

Memorandum

To: Market Pricing Working Group
From: John MacKenzie, IESO
Date: August 15, 2008
Re: Issue #39: Inter-Jurisdictional Commercial Trade of Operating Reserve – Final Report

Attached, for Market Pricing Working Group (MPWG) review and feedback is the draft final report for MPWG Issue #39: Inter-Jurisdictional Commercial Trade of Operating Reserve. The report presents the results of the analysis and IESO recommendations regarding this issue.

MPWG members are requested to:

- Review the draft final report and provide feedback at the MPWG meeting on August 19th, 2008:
- If appropriate, provide additional feedback to the IESO in writing by September 12th, 2008.

Following the receipt of the feedback, the IESO intends to finalize the report and recommendations and submit them, along with the stakeholder feedback, to the MPWG and to the IESO management by the end of September 2008 for a decision. The IESO would also report the results of this study and decision to the IESO Board as part of the corporate performance measures reporting process.

Yours truly,

John MacKenzie

Attach.



Market Pricing Working Group Issue #39:

Inter-jurisdictional Commercial Trade of
Operating Reserve

Final Report – DRAFT

15 Aug 2008

Introduction

This report presents the results of the analysis and final IESO recommendations regarding the Market Pricing Working Group (MPWG) Issue #39: Inter-Jurisdictional Commercial Trade of Operating Reserve. Prior to market opening the IESO Board committed that the IESO would investigate exporting operating reserve from Ontario to neighbouring markets. Subsequently, the issue was raised at the March 1, 2007 MPWG and the February 26, 2007 Technical Panel.

Addressing this issue is one of the 2008 priorities and performance measures for IESO MPWG.

This report is organized as follows:

- Background
- Structure and Overview of the Study
- Survey of North American Electricity Markets and Regulatory Bodies
- Analysis
- Recommendations

Background

DESCRIPTION OF THE ISSUE

Current IESO-administered market design and rules only permit commercial importing of operating reserve into Ontario. There has been limited importing since market commencement, which consists of 30-minute Operating Reserve from Quebec and MISO. The IESO-administered markets do not permit the commercial exporting of operating reserve from Ontario to neighbouring electricity markets.

Commercial exporting of operating reserve from Ontario was not part of the initial market design for two reasons. The first was that it was judged to be non-essential to starting the market. The second was the complexity foreseen in developing the inter-jurisdictional mechanisms to schedule and activate exports of operating reserve from Ontario.

Increasing the inter-jurisdictional commercial trade of operating reserve could increase regional market efficiencies through expansion of the operating reserve market, in the same manner as the existing inter-jurisdictional trade of energy,

WHY A MARKET PRICING ISSUE

Operating reserve and energy markets are co-optimized. Changes to how operating reserve is commercially traded will impact operating reserve and energy market prices. Some other areas of potential pricing and market impacts include:

- Integrating inter-market operating reserve trade is expected to have an impact on the economic efficiencies and reliability of the associated markets. These effects necessitate a cost-benefit analysis of any changes in the operating reserve market. Especially, reliability standards and system tool constraints has to be considered.
- Integrating inter-market commercial operating reserve trade may/may not give rise to unintended market outcomes.

IESO PROCESS AND SYSTEMS IMPACT

Integrating inter-jurisdictional commercial trade of OR may have a major impact on IESO processes and systems, which may include:

- Developing a new set of market rules as well as amending the existing ones to facilitate and incorporate inter-market commercial operating reserve trade into the existing market structure.
- Developing a new level of co-ordination between the IESO and Ontario's market participants and neighbouring jurisdictions to schedule, activate and transmit commercially traded operating reserve across jurisdictions.
- IESO system tools (for example, Dispatch Scheduling Optimizer) may need to be upgraded to implement inter-market commercial operating reserve trade.

RELATED ISSUES

The IESO and neighbouring jurisdictions must meet industry reliability standards with respect to provision and activation of operating reserve. Any changes to the commercial trade of operating reserve

must not negatively affect the ability of the IESO and the neighbouring jurisdictions to meet those standards.

The IESO participates in reliability based regional operating reserve programs within the Northeast Power Coordination Council (NPCC) such as shared activation of reserve (SAR) and regional reserve sharing (RRS).

Any changes to the commercial trade of operating reserve must recognize and accommodate these regional programs.

Structure and Overview of the Study

THE SCOPE OF THE STUDY

This study is concerned with commercial inter-jurisdictional operating reserve trade, which includes the possibility, viability, efficiency and net benefit of commercially importing and exporting operating reserve to and from Ontario.

