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# Chapter 1

August 23, 2007

Presentation to Market Pricing Working Group on the  
Market Surveillance Panel Report  
November 2006 – May 2007

# Chapter 1: Summary

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- Pricing
- Demand
- Supply
- Imports and Exports

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# Pricing

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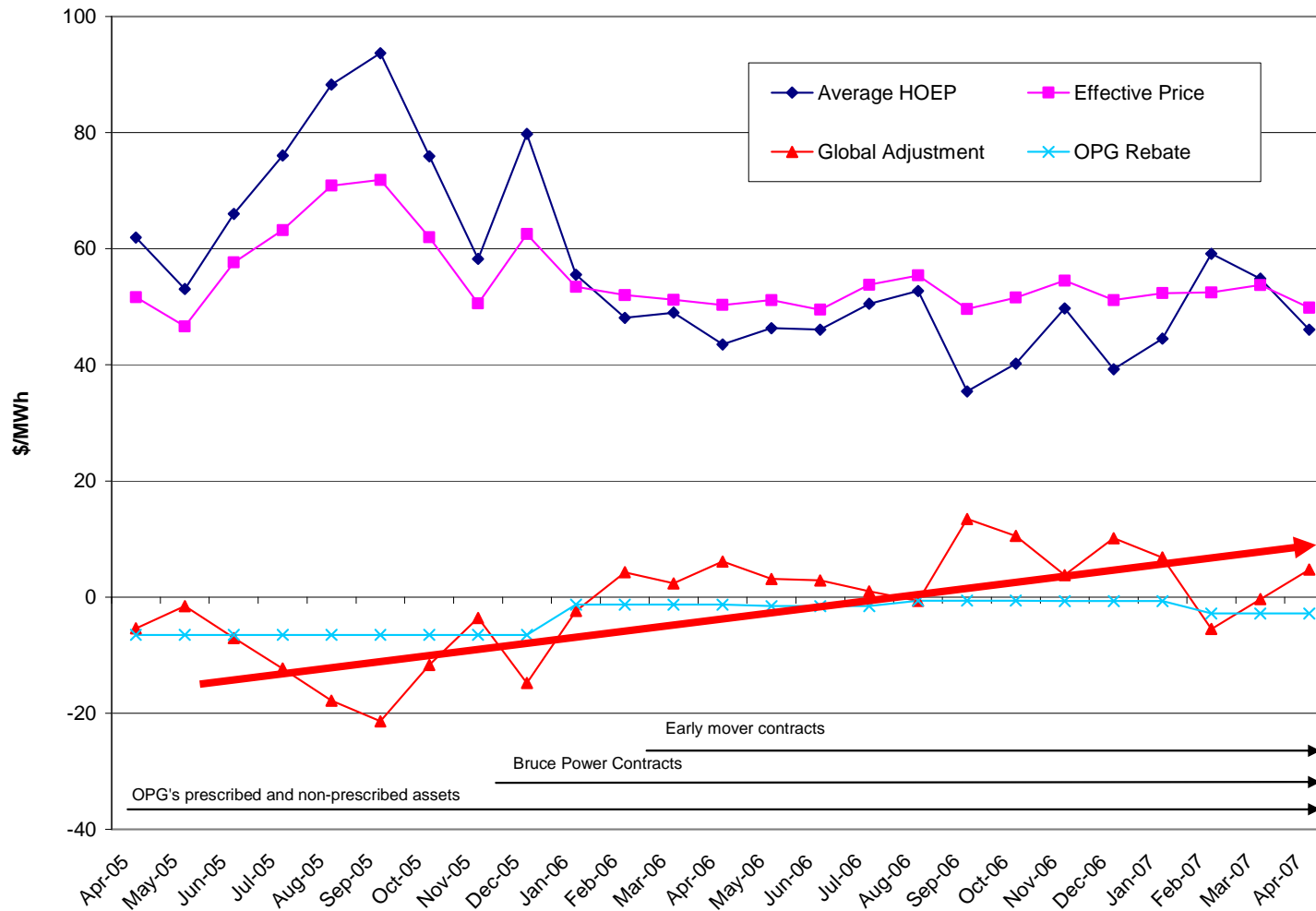
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# Pricing - Overview

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- Average HOEP of \$48.75, down from \$55.88 one year ago
  - Low natural gas prices compared to previous year
  - Strong generator performance
  - Relatively moderate weather
- After the Global Adjustments (and OPG Rebates) effective price to consumers is only \$1/MWh lower than the previous year as uplifts rise

# Pricing - Adjusted HOEP



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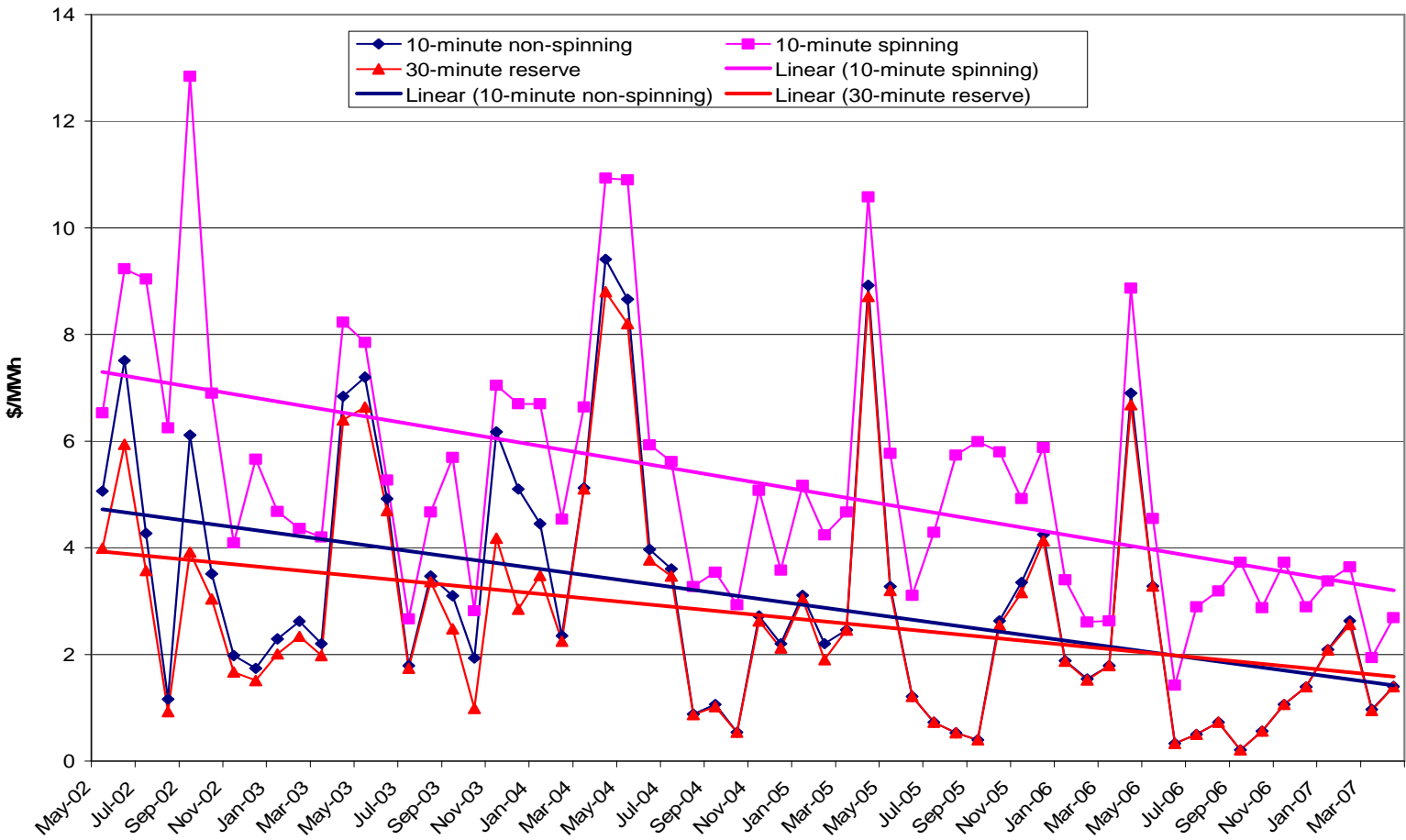
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# Pricing - Operating Reserve (OR)

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- OR prices continue to decline
  - 10S, 10N, and 30R prices lower both on-peak and off-peak

# Pricing - OR Prices



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# Pricing - Pre-dispatch vs. Real-time

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- One-hour ahead and three-hour ahead price accuracy continues to improve
  - Average one and three-hour differences decreased by more than 10 percent compared to same period one year ago
- Although overall error was lower this period, the error grew in months of February through April 2007.
- **Why?**

