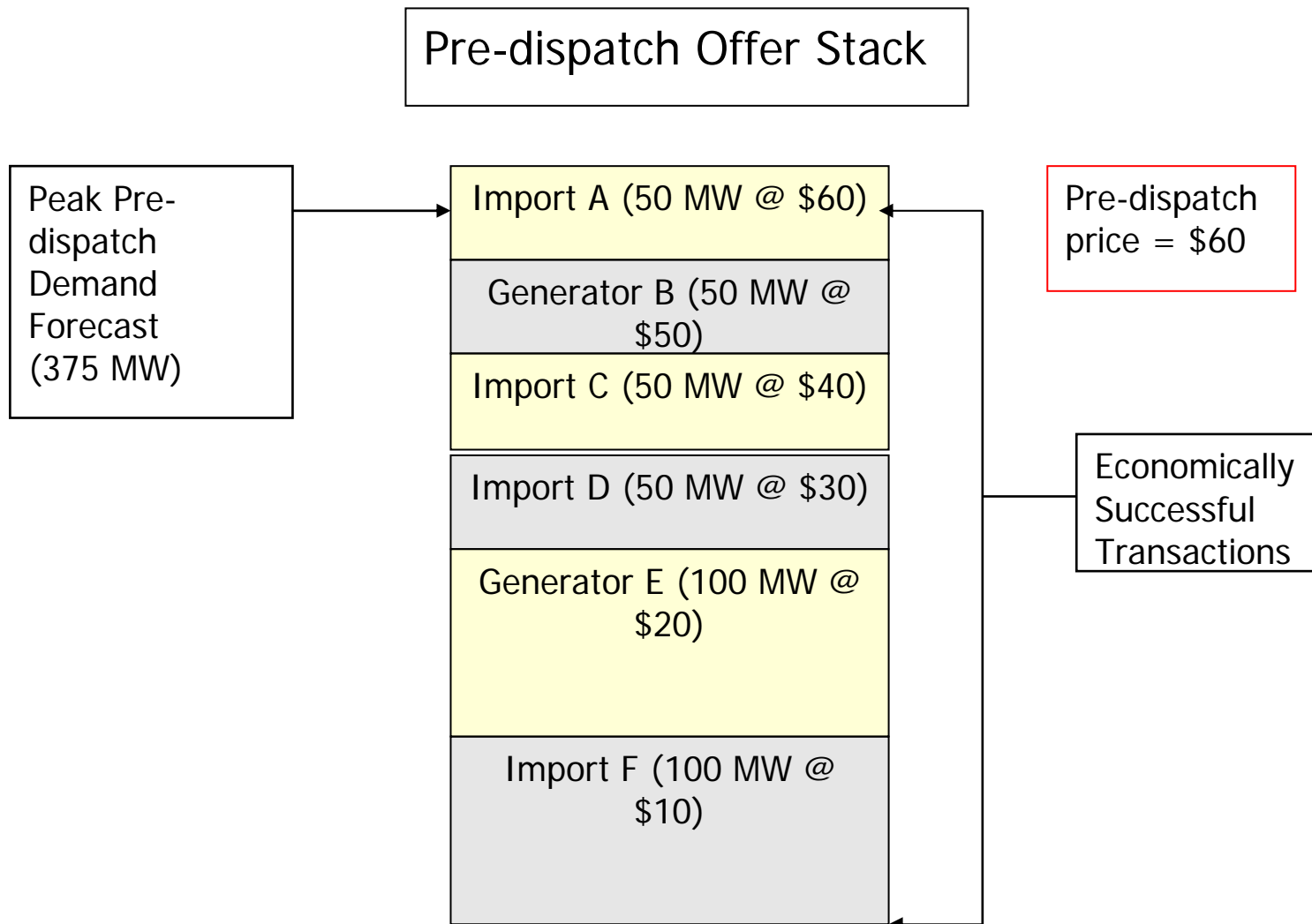


- Current Market Structure
- Efficiency Impacts of Proposed Change
- Proposed Methodology to estimate potential efficiency impact of a change to average