The IESO does participate in reliability based regional operating reserve programs within the Northeast Power Coordination Council (NPCC) such as shared activation of reserve (SAR) and regional reserve sharing (RRS). These programs are not within the scope of this study.

STUDY METHODOLOGY

The IESO undertook a broad and in-depth review of inter-market trade of operating reserve in North America, analyzed the results of that review and presented the results and preliminary recommendations to the Market Pricing Working Group for feedback. The Working Group identified additional areas of study and analysis. On the basis of the review and additional study and analysis, the IESO developed its final recommendation.

Review

The IESO reviewed publicly available literature/documents and conducted interviews with North American (including Ontario) electricity market/system operators and participants to identify the nature and extent of commercial inter-market trading of operating reserve within North American electricity markets. The purposes of this review were to:

- Identify if there is inter-jurisdictional commercial trade of operating reserve?
 - i) if yes, to what extent and how it is done;
 - ii) if no, why not.
- Identify economic efficiency and reliability impacts of inter-jurisdictional trade of operating reserve.

The OR market of the following jurisdictions (aside IESO) were reviewed:

- New York Independent System Operator (NYISO)
- Midwest Independent System Operator (MISO)
- PJM
- ISO-New England
- California Independent System Operator(CAISO)
- Electric Reliability Council of Texas (ERCOT)
- Alberta Electric System Operator (AESO)

In addition the IESO reviewed publicly available literature/documents and conducted interviews with following regulatory bodies to identify institutional, regulatory or other barriers to commercial importing and exporting of operating reserve to and from Ontario.

- Federal Energy Regulatory Commission (FERC)

- North American Electric Reliability Corporation (NERC)
- North-East Power Co-ordinating Council (NPCC)
- Western Electricity Co-ordinating Council (WECC)
- National Energy Board (NEB)
- Ontario Energy Board (OEB)

Analysis

The IESO analyzed the results and findings to identify/assess, qualitatively:

- a) The potential impact of commercial imports and exports of operating reserve on the economic efficiencies of the IESO-administered markets.
 - Are there efficiency improvements?
- b) The potential impact of commercial imports and exports of operating reserve on the reliability of the IESO-controlled grid and the northern region.
 - Is reliability maintained?
- c) Barriers to commercial inter-market trade of operating reserve to/from Ontario.

Survey of North American Electricity Markets and Regulatory Bodies

EXISTING INTER-JURISDICTIONAL TRADING IN ONTARIO

There are three types of inter-jurisdictional (IJT) transactions currently permitted in the IESO administered market:

- Import of energy or operating reserve from another jurisdiction into Ontario.
- Export of energy from Ontario to another jurisdiction.
- Move energy from one jurisdiction, through Ontario, to a different jurisdiction, i.e. a wheel through.

The IESO-administered markets do not permit the commercial exporting of operating reserve from Ontario to a neighbouring jurisdiction.

Market participants can import 10 minute non-spinning and 30 minute operating reserve into Ontario. In order to offer operating reserve a participant must:

- Be able to provide the energy when called upon within the time frame specified by the class of operating reserve involved (either 10 minutes or 30 minutes).
- Be able to supply the energy for up to one hour (the neighbouring jurisdiction must allow this to occur).
- Each offer to provide operating reserve must be accompanied by a corresponding energy offer or energy bid that covers the same megawatt (MW) range.

The importing of operating reserve witnessed since market commencement consists of 30-minute operating reserve imports from Quebec and MISO. Charts 1 and 2 below present data on the level of that trade for the period January 2007 to the end of January 2008. The data shows that on a monthly basis, approximately 40,000 MWh of operating reserve is imported. This represents approximately 12% of the Ontario 30 minute OR requirement and 4% of the Ontario total OR requirement.