# Pricing - Pre-dispatch vs. Real-time (cont'd)

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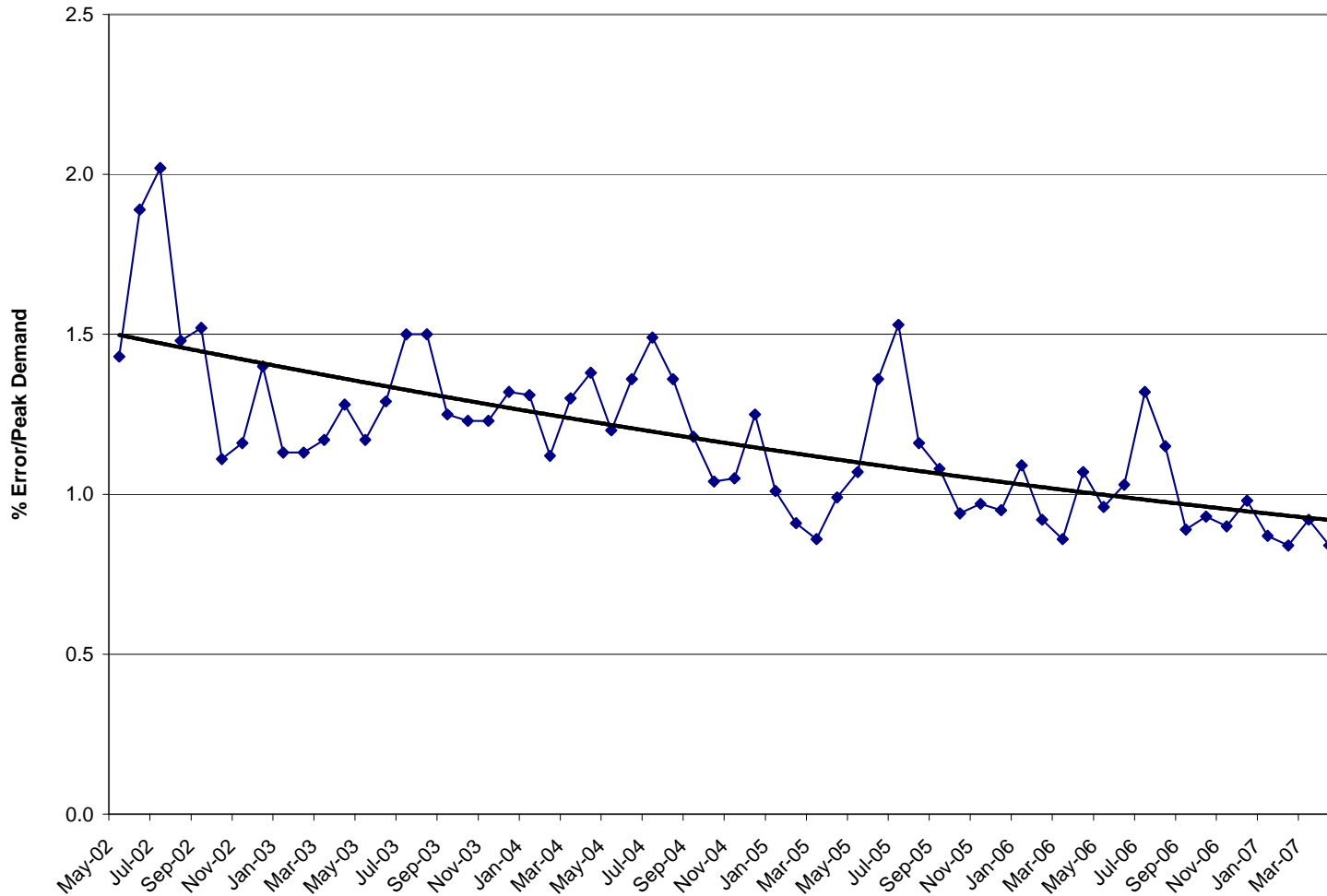
- The main underlying causes of errors in price projections:
  1. Demand forecast error;
  2. Failure of scheduled imports and exports;
  3. New Factor - Frequency that imports set the pre-dispatch price.

# 1. Demand Forecast Error

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- As a percentage of peak demand, demand forecast error has continued to decline
- There has been an obvious forecasting improvement since market opening

# Average One-hour Ahead Forecast Error since May 2002 (% of Peak Demand)



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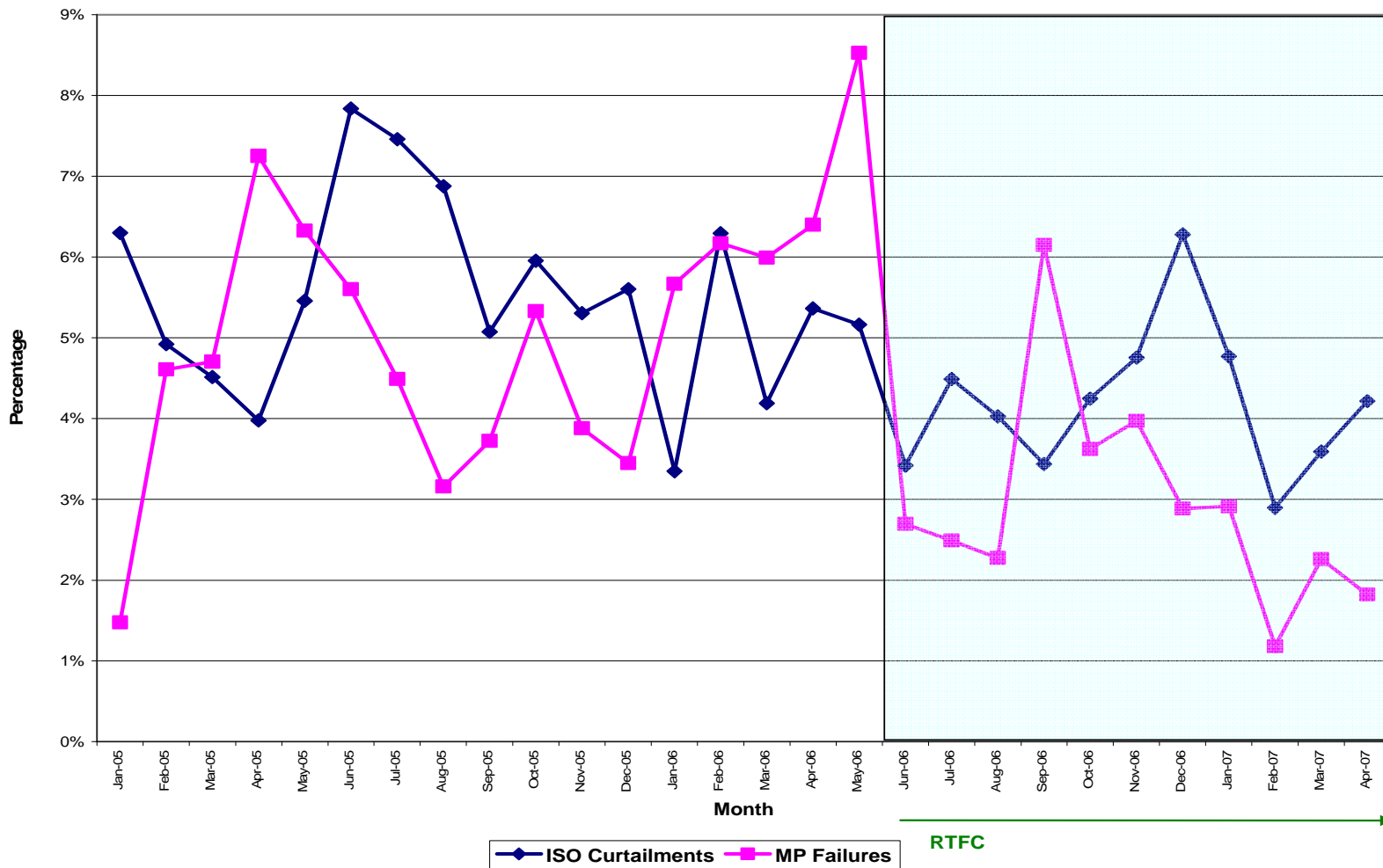
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## 2. Real-Time Failed Intertie Transactions

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- Import and export failures lead to errors between pre-dispatch and real-time prices
- Import failure rate remained consistent compared to same period one year ago. Export failure rate has declined from 10 percent to 6.8 percent
- Implementation of the Intertie Failure Charge (IFC) appears to have had an impact of the number of export failures
- As a side note : has reduced binding NISL

# Ratio of Monthly Total Export Failures by Cause to Total Exports



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# Monthly Intertie Failures cont'd

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## **Recommendation 1-1**

***Given the persistent large number of intertie failures not under a market participant's control, the Panel urges the IESO to continue to review this issue with New York ISO to better understand why there are such high failure levels and determine whether there are solutions which could reduce such failures to the benefit of both markets***