- There will always be the possibility of real-time inefficiencies with any pre-dispatch demand forecast
 - When real-time demand is greater than the pre-dispatch forecast of demand there may be inefficiencies as we are satisfying demand with relatively expensive domestic generation when inexpensive imports were available in pre-dispatch
 - When real-time demand is less than the pre-dispatch forecast of demand there may be inefficiencies as we are using relatively expensive imports to meet demand when cheaper domestic resources are available

- Efficiency impact analysis is only part of the required analysis:
 - Reliability impact
 - Cost-Benefit Analysis will need to be conducted, including implementation costs

- All pre-dispatch runs use a peak forecast of demand
- This may lead to over-scheduling of imports and domestic resources in pre-dispatch



- Total Cost of satisfying peak demand using the resources available in pre-dispatch

Resources	Scheduled MW	Offer Price (\$/MW h)	Total Cost (\$)
Import F	100	10	1000
Generator E	100	20	2000
Import D	50	30	1500
Import C	50	40	2000
Generator B	50	50	2500
Import A	25	60	1500
Total MW = 375		Total cost = \$10 500	

Real Time Offer Stack

Pre-dispatch
forecast of
peak demand
= 375 MW

Pre-dispatch
price = \$60

Generator G (25 MW @ \$65)
Generator B (50 MW @ \$50)
Generator E (100 MW @ \$20)
Imports (225 MW @ -\$2000)

- Total cost of satisfying demand in real-time with the resources scheduled in pre-dispatch
- Real-time demand is lower than forecast (350 MW)
- Notice that Import A scheduled to 25 MW when Generator B could supply that energy less expensively

Resource s	Schedule d MW	Offer Price (\$/M Wh)	Total Cost (\$)
Import F	100	10	1000
Generator E	100	20	2000
Import D	50	30	1500
Import C	50	40	2000
Generator B	25	50	1250
Import A	25	60	1500
Total MW = 350		Total cost = \$9250	

- If the IESO were to select the optimum level of resources regardless of pre-dispatch scheduling parameters to satisfy real-time demand it would not have scheduled Import A and would have dispatched Generator B for 50 MW instead

Resources	Scheduled MW	Offer Price (\$/MWh)	Total Cost (\$)
Import F	100	10	1000
Generator E	100	20	2000
Import D	50	30	1500
Import C	50	40	2000
Generator B	50	50	2500
Import A	0	60	0
Total MW = 350		Total cost = \$9000	

Total Cost Comparison

Resources Scheduled in Pre-Dispatch			
Resources	Scheduled MW	Offer Price (\$/MWh)	Total Cost (\$)
Import F	100	10	1000
Generator E	100	20	2000
Import D	50	30	1500
Import C	50	40	2000
Generator B	25	50	1250
Import A	25	60	1500
Total MW = 350		Total cost = \$9250	

Optimal Set of Resources			
Resources	Scheduled MW	Offer Price (\$/MWh)	Total Cost (\$)
Import F	100	10	1000
Generator E	100	20	2000
Import D	50	30	1500
Import C	50	40	2000
Generator B	50	50	2500
Import A	0	60	0
Total MW = 350		Total cost = \$9000	