Chart 1

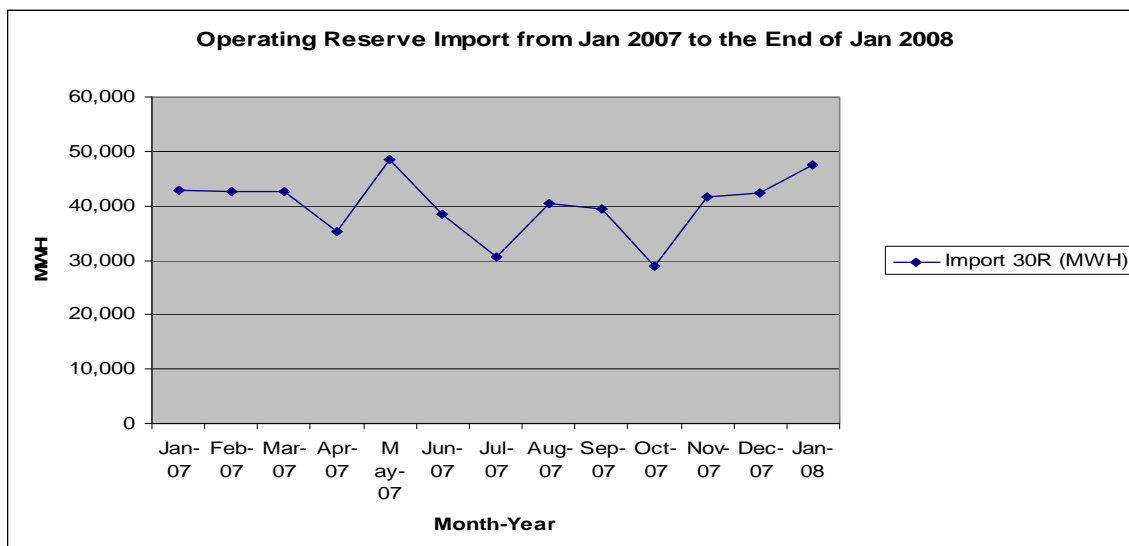
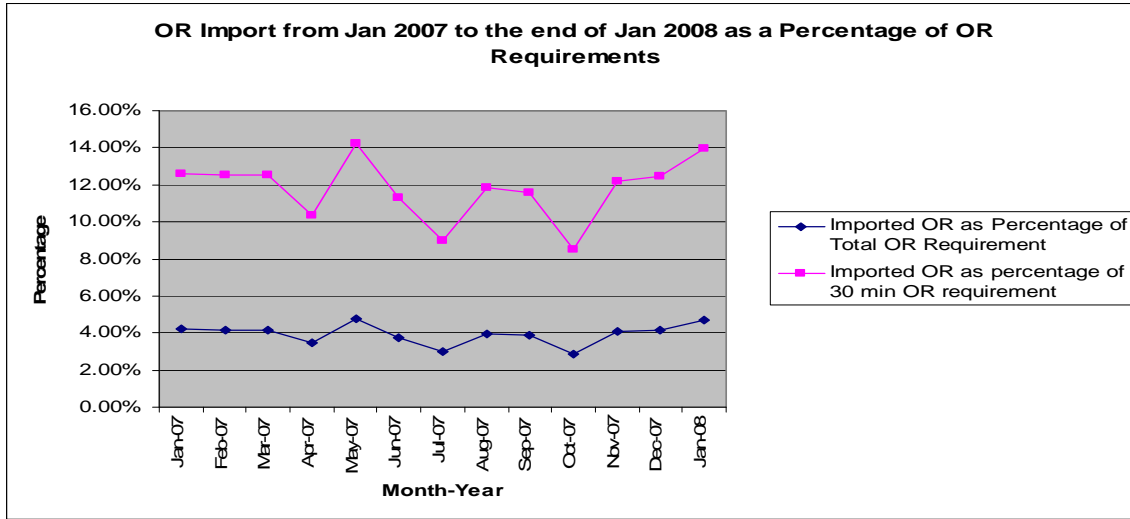


Chart 2



KEY FINDINGS OF THE SURVEY

The survey did not identify evidence of commercial inter-jurisdictional operating reserve trade in any jurisdiction in North America, other than IESO, which currently only allows commercial operating reserve imports.

Commercial inter-jurisdictional OR Trade does not apply to some jurisdictions, for example:

- ERCOT is a self contained Grid.
- MISO OR market is scheduled to open in fall, 2008. OR imports from MISO to Ontario that have occurred are actually from one of the MISO Balancing Authorities, which is responsible for local management and procurement of operating reserves.
- PJM has no non-synchronized OR market, it is in the process of developing it.

NYISO does not allow commercial inter-jurisdictional OR trade. To allow such trade, a change to the NYISO tariff would be required.

ISO-NE identified software limitations as a barrier to OR trade. External resources will be permitted to participate in the Forward Reserve Market when the respective Control Areas implement the technology and processes necessary to support recognition of Operating Reserve from External Resources.

The survey did identify potential opportunities for OR trade in future with other jurisdictions.