### 3. New Factor - Imports Setting Pre-dispatch Price

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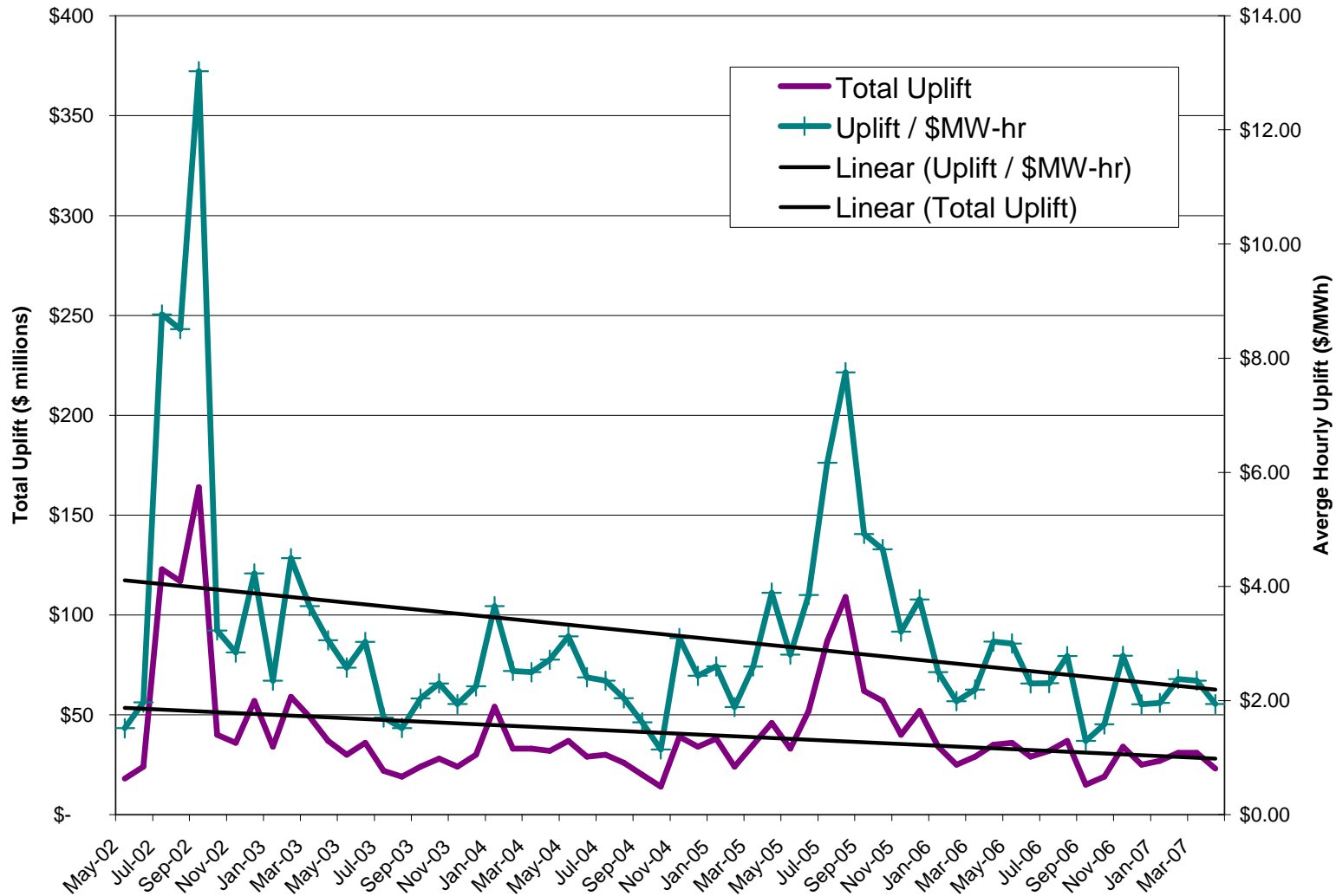
- Increasing frequency of imports setting the pre-dispatch price is a main factor
  - Imports can set the pre-dispatch price but are unable to set the real-time price
  - Gap between PD import and RT generator offer causes price difference
  - Further work to be undertaken

# Uplift Charges

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- The components of uplift include:
  - IOG payments (Day-ahead and Real-time)
  - CMSC payments
  - Operating Reserve payments, and
  - Losses
- Total Uplift reported in \$ while Hourly Uplift is in \$/MWh
- Total Uplift charges lower than same period last year (\$215 million in 2005/06 and \$171 million in 2006/07)
  - Uplifts decreased from \$52 million in December 2005 to \$25 in December 2006 primarily due to mild weather
- Decrease primarily due to lower losses and CMSC payments

# Uplift Charges since Market Opening



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# Demand

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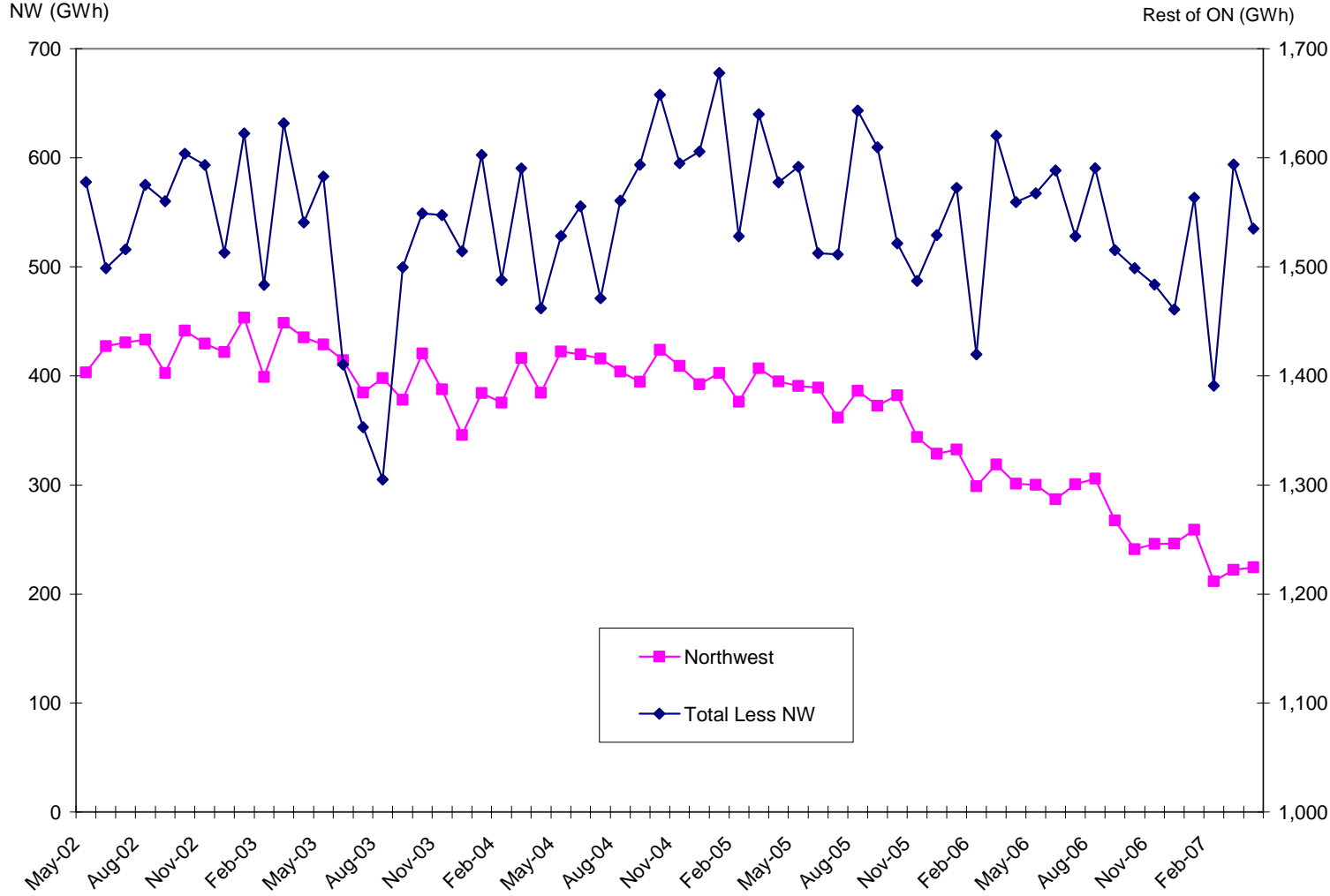
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# Demand - Overview

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- Ontario demand virtually unchanged
  - Wholesale load continues to drop (principally due to loss of wood processing facilities in the Northwest)
- New record winter hourly Market Demand of 25,961 MW on February 13, 2007