Efficiency Loss of \$250

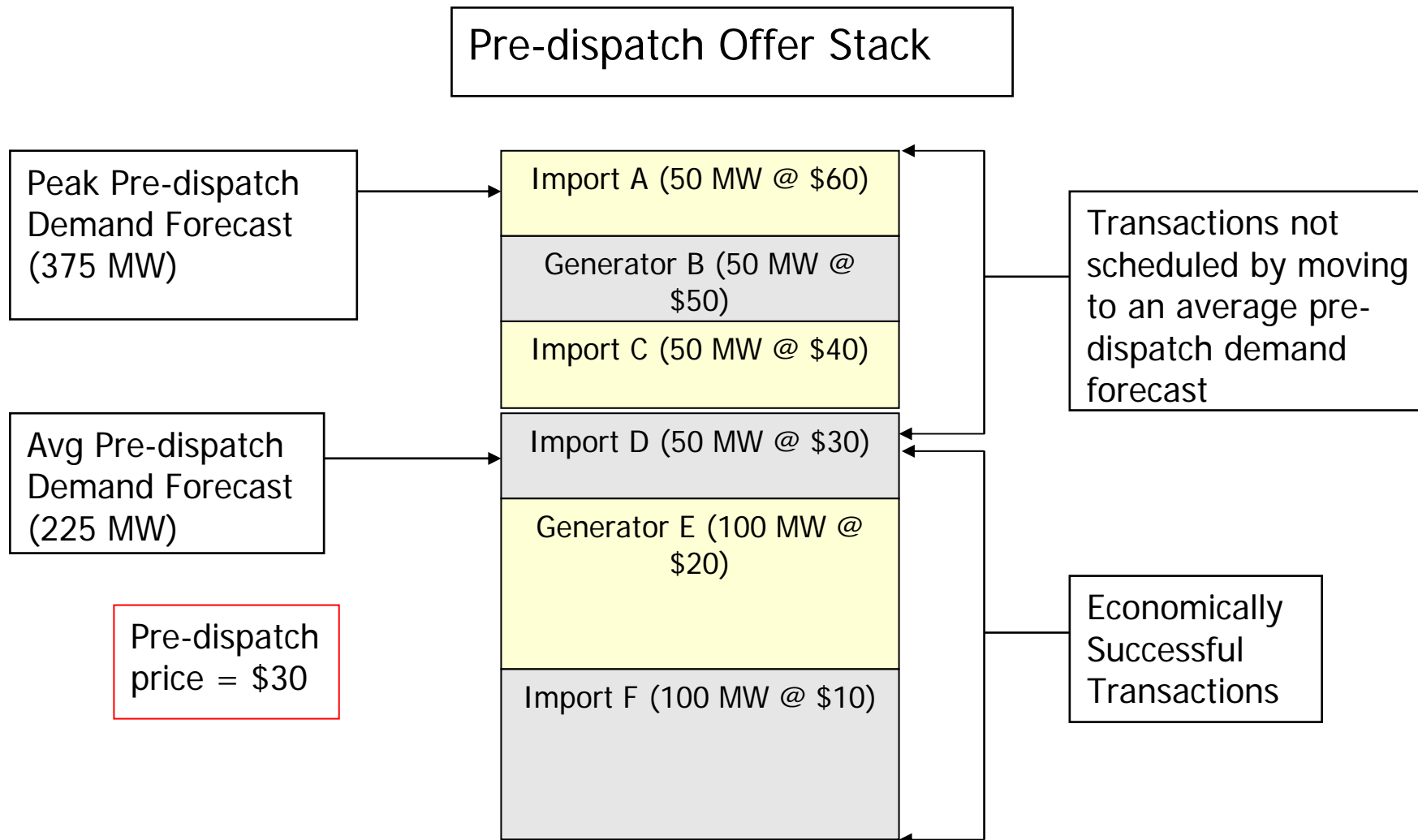
- Total cost of satisfying demand in real-time with the resources scheduled in pre-dispatch
- This is an example of satisfying real-time demand that is higher than forecast (400 MW)
- Notice that Generator G is dispatched to 25 MW when Import A is less expensive and could have been scheduled in pre-dispatch

Resource	Schedule d MW	Offer Price (\$/MWh)	Total Cost (\$)
Import F	100	10	1000
Generator E	100	20	2000
Import D	50	30	1500
Import C	50	40	2000
Generator B	50	50	2500
Import A	25	60	1500
Generator G	25	65	1625
Total MW = 400		Total cost = \$12 125	

- Assume that there was another import available for 25 MW @ \$62.50
- If the IESO were able to select the optimum level of resources to satisfy real-time demand it would have scheduled Import A and Import H and would not have dispatched Generator B

Resources	Scheduled MW	Offer Price (\$/MWh)	Total Cost (\$)
Import F	100	10	1000
Generator E	100	20	2000
Import D	50	30	1500
Import C	50	40	2000
Generator B	50	50	2500
Import A	25	60	1500
Import H	25	62.5	1562.5
Total MW = 400		Total cost = \$12 063	