- with MISO when it opens OR market.
- with NYISO if it makes necessary tariff changes.
- with Quebec and Manitoba.

The survey identified 'seams' issues that would need to be addressed and resolved/worked out before undertaking OR trade with neighbouring jurisdictions, especially with NYISO and MISO. Some of these seams issues between NYISO and Ontario's IESO are briefly described in Table 1 below.

Table 1
NY OR Market vs. Ontario OR Market

	NY Operating Reserve Market	Ontario Operating Reserve Market
OR Market Timing	<ul style="list-style-type: none"> • New York has a day ahead (DA) and a real time (RT) OR market. Suppliers submit availability bids for each hour of upcoming day (DA). • OR suppliers receive both a DA and RT schedule. 	<ul style="list-style-type: none"> • Ontario only has a real time OR market. • Day Ahead Commitment process for energy (not for OR).
OR Market Pricing and Scheduling	<ul style="list-style-type: none"> • Reserve clearing price is determined by using a concept of ‘shadow price’. • Shadow Price is determined by the Lost Opportunity Cost (LOC) of the marginal reserve provider + its availability bid. • In RT availability bid is automatically set to zero. • LOC = the margin on the sale of energy that the marginal unit foregoes to provide an ancillary service (Reserve & Regulation). <p>The Market Clearing Price of each locational reserve product is equal to the sum of the relevant shadow prices.</p> <p>In RT, OR suppliers are selected via co-optimization with energy and regulation.</p>	<ul style="list-style-type: none"> • Prices and schedules determined every 5 minutes in conjunction with energy (joint optimization). • There is no market for regulation.
Locational vs. Uniform Price in OR Market	<ul style="list-style-type: none"> • NYISO calculates separate DA market and RT market prices for three OR products for each of three locations (West, East and Long Island). 	<ul style="list-style-type: none"> • At present, Ontario does not have a Zonal system of pricing. Ontario only has a uniform price for its OR market.

The survey identified no regulatory barriers to conducting commercial inter-jurisdictional OR trade.

Analysis

Expanded operating reserve trade with neighbouring jurisdictions is expected to produce following benefits:

- i) Increased competition in the regional OR market which would lead to improved use and allocation of regional resources, reducing the regional average production cost of electricity. A few side benefits expected are:
 - Benefit to wider environment via increased generation efficiency.
 - Fostered economic growth via opportunities for new usages of energy.
- ii) Price convergence among neighbouring jurisdictions via increased competition. As OR and energy products are associated by joint optimization, the energy price is likely to reflect impacts of inter-jurisdictional OR trade.
- iii) Would maintain reliability of the Ontario's electricity system at a decreased cost