# Demand - Total Monthly Wholesale Demand Since Market Opening (GWh)



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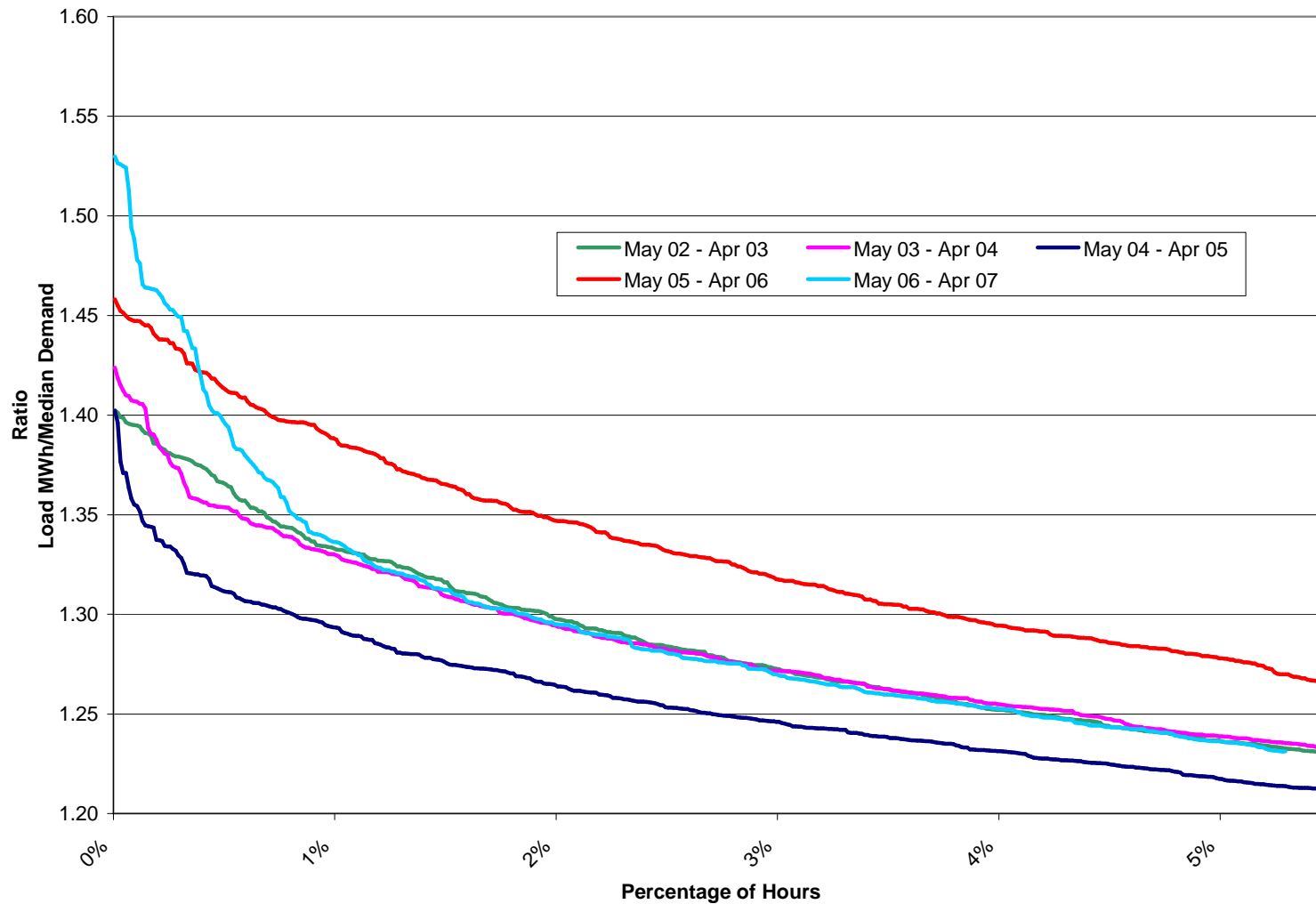
# Demand - Peak Load Growth in Ontario

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- Peak load levels continue to grow relative to the median load
- New York peak load growth patterns similar to Ontario

# Demand - Peak Load Growth

## Ontario Normalized Load Duration Curves



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# Supply

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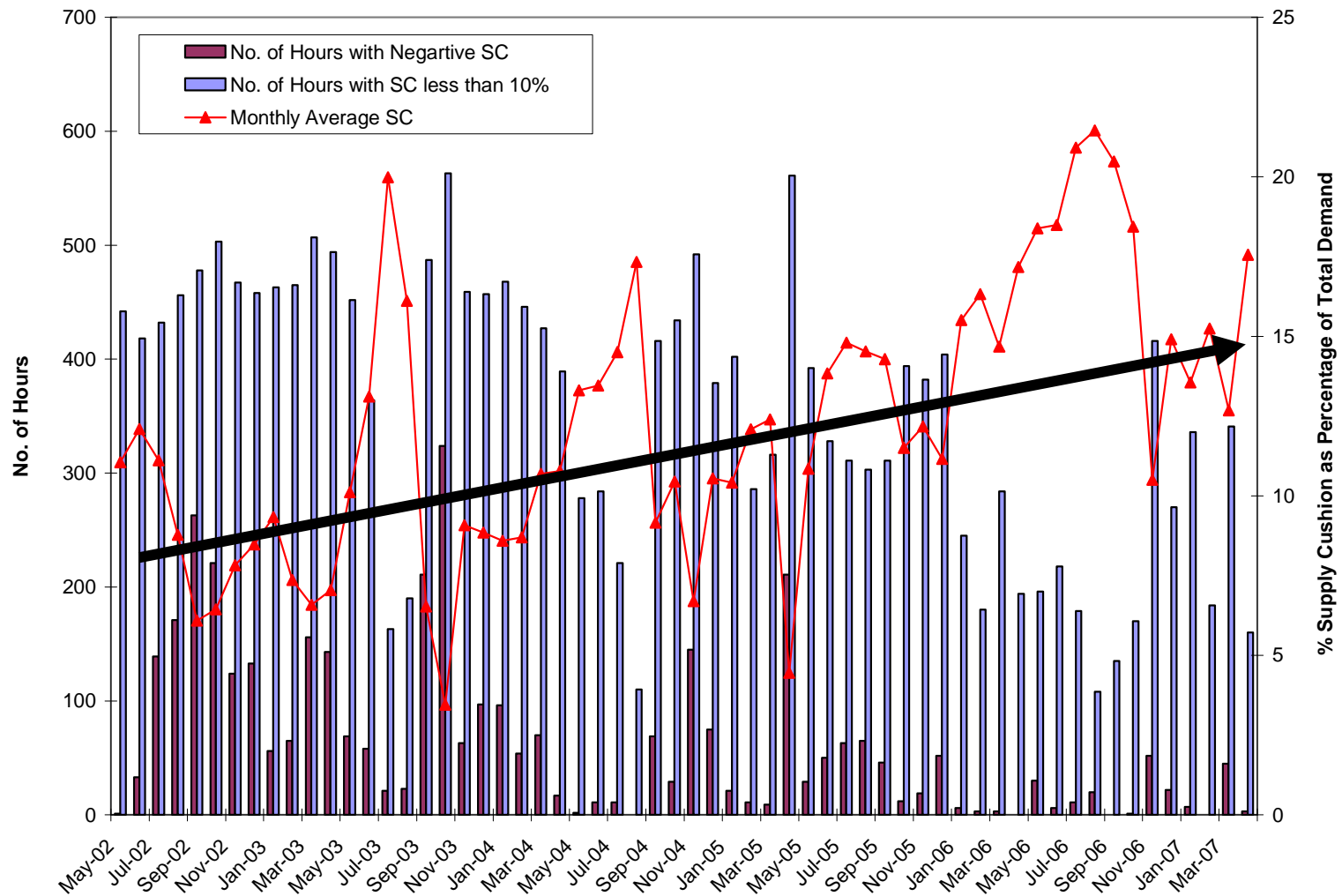
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# Supply - Overview

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- Supply cushion has been progressively increasing since 2003 with new generation
- Forced outage rates have declined since 2003
  - Nuclear forced outage rates appear to be leveling off

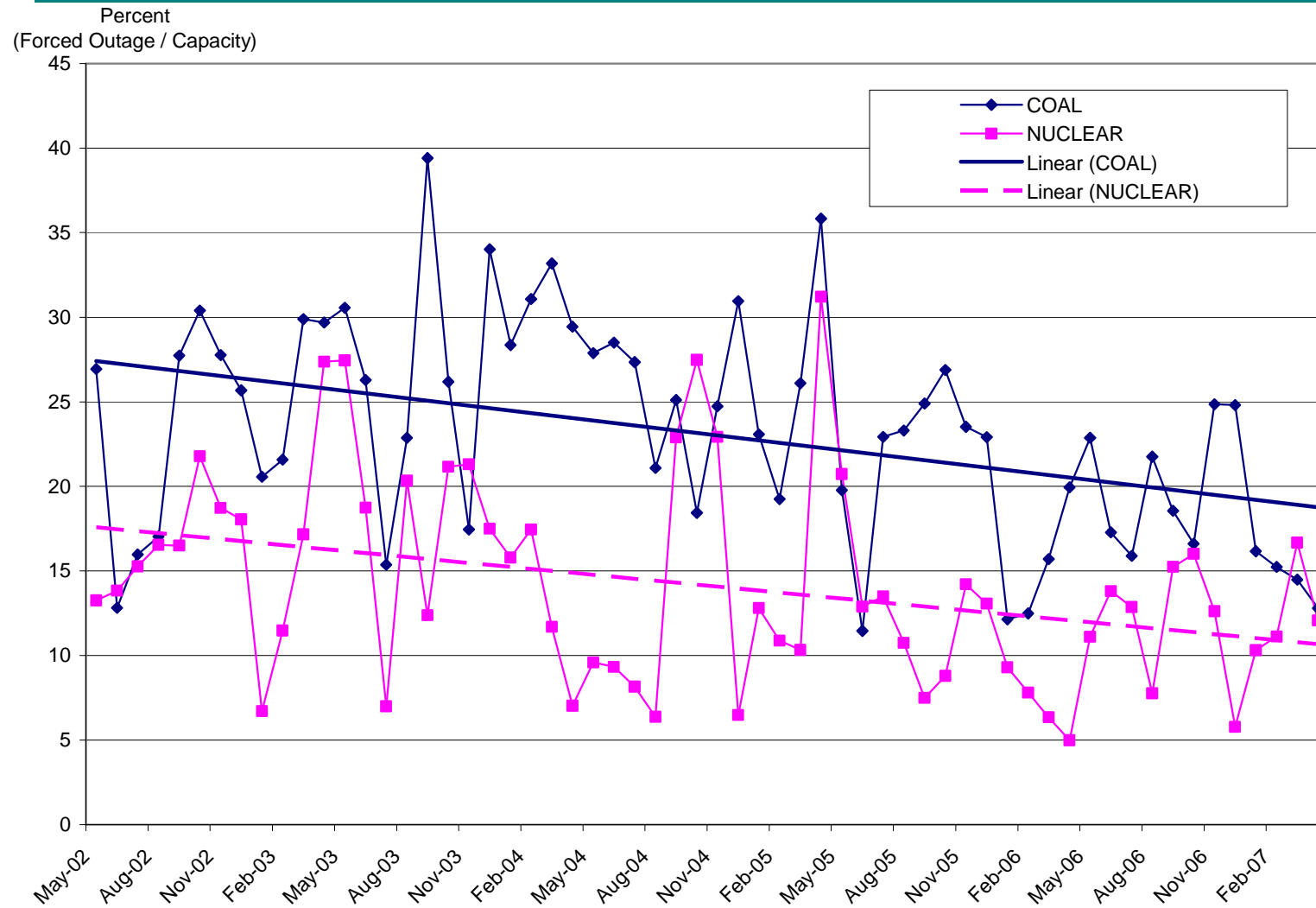
# Supply - Average Monthly Domestic Supply Cushion