Potential Impact of Proposed Changes



Real time Supply Stack

Peak pre-dispatch demand forecast

Generator B (50 MW @ \$50)
Generator E (100 MW @ \$20)
All Imports (225 MW @ - 2000)

Real-time Supply Stack

Average pre-dispatch demand forecast

Generator J (25 MW @ \$80)
Generator I (25 MW @ \$75)
Generator H (25 MW @ \$70)
Generator G (25 MW @ \$65)
Generator B (50 MW @ \$50)
Generator E (100 MW @ \$20)
All Imports (125 MW @ - 2000)

- Total cost of satisfying demand in real-time with the resources scheduled in pre-dispatch
- In this example this is the most efficient solution to meet 225 MW of demand.
- Using a peak demand forecast in pre-dispatch to satisfy 225 MW of real-time demand would result in total costs of \$6000

Optimal Set of Resources			
Resources	Scheduled MW	Offer Price (\$/MWh)	Total Cost (\$)
Import F	100	10	1000
Generator E	100	20	2000
Import D	25	30	750
Total MW = 225		Total cost = \$3750	

- Total cost of satisfying demand in real-time with the resources scheduled in pre-dispatch using an average demand forecast
- This is an example of satisfying real-time demand that is higher than forecast (350 MW)
- Satisfying 350 MW of real-time demand with a peak pre-dispatch demand forecast resulted in a total cost of \$9250

Resources	Scheduled MW	Offer Price (\$/MWh)	Total Cost (\$)
Import F	100	10	1000
Generator E	100	20	2000
Import D	25	30	750
Generator B	50	50	2500
Generator G	25	65	1625
Generator H	25	70	1750
Generator I	25	75	1875
Total MW = 350		Total cost = \$11 500	

Base Case Simulation:

1. Perform a simulation of pre-dispatch using a peak demand forecast. This will result in pre-dispatch schedules for imports, exports and domestic resources.
2. Use the schedules from the pre-dispatch simulation to simulate the real-time outcome.
3. From the results of the real-time simulation calculate the total surplus (consumer surplus + producer surplus) of meeting demand in real time.

Outcome: total surplus (consumer and producer) of meeting demand in real time with the resources scheduled using a peak demand forecast in pre-dispatch

- **Simulation of Possible Change**
 1. Perform a simulation of pre-dispatch using an average demand forecast. This will result in pre-dispatch schedules for imports, exports and domestic resources. From this we can calculate the change in net imports from the peak pre-dispatch simulation. The change in net imports is the difference between the net imports scheduled with a peak pre-dispatch demand forecast and the net imports with an average demand forecast.
 2. From previous simulation results the change in net imports is expected to be negative the vast majority of the time, i.e. a decrease in net imports.
 3. Incorporate the changes in net imports into the real-time simulation inputs.

4. Simulate the real-time results with changes to the net imports from Step 5 and utilizing the export response function in Step 6.
5. From the results of the real-time simulation calculate the total surplus (consumer surplus + producer surplus) in real time.

Outcome: total surplus (consumer and producer) of meeting demand in real time with the resources scheduled using an average demand forecast in pre-dispatch.

- Baseline Estimate *minus* Estimate of possible change:

Outcome: net efficiency impact

- Data:
 - IESO proposes to make a representative month composed of one week from each season

- Consumption in Ontario remains the same in both simulation scenarios
- Generator offers are representative of their production costs
- Import offers can be used as a representative measure of their opportunity cost of providing energy to Ontario

- Import offers remain unchanged as a result of the change in pre-dispatch demand forecast used.
- Moving to an average demand forecast in pre-dispatch will not result in additional generators desynchronizing.
- Hours the efficiency analysis will be conducted for

- Usage of elasticity estimate
- Export response function in real-time adjusts exports on an interval by interval basis

- The IESO would like to seek stakeholder comments on this proposed methodology
- Please submit comments in writing by August 15, 2007

- August 2007 – December 2007
 - Incorporate stakeholder feedback into methodology
 - Conduct efficiency analysis and present results
 - Assess and quantify reliability impacts
 - Cost-Benefit analysis
 - IESO recommendation