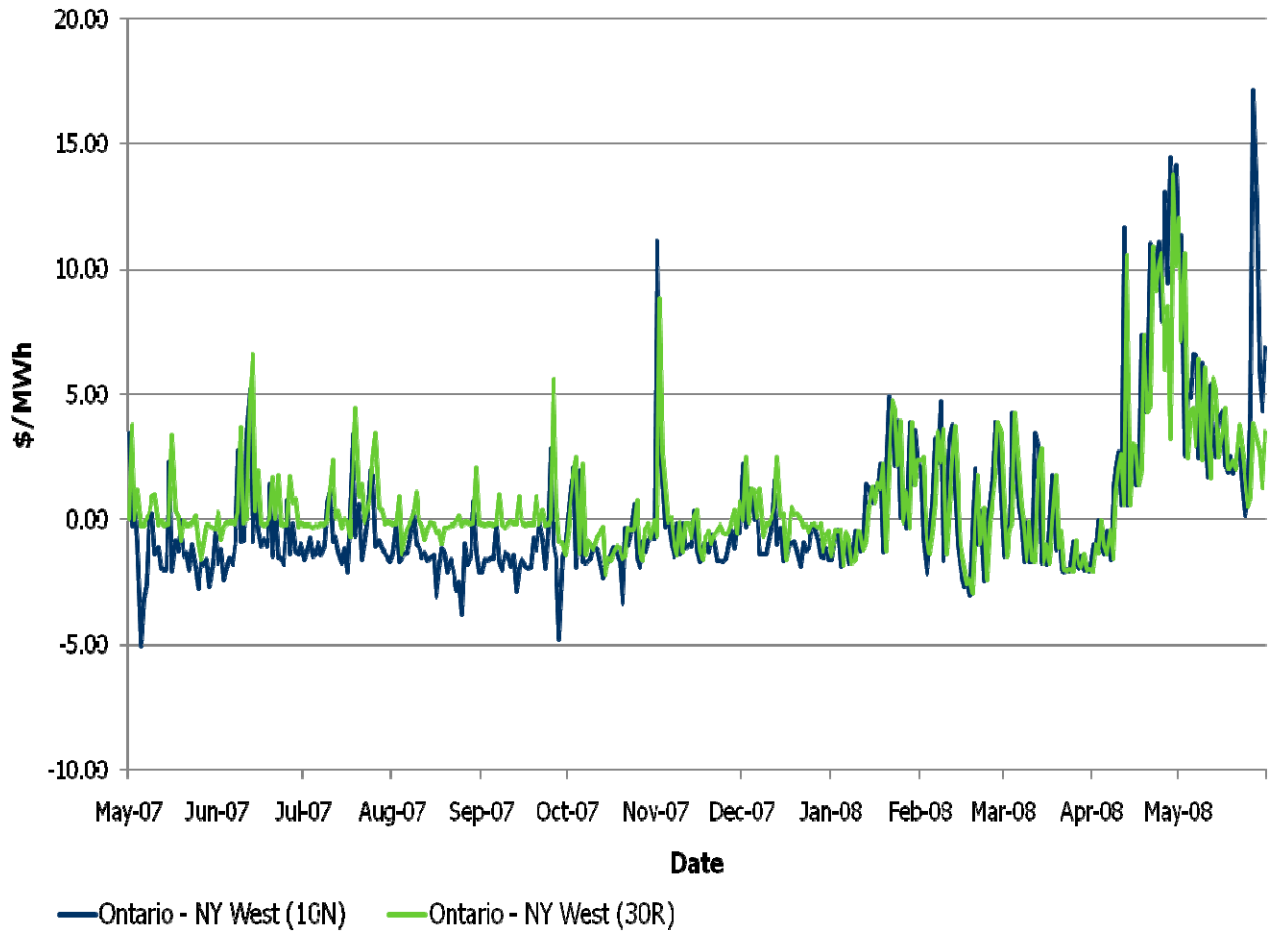
A key requirement for commercial inter-jurisdictional OR trade is price differences in OR markets of neighbouring jurisdictions. Ontario-NY OR price differences were studied to answer two questions:

- If the Ontario's IESO and NYISO were to remove the seams prohibiting or hindering OR trade, then do current price differences between the markets indicate opportunities for arbitrage?
- Do the price differences indicate that there would be material efficiency gains that could be realized?

The price difference is studied for one year (May 2007 to May 2008) period in two areas:

1. Difference between Ontario real time and NY (West) Day Ahead OR price (Chart 3 below).
2. Difference between Ontario real time and NY (West) real time price (Chart 4 below).

Chart 3
Ontario Real Time and New York (West) Day-ahead OR Price Differences
(May 2007- May 2008)