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# Supply - Forced Outages Relative to Total Capacity (%)



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# Supply - Net Revenue Analysis

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- Investment decisions are induced by sufficient revenues for a generator to make an adequate rate of return on its investment
- Analysis used the standard FERC Analysis for Net Revenue
- Average market revenues derived from the HOEP continue to be **insufficient** to induce the construction of gas-fired generation in Ontario
- New entrants would require subsidization

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# Imports and Exports

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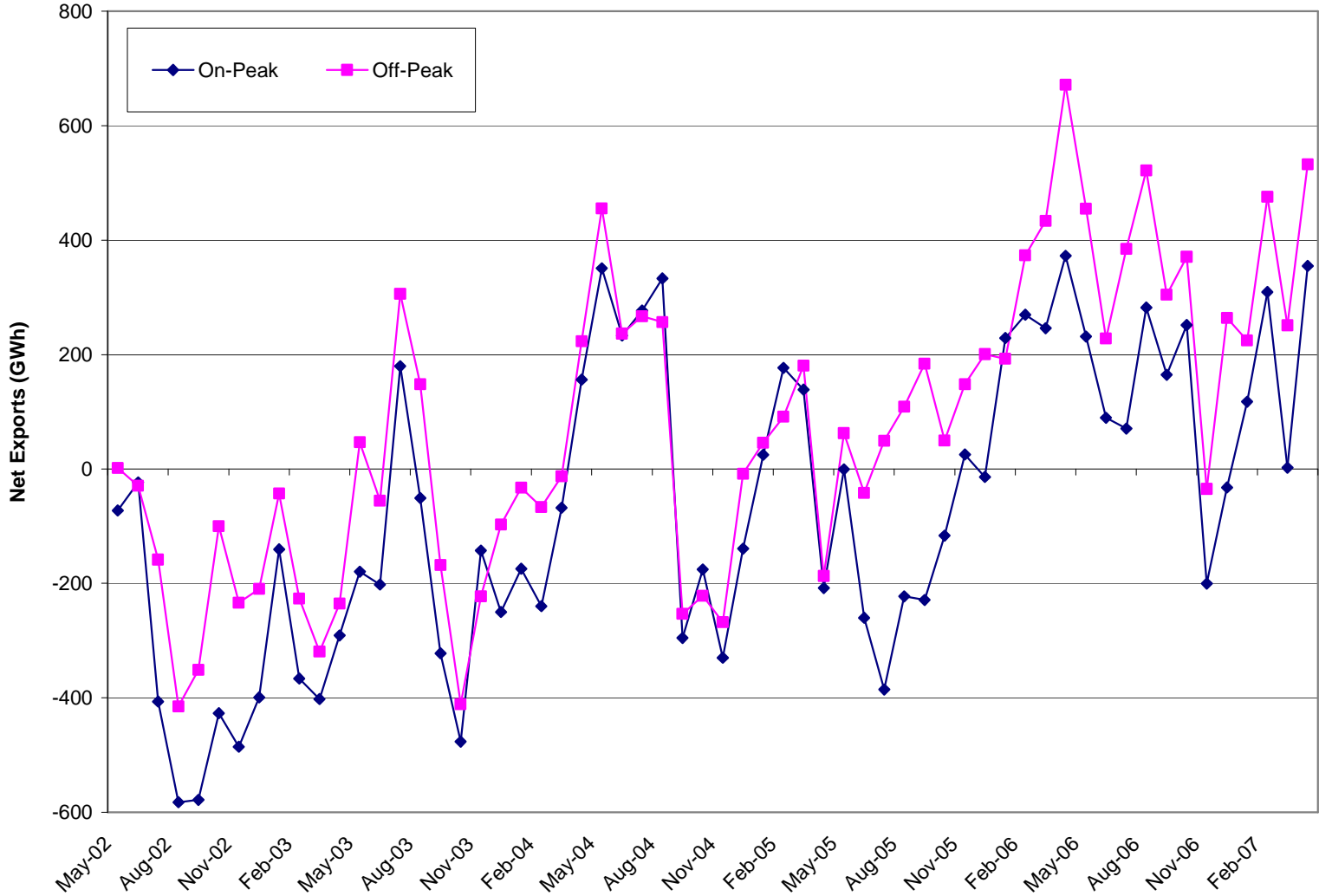
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# Imports and Exports - Overview

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- Arbitrage opportunities between markets lessened
  - Imports declined by 0.8 TWh (22%)
  - Exports declined by 1.8 TWh (25%)
- Long-term trade flows may be altering as a result of rising MISO prices and reduced arbitrage opportunities between New York and MISO
- Ontario was a net exporter for all months during winter 2006/07 except November

# Monthly Net Exports (GWh)



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# Wholesale Electricity Prices in Neighbouring Markets

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- On average, market prices in Ontario are the lowest of neighbouring markets during 2006/07 winter months (Uplifts **not** included)
- *Foreshadowing - New York and MISO prices lower on average compared to the Richview Shadow Price*

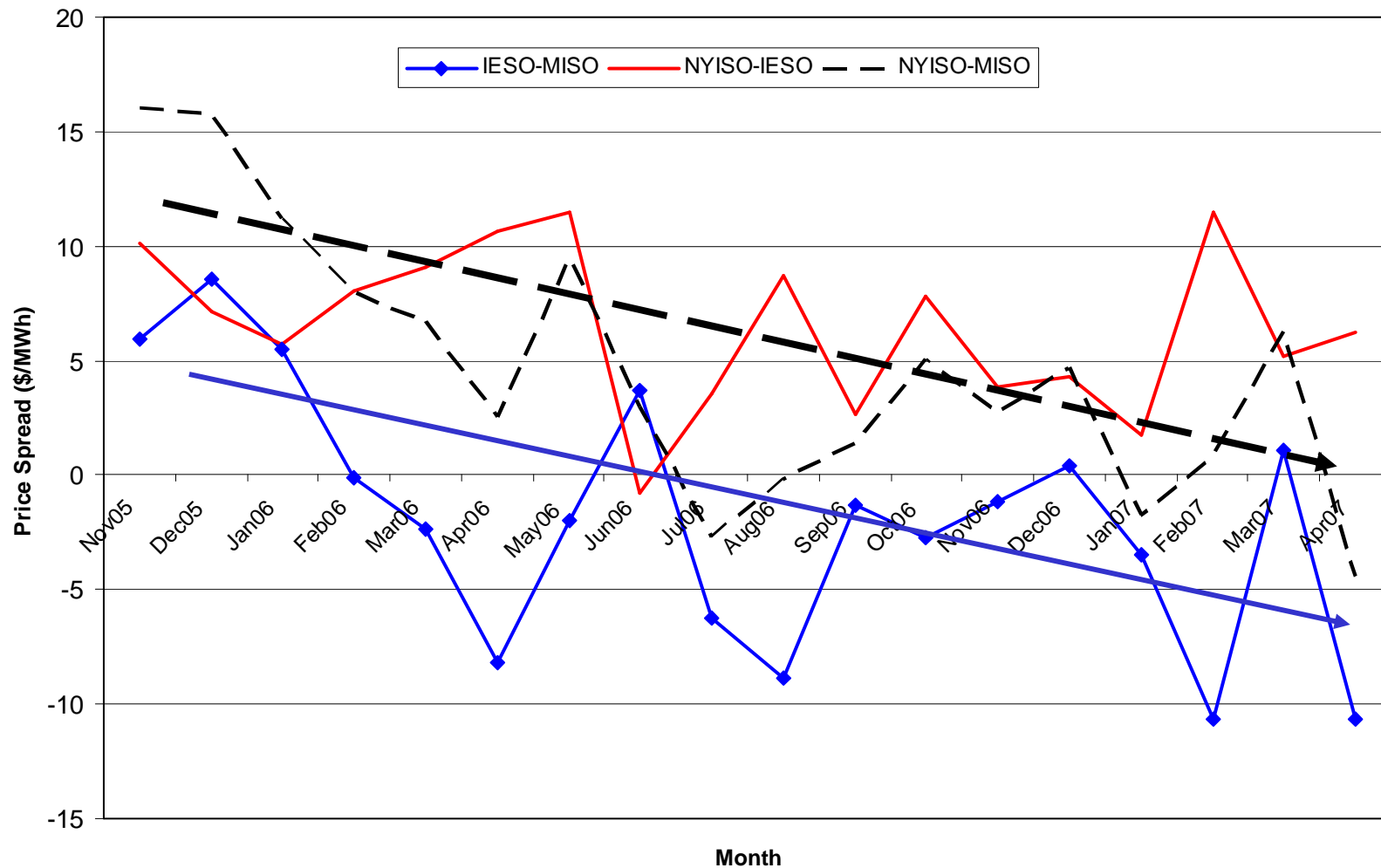
	Off-Peak	On-peak	Total
<b>Ontario (HOEP)</b>	38.74	60.66	48.75
<b>Ontario (Richview Shadow Price)</b>	43.99	69.37	55.66
<b>MISO</b>	40.56	67.27	52.76
<b>New England</b>	67.92	84.07	75.23
<b>New York</b>	45.27	64.78	54.18
<b>PJM</b>	53.55	72.34	62.13
<b>Average</b>	49.68	69.93	58.92

