

ISSUE 40: Locational Marginal Pricing for Intertie Transactions

Date Raised

The Market Surveillance Panel (MSP) first identified inefficiencies associated with intertie transactions in its June 2006 MSP Report. In early 2007, the issue of inefficient exports was again raised during an Ontario Energy Board review of the IESO market rule amendment MR-00331-R00: “Specify the Facility Ramping Capability in the Market Schedule” (the 3-times ramp rate hearing). In this matter, the IESO argued that “the 12-times ramp rate dampens the HOEP and therefore creates a greater wedge between the HOEP and the actual cost of dispatch”. This phenomenon, along with the uniform pricing regime, was identified as a contributing factor for inefficient net exports to New York. At this time, it was suggested that Locational Marginal Pricing (LMP) for Intertie Transactions be investigated.

Description

The Ontario Electricity market employs a uniform pricing model. This regime is characterized by financial settlements based on prices calculated in the unconstrained sequence of the Dispatch Scheduling Optimizer (DSO), and physical dispatches determined by the DSO’s constrained sequence. Differences between the two sequences can create situations whereby the price paid to a supplier (or the price paid by a consumer) does not reflect the incremental cost (or value) of the energy supplied (or consumed). When this happens, it can lead to inefficient levels of production or consumption. Such allocative inefficiencies have been identified to exist in the Ontario electricity market. Specifically, the Market Surveillance Panel (MSP) has identified inefficiencies associated with interjurisdictional trade between Ontario and its interconnected neighbours¹. With respect to interjurisdictional trade, the IESO is considering if identified inefficiencies could be mitigated by settling and dispatching intertie transactions on the basis of locational prices determined in the DSO constrained sequence; and whether such a design would improve Ontario market efficiency.

In the current market design, imports and exports receive both market and physical dispatch schedules that are determined in the hour-ahead pre-dispatch sequence and fixed for real-time dispatch. These intertie transactions are settled on the basis of Ontario’s real-time market clearing price (MCP), which is adjusted by an Intertie Congestion Price (ICP) that reflects transmission congestion across a given interconnection². Intertie transactions are eligible to receive Congestion Management Settlements Credits (CMSC) resulting from differences between market and physical dispatch schedules. In addition to this, imports are also eligible

¹ [Market Surveillance Panel \(MSP\) Reports, Ontario Energy Board](#) - Refer to Background section for discussion on the nature of identified inefficiencies.

² The ICP is also calculated in pre-dispatch and fixed for real-time. For more information on the scheduling and settlement of Intertie Transactions, refer to IESO’s Interjurisdictional Energy Trading training workbook http://www.ieso.ca/imoweb/pubs/training/Workbook_IJT.pdf.

ISSUE 40: Locational Marginal Pricing for Intertie Transactions

for the Import Offer Guarantee (IOG), which is used to mitigate the price risk faced by an import that is scheduled on the basis of pre-dispatch prices, but settled on real-time prices.

An LMP regime for intertie transactions would result in imports and exports being settled on locational prices calculated for each of the 13 interconnections between Ontario and its interconnected neighbours. Generators and consumers in Ontario would continue to be settled based on Ontario's uniform price. Such a regime is expected to impact not only components of interjurisdictional energy trade, but the Ontario electricity market as a whole. Key market elements to be considered are:

- Determining representative locational marginal prices for interties
- Market clearing price (MCP)
- Efficiency changes/implications and wealth reallocations; resulting from potential differences between intertie locational prices and Ontario's uniform MCP
- Intertie Offer Guarantee (IOG)
- Congestion Management Settlements Credits (CMSC)
- Transmission Rights (TR) market
- Wheel-through transactions

In evaluating LMP for intertie transactions, a full assessment of potential market impacts resulting from its implementation should be considered. The above list introduces some of the potential issues for stakeholder discussion, and is expected to evolve going forward.

Background

Intertie Inefficiencies and Anomalous Market Outcomes

A net trade flow from Ontario to New York is inefficient when the incremental cost of producing the energy in Ontario is higher than the New York delivered price (which is presumably the incremental cost of producing in New York less any transactions cost). Analysis conducted by the MSP points to Ontario's uniform pricing model as a cause of this inefficient trade flow³. The problem is that exporters from Ontario to New York pay the lower uniform MCP rather than the higher relevant shadow (locational) price at the New York interface. In addition, the MSP has also identified several anomalous market outcomes relating to import and export CMSC. For example, it was noted that the existence of both the unconstrained and constrained schedules facilitate simultaneous import and export arbitrage opportunities at the same intertie⁴.

LMP for intertie transactions could provide transparent price signals based upon the actual incremental cost/value of dispatch for these transactions. This could encourage more efficient scheduling of imports and exports. An LMP regime may also eliminate the need for the unconstrained dispatch of intertie transactions, thus eliminating the need for CMSC payments to be made to imports and exports. This could mitigate the numerous CMSC-related anomalies identified by the MSP.

³ [MSP Report: November 2005-April 2006](#) (pg. 68-79), [MSP Report: May 2006-October 2006](#) (pg. 104-110), [MSP Report: November 2006-April 2007](#) (pg. 145-151)

⁴ [MSP Report: November 2005-April 2006](#) (pg. 80-82)

ISSUE 40: Locational Marginal Pricing for Intertie Transactions

Design Issues

Representative Locational Marginal Prices for Interties

The introduction of LMP for intertie transactions raises a number of issues related to current mechanisms employed in the Ontario market. First and foremost, a decision must be made regarding what prices are to be used as representative locational prices for each of the 13 'external zones' between Ontario and neighbouring jurisdictions. If the shadow prices⁵ calculated at each of the 13 external nodes are chosen as representative locational prices, the accuracy/appropriateness of both the pre-dispatch and real-time calculation of these prices would have to be addressed.