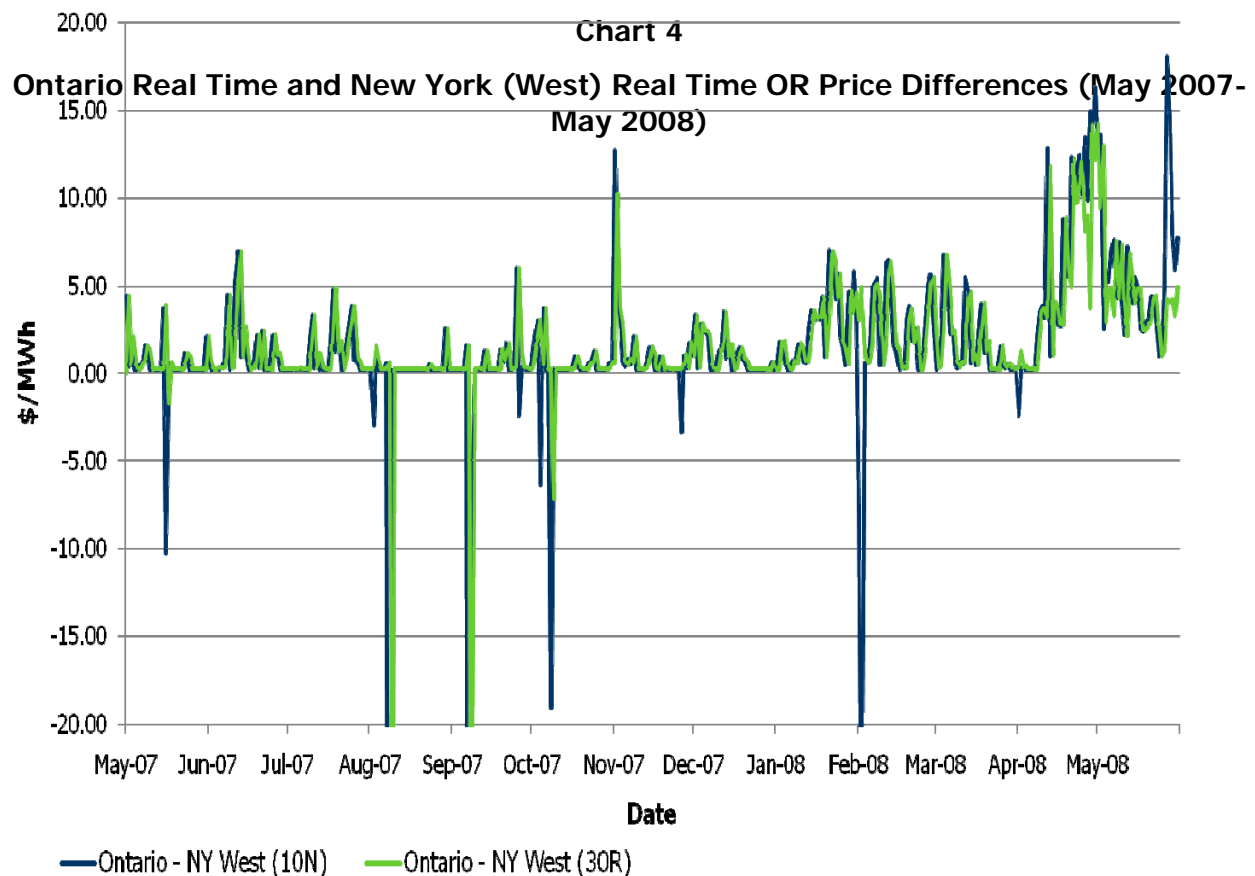


The blue line in Chart 3 is the Ontario 10 Minute Non spinning OR price minus the New York West day-ahead 10 Minute Non spinning OR price.

The green line in Chart 3 is the Ontario 30 Minute OR price minus the New York West day-ahead 30 Minute OR price.

Key findings from the data are:

- Ontario 10N prices are, on average, 0.25\$/MWh higher than the NY West 10N prices.
- Ontario 30R prices are, on average, 0.70\$/MWh higher than the NY West 30R prices.
- The higher average OR prices in Ontario are largely driven by the higher OR prices in May 2008.



The blue line in Chart 4 is the Ontario 10 Minute Non spinning OR price minus the New York West real-time 10 Minute Non spinning OR price.

The green line in Chart 4 is the Ontario 30 Minute OR price minus the New York West real-time 30 Minute OR price.

Key findings from the data are:

- Ontario 10N prices are, on average, 1.30 \$/MWh higher than the NY West 10N prices.
- Ontario 30R prices are, on average, 1.58 \$/MWh higher than the NY West 30R prices.
- The higher average OR prices in Ontario are largely driven by the higher OR prices in May 2008.

The observed price differences indicate that there is unlikely to be arbitrage opportunities for Ontario-NY OR trade as trade transaction costs (uplift charges, transmission fees etc) would exceed the price differences. It should also be noted that Market Surveillance Panel observed persistent energy price differences Ontario-NY energy prices of \$8, implying exports need about \$8 to cover transaction cost for energy.

The IESO also believes that it is reasonable to conclude that even if some arbitrage occurred, given the small price difference, any efficiency benefits are not likely to be material.

Recommendations

- 1) The IESO should not pursue expanded inter-market commercial trade of operating reserve at this time.
- 2) The IESO should keep this study and analysis as a benchmark to follow up in the future.
- 3) If market conditions change that would indicate that inter-jurisdiction trade of operating reserve may be feasible, e.g. resolution of seams issues, development of significant price differences, the IESO should request the ISO/RTO Council (IRC) Markets Committee or a comparable forum to examine expanding inter-market commercial trade of operating reserve.

These recommendations are appropriate because:

1. The review of the Ontario-NY OR price data indicates that there are unlikely to be arbitrage opportunities and material efficiency gains if inter-jurisdictional OR trade occurs.
2. To pursue commercial inter-market OR trade would require significant changes in all affected jurisdictions (e.g. market systems, procedures) with associated resource and negotiation costs.