# Market Price Spreads and Trade Flows

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- Energy price spreads between Ontario and the major markets in the U.S. have been narrowing
- Price spread between IESO and MISO suggests fundamental shift in market arbitrage opportunities

# Market Price Spreads and Trade Flows (cont'd)



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# Chapter 2

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# Chapter 2: Summary

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- This chapter analyzes anomalous events:
  - high priced hours ( $> \$200$ )
  - low priced hours ( $< \$20$ ), and
  - anomalous behaviours by the IESO and market participants
- Between Nov. 2006 and Apr. 2007,
  - One high priced hour: \$215.64, April 12, 2007 HE17
  - 189 low priced hours (vs. 110 hrs in Nov 05-Apr 06), with three negative priced hours
  - Effects of a binding NISL (Net Interchange Scheduling Limit)
  - Improvement in the Load Predictor Algorithm

# April 12, 2007 HE17

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- HOEP \$215.64
  - Pre-dispatch
    - \$96.20 with 19,021MW of the Ontario demand
    - 1,308MW of net export
    - 7.9 percent of supply cushion
  - Real-time
    - 19,269MW of peak demand (240MW heavier)
    - About 670MW of derates on hydro units due to ice conditions
    - 0.4 percent of supply cushion
    - - 400MW ACE later in the hour, leading to 500MW ORA
    - Peak MCP \$396.65

# April 12, 2007 HE17 (cont'd)

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- The Panel's concern is that reducing the OR requirement does not remove the IESO from its obligations

## **Recommendation 2-1:**

***Replenishing the OR requirement ASAP so that the prices reflect the loss of supply more accurately and market participants are encouraged to respond as quickly as possible***

- The HOEP would have been \$6.61 higher had the OR requirement not been reduced

# Negative Priced Hours

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- Dec. 19, 2006 HE4: -\$0.18
- Dec. 26, 2006 HE2: -\$1.65
- Dec. 26, 2006 HE3: -\$1.66
- Reasons included:
  - Low Demand
  - Over forecasted demand, and
  - Failed export due to New York security
- the Ontario consumers actually paid or likely would pay a positive price (HOEP+ GA –OPG Rebate)

# April 25 - Effects of a Binding NISL

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- NISL --- the hour-to-hour net change in total intertie schedules across all interfaces, reflecting internal maximum generation ramp capability to meet the change in intertie transactions.
- Normally the NISL is 700MW (it was before market opening)
- When the NISL is binding, an export that is offered below the PD price may be scheduled, while an import that is offered below the PD price not scheduled
- April 25, 2007 HE23: 1,021MW of export and 973MW of import were dispatched 'out-of-merit'

# Effect of a Binding NISL (cont'd)

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- Binding NISL has efficiency implications as it limits efficient trades if the limit is set too low

## **Recommendation 2-2:**

***The IESO should review whether the 700MW NISL limit could be increased***

# February 2, 2007 - Improvement in the Load Predictor Algorithm

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- Load Predictor is a tool that adjusts and smoothes the forecast Ontario demand for the MIO
- The DSO calculates the shadow price with the forecast NDL, which is in turn equal to the forecast total demand (NDL+DL) minus the actual DL. That is,

$$\text{Forecast NDL} = \text{Forecast (NDL+DL)} - \text{Actual DL}$$

- When a DL consumes less or more than forecast, the error goes into the forecast of NDL, leading to double counting of NDL

## February 2, 2007 - Improvement in the Load Predictor Algorithm (cont'd)

- In the case of Feb. 2, 2007 HE19, the DL consumed 114MW less, leading to the shadow price increasing from about \$200 to \$2,000
- Which in turn constrained off other Dispatchable load
- This is an efficiency issue as an incorrect demand forecast leads incorrect shadow prices may lead to other DL being constrained off

# February 2, 2007 - Improvement in the Load Predictor Algorithm(cont'd)

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## **Recommendation 2-3:**

***The Panel recommends the IESO should explore improvements to the load predictor tool in order to reduce forecast errors associated with sudden changes in dispatchable load consumption, and the resulting dispatch inefficiencies.***

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# Chapter 3

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# Chapter 3: Summary

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The chapter summarizes changes to the market and new analyses in the past six months

- Efficiency gains from DL supplying OR
- DACP
- Import Offer Guarantees
- Segregated Mode of Operation
- Implications of LMP

# Efficiency Gains of DL Supplying OR

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Two efficiency gains:

- (1) DL offers reflect their willingness to pay and promote transparent dispatch efficiency; and
- (2) cheaper OR, frees generators to supply energy through joint optimization

DL Efficiency gains were estimated at \$7 million in 2006

# Efficiency Gains of DL Supplying OR (cont'd)

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In the period one DL migrated to OPA's DR and ceased offering OR (Sept 2006 – Apr 2007), leading to \$82,000 of efficiency loss

## **Recommendation 3-1:**

***The Panel encourage the IESO and OPA to continue to improve coordination between DL and DR in order to promote the efficient use of DL's OR capability***

# Day Ahead Commitment Process (DACP)

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- The DACP provides a eligible generator with start-up cost, SNL cost, and variable O&M costs. That is, a generator's cost is fully recovered (DA-GCG)
- To be eligible for DA-GCG, a generator must be scheduled for at least its MRT in the DACP run.
- Incentive is to bid below cost in order to be fully scheduled
- True Cost information is provided after the fact and not accounted for in determining the dispatch.
- 60 percent of time there were spare coal capacity online when a gas-fired generator was committed through DACP (Jun 06 to Apr 07)

# DACP (cont'd)

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- Two sources of inefficiency:
  - A unit may come online earlier in a day, or
  - comes online in a day even there are no reliability concerns

## **Recommendation 3-2:**

- ***Review the DACP***
  - ***Three part bids and 24 hour optimization***
  - ***As an interim alternative, the DACP should take into account of the full generation cost***
- A similar guarantee program exists in real-time (SGOL)

## **Recommendation 3-3:**

- ***Review the interface between the SGOL and DA-GCG***
- ***SGOL scheduling should also consider the full cost in dispatch decisions***

# Import Offer Guarantee (IOG)

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- Import Offer guarantees similar to generator guarantees is a program designed to enhance reliability
- Not intuitive why such guarantees should be paid in hours where reliability is not an issue ( typically Off-peak hours)
- Domestic supply condition was much improved in past two years to the point where no negative supply cushion
- \$5 to \$12 million IOG payments each year for overnight hours

## **Recommendation 3-4:**

***The Panel recommends the IESO review off-peak conditions to determine if the RT-IOG and DA-IOG programs are providing an improvement in reliability commensurate with the payments being made. The IESO should consider discontinuing off-peak IOG payments where these no longer appear to provide corresponding reliability benefits.***

# Segregated Mode of Operation (SMO)

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- Segregated Mode of Operation (SMO) is the ability of certain facilities to switch from the IESO to external grids (to Quebec only)
- SMO output to is not considered as 'export' by the Market Rules, and thus the owner is not subject to the IOG offset rules
- It is simply a fairness issue to bring these transactions in line with others

## **Recommendation 3-5:**

***The Panel recommends the IESO review the treatment of energy exported through Segregated Mode of Operation with a view to including this energy in the determination of RT-IOG offsets for implied wheeling.***

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# Implications of Nodal Pricing on Revenues and Efficiency