Shadow prices are a function of bids and offers, transmission constraints/distribution factors, line losses, and resource ramp rates. An evaluation into the integrity of each of these components is required to determine the appropriateness of using the existing shadow prices for intertie LMPs. For example, in certain regions of Ontario (e.g. Northwest) bids and offers are not always reflective of the true cost of production. In such cases, the use of shadow prices calculated on the basis of bids and offers may not be appropriate. With respect to real-time, a previous MPWG issue paper identifies that real-time shadow prices calculated at external nodes are also not representative of bids and offers⁶. This is because the schedule of imports and exports has already been fixed in the hour ahead pre-dispatch, and bid/offer prices have been set to \pm MMCP⁷ in real-time. A mechanism for determining representative real-time intertie LMPs to be used for financial settlement would have to be addressed going forward.

Integration Issues

In addition to suitable locational prices, issues related to the integration of locational price-based intertie transactions with the rest of the Ontario market must be examined. The relationships between the intertie transaction schedule and existing pre-dispatch and real-time market and physical schedules will have to be defined. The appropriateness of including intertie bids/offers in the calculation of the pre-dispatch uniform market clearing price should also be reviewed. A new mechanism for balancing payments to and from importers and exporters may have to be developed as a result of locational prices that can be higher or lower than the uniform MCP.

Interjurisdictional Trade Issues

As noted earlier, the locational pricing of interties would have an impact on the way IOGs are determined, as the difference between pre-dispatch offers and real-time locational prices would form the new basis for IOG payments. In addition, CMSC for intertie transactions would effectively be replaced by locational prices and the single (constrained) schedule for imports and exports. Also, major components of the Transmission Rights market may be affected as the

⁵ Shadow prices are calculated in the constrained sequences of the DSO. They represent the cost of energy at each injection or withdrawal point (node) in Ontario, including Ontario's 13 interconnection nodes.

⁶ [MPWG Description Paper Issue 20: Treatment of Intertie Transactions in a Congestion Pricing Regime](#)

⁷ Maximum/minimum market clearing price: \pm \$2000/MW

ISSUE 40: Locational Marginal Pricing for Intertie Transactions

calculation of congestion rents and TR payments would have to be based on differences between locational prices for the interties and Ontario's market clearing price.

Overall Market Impacts

A potential move to LMP for intertie transactions may have widespread impacts throughout the Ontario electricity market. Potential changes to pre-dispatch and real-time market price, in addition to changes in intertie prices faced by traders, could lead to changes in import/export and possibly production/consumption behaviour. As a result, changes to market efficiencies and other market implications, such as wealth reallocation would need to be quantified and evaluated in a cost-benefit analysis.

Why a Pricing Issue

A move to LMP for intertie transactions is expected to provide greater price transparency for electricity in Ontario. Imports/exports would be paid/charged prices that can be different from the uniform market price. The integration of such a design may impact the calculation of Ontario's uniform MCP, if it is determined that unconstrained scheduling of intertie transactions is no longer required. In this case, both pre-dispatch and real-time price calculation, as well as key components of the hourly uplift (CMSC & IOG) would also be impacted.

Impacts of Issue

Market Impact

Context regarding the market impact of LMP for intertie transactions is provided in the Background section.

Participant Impact

[To be developed]

IESO Processes and Procedures Impact

The integration of LMP for intertie transactions would likely require changes to both pre-dispatch and real-time DSO sequences. The unconstrained sequence in both timeframes would have to be modified to include intertie transactions scheduled in the (pre-dispatch) constrained sequence. Settlement processes regarding intertie transactions, including the calculation of IOG payments and prices used to settle the TR market, would also require significant modification.

Related Issues

- 001: Pre-Dispatch Price Sensitivity
- 007: Imports and Exports Setting Price
- 016: Historical Analysis of Nodal Pricing
- 018: Pricing and Allocation of Line Losses
- 019: Node Loss Factors

ISSUE 40: Locational Marginal Pricing for Intertie Transactions

- 020: Treatment of Intertie Transactions in a Congestion Pricing Regime
- 022: Pricing Physical Constraints
- 032: Role of IOG

Options Considered

[To be developed]

Selected References

Interjurisdictional Energy Trading Marketplace Training Workbook:

http://www.ieso.ca/imoweb/pubs/training/Workbook_IJT.pdf

Market Pricing Working Group Issue #7 (Imports and Exports Setting Price) Description Paper:

http://www.ieso.ca/imoweb/pubs/consult/mep/MP_WG-20060303-Issue7-Imports-Exports-Setting-Price.pdf

Market Pricing Working Group Issue #20 (Treatment of Intertie Transactions in a Congestion Pricing Regime) Description Paper:

http://www.ieso.ca/imoweb/pubs/consult/mep2/MP_WG-20070823_Issue20_Treatment_of_Imports_in_LMP.pdf

Market Surveillance Panel Report published June 16, 2006 (pages 68-82, 121-128):

http://www.oeb.gov.on.ca/documents/msp/msp_report_final_130606.pdf

Market Surveillance Panel Report published December 22, 2006 (pages 104-110):

http://www.oeb.gov.on.ca/documents/msp/msp_report_final_20061222.pdf

Market Surveillance Panel Report published August 10, 2007 (pages 145-151):

http://www.oeb.gov.on.ca/documents/msp/msp_report_20070810.pdf