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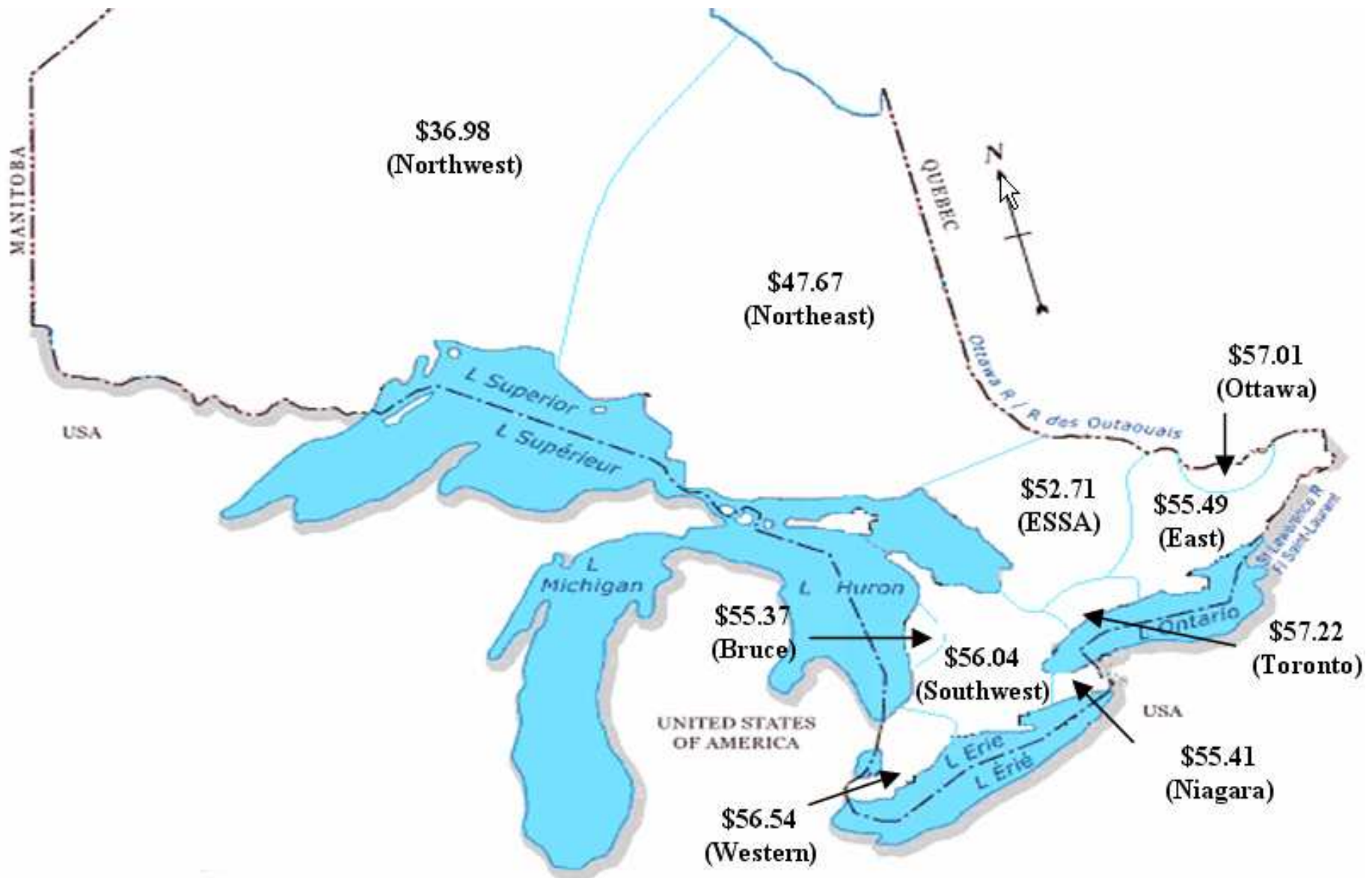
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# Implications of Nodal Pricing

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- Use of existing data to examine if a shift to nodal pricing:
  - Part 1. Would create incentives for investment
  - Part 2. Cost to consumers for such a shift
  - Part 3. Efficiency Benefits Gained
- Analyses subject to assumptions and modeling limitations
  - Suggest allocative and dynamic efficiency benefits
  - Observed prices are used but prices could change (rise and fall) relative to current nodal prices

# Average Internal Zonal Prices Nov 2006 – April 2007



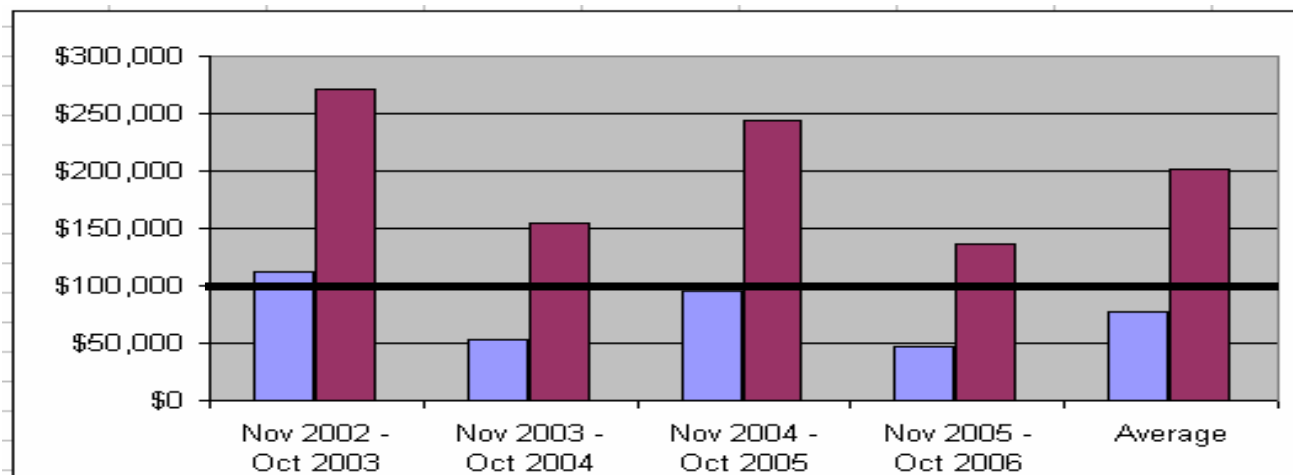
# Part 1 - Net Revenue Analysis using Observed Nodal Pricing

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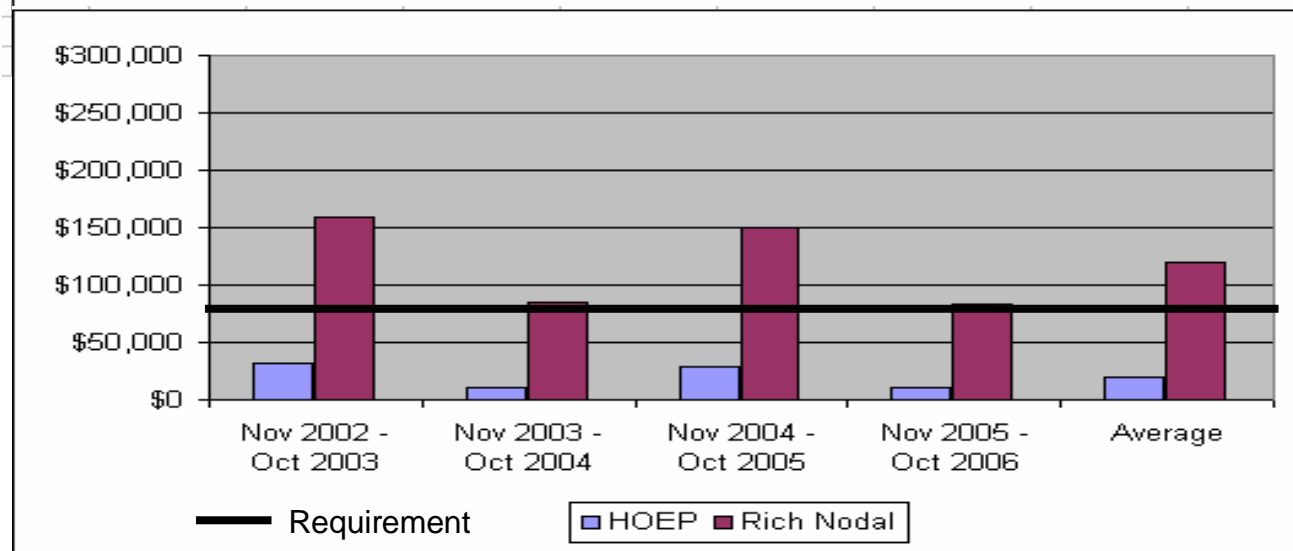
- Net Revenue plant could have earned
  - from energy payments above all variable fuel operating and maintenance costs
  - to cover annualized investment and fixed costs
- Net Revenue based on HOEP **not sufficient**
- Net Revenues based on observed Richview nodal price is **sufficient**
- Net Revenues in most zones across Ontario are sufficient

# Estimated Net Revenue by Efficiency Type – Using HOEP and Richview Nodal Prices

7,000  
Btu/kWh CC



10,500  
Btu/kWh CT



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## Part 2 - System Revenue Analysis with Observed Nodal Pricing

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- In Ontario's hybrid market:
  - prices can rise without an immediate proportional change to customers' costs
  - due to Global Adjustment and OPG Rebate
- Estimate revenues to generators using observed nodal prices, compared to HOEP
  - implication for change in cost to wholesale and retail customer

## Part 2 - System Revenue Analysis - Results

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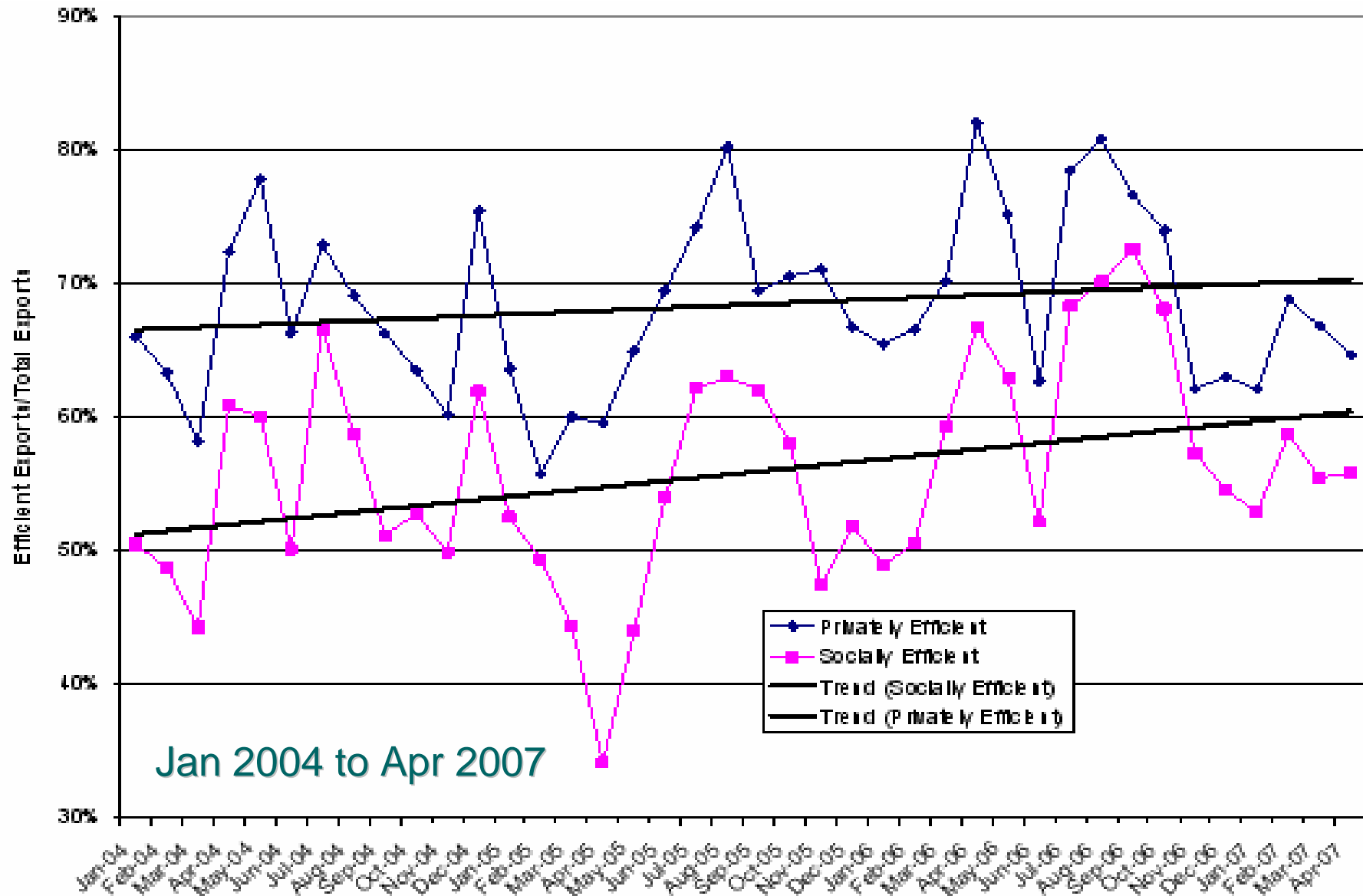
- Total “Contract Revenues” are about \$121M higher for observed nodal prices
  - about \$0.80 per MWh for Ontario consumers
  - But about \$50M increased revenue to OPG
- Impact may not be the same in all parts of the province
- Since no dynamic responses modeled change could be smaller than estimated
  - but also depends on future balance of contracted and non-contracted generation and generation additions

## Part 3 - Efficiency Gains from Exports with Nodal Pricing

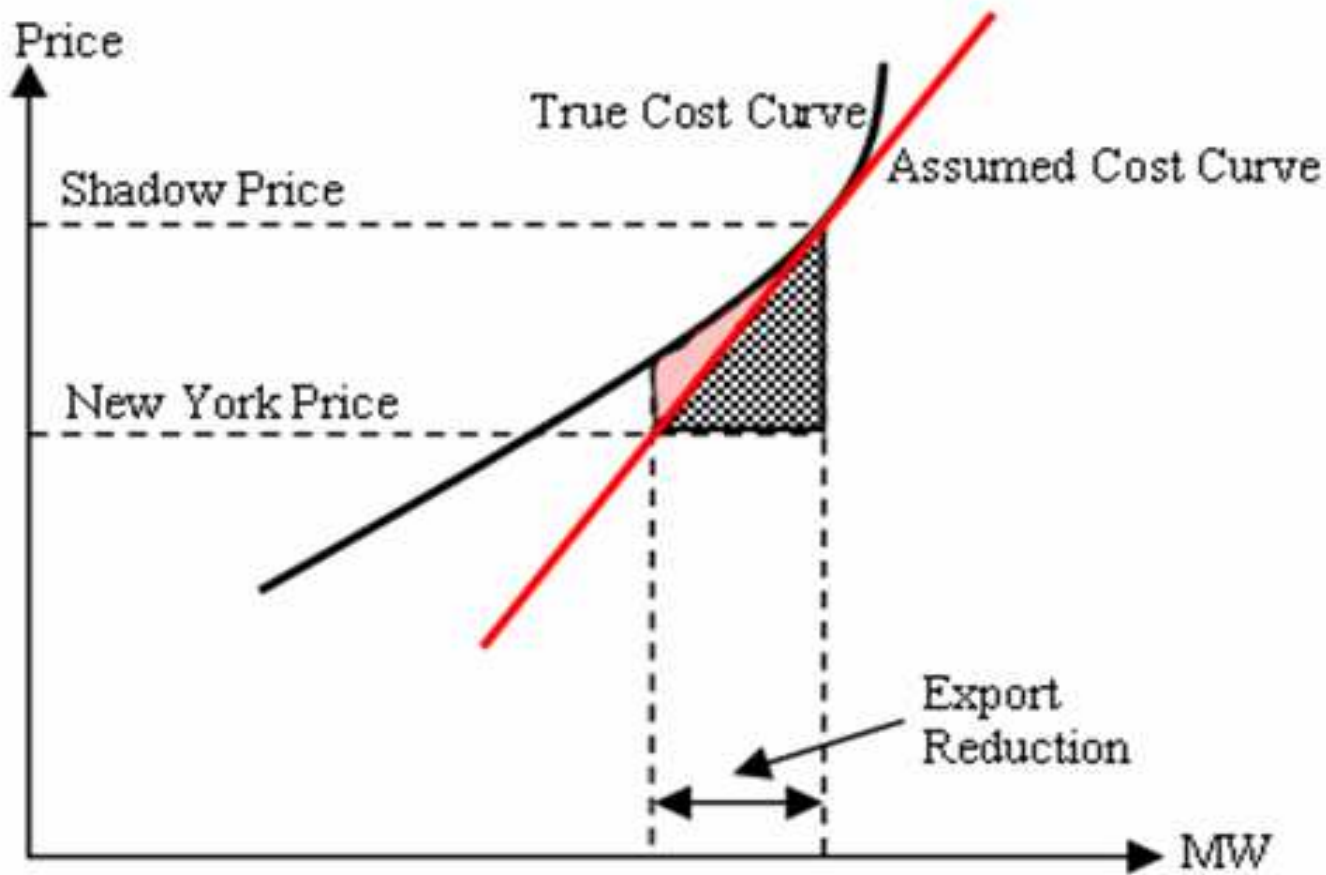
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- Existence of socially inefficient exports (to New York)
  - Export pays HOEP while marginal cost of supply is the typically higher nodal price at point of export
- Privately Efficient if
$$\text{NY Price} > \text{HOEP} + \text{Transmission charge}$$
- Socially Efficient if
$$\text{NY Price} > \text{Beck nodal price}$$

# Privately Inefficient & Socially Inefficient Exports to New York



# Efficiency Gains from Export Reductions



# Estimated Efficiency Gain

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- The efficiency is estimated as \$61M
  - for the period Jan 2006 to April 2007
- With upper and lower bounds of \$66M to \$47M
  - for range of elasticity estimates

# Conclusion & Recommendation

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- It appears that the efficiency benefits from an improved market design could be achieved with relatively small price increases

## **Recommendation 3-6:**

***The panel recognizes that adopting locational pricing would be a fundamental design change; however, we encourage the IESO to assess the efficiency benefits and costs of such an approach to provide a sound analytic basis for the consideration of future policy decisions.***

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# More Questions?