

DRAFT

June 12, 2008 revision: Added section 1 - Summary to the paper.

June 24, 2008 revision: combine Summary and Introduction; clarification of evaluation and scheduling design; clarification of CMSC implications

October 9, 2008 revision: Add update to linked wheel volumes under section 2 "Background". Add guarantee payment to section 6 "Linked Wheel Congestion Pricing Proposed Design – Settlements".

October 20, 2008 revision: re-draft as Working Group recommendation to Technical Panel, outlining two settlement options.

1. Summary

A linked wheel transaction occurs when a market participant simultaneously imports electricity into Ontario and exports the same quantity out of Ontario.

This paper presents the recommended design to achieve congestion pricing and economic based scheduling and dispatch of linked wheel transactions. The paper identifies how linked wheel transactions should be bid, evaluated and scheduled. The paper identifies two options for the resulting settlement of linked wheel transactions.

The paper also identifies remaining design issues that should be considered when considering whether or how to achieve congestion pricing and economic dispatch of linked wheels.

The treatment of linked wheel transactions is of primary concern to market participants who import and export electricity. However, if changes are made to the scheduling and dispatch of linked wheel transactions, there may be consequential changes to market prices and uplift charges paid by Ontario consumers.

This initiative began in September 2007 as a market rule amendment submission from a stakeholder in the trading sector and has since been discussed at both the Technical Panel and the Intertie Trading Standing Committee. A Working Group of intertie traders, with IESO support, was formed in August 2008 at the request of the Technical Panel to develop a recommended design for the economic scheduling and dispatch of linked wheel transactions. This paper is the product of the Working Group efforts.

More detailed can be found on the stakeholder engagement page at http://www.ieso.ca/imoweb/consult/consult_se45.asp

2. Background

A wheeling through transaction is a simultaneous import of energy into Ontario and export of energy from Ontario by a market participant (i.e. the market participant moves energy from one neighbouring jurisdiction, through the Ontario grid and into another neighbouring jurisdiction).

The linked wheeling through transaction was introduced in the Ontario market prior to market commencement to provide a means for a market participant to move energy from one jurisdiction through Ontario to another jurisdiction and ensure that the import energy is not diverted from the market participant's intended customer in the export market.

Prior to March 2008, to effect a linked wheeling through transaction, the market participant was required under the market rules to:

- Submit an import offer, priced at -MMCP (-\$2000/MW), and an export bid, priced at +MMCP (+\$2000/MW); and
- Identify the import and export as linked through the NERC tag

The IESO evaluates separately the import and export legs of a linked wheeling through transaction, but under the existing market rules, the IESO is required to schedule and dispatch the import and export (including application of constraints) such that both the import and export quantities are equal to the lower quantity that would otherwise have been scheduled and/or dispatched. Linked wheel transactions are not eligible for CMSC payments (refer to market rules Ch 9 sec 3.5.8)¹.

In September 2007, a market participant requested an amendment to the market rules to enable the "economic dispatch of linked wheels"². The market participant asserted that the current treatment exposes a market participant conducting a linked wheel to significant and unacceptable financial risk if there is congestion on the interties. The market participant cited neighbouring jurisdictions use of 'congestion pricing' as a more appropriate treatment. Under a 'congestion pricing' model, the market participant would indicate maximum price they are willing to pay for the linked wheel to flow, where that price is measured as the difference between the sink intertie zone price and the source intertie zone price. The markets in New York, PJM and MISO were cited as examples where such a 'congestion pricing' construct is used.

In consultation with the Inter-Jurisdictional Trading Standing Committee (IJTSC), the IESO implemented an 'interim' solution to address, to some extent, the financial risk issues identified by the market participant in MR-00338. The 'interim' solution was to change to the offering requirements for the import leg of the linked wheel. Market participants are now permitted to offer the import leg at any price

¹ Refer to market rule amendment MR-00315 published on the IESO web site at the following link:

http://www.theimo.com/imoweb/pubs/mr2006/MR_00315-R00-BA.pdf

² Refer to market rule amendment submission MR-00338 published on IESO web site at the following link:

<http://www.theimo.com/imoweb/pubs/mr2007/MR-00338-Q00.pdf>

between -50 \$/MW to -MMCP (-\$2000/MW). All other requirements and treatment are unchanged. The interim solution was implemented in March 2008.

Between January and mid-July 2008, there was a significant increase in linked wheel transactions through Ontario relative to previous years. Prior to 2008, the average volume of linked wheel transactions on a monthly basis was less than 50 GWh. For the first six months of 2008, the monthly volume of linked wheel transactions has been between 200 GWh and 1000 GWh. In mid July 2008, the NYISO changed its tariff to prohibit certain linked wheels. The effect of the NYISO tariff change was to reduce the linked wheel volume through Ontario by a factor of over 10.

In its investigation of the congestion pricing constructs used in neighbouring jurisdictions, the IESO has determined that the constructs are similar in many respects. They all allow market participants to submit single transaction offers for a linked wheel, specifying the congestion price they are willing to pay to have a specified MW level transaction flow. They all allow linked wheel transactions to be offered and scheduled day-ahead and in real-time. There are apparent differences in the requirements for linked wheels not scheduled day-ahead but offered in real-time: PJM and MISO require such linked wheels to be offered as 'price-takers', while New York does not have any offer pricing restrictions.

3. Recommended Linked Wheel Economic Dispatch Design – Market Participant Offers

Market participants wishing to transact a linked wheel would submit a single offer for the linked wheel that would specify:

- The source boundary entity and control area³
- The sink boundary entity and control area³
- The NERC transaction tag
- Two to twenty price-quantity pairs, where the price in each p-q pair indicates the maximum difference between the sink intertie zone price and the source intertie zone price that the participant is willing to pay to have the corresponding MW quantity flow as a linked wheel.

4. Recommended Linked Wheel Economic Dispatch Design – Evaluation and Scheduling in Pre-Dispatch

A linked wheel transaction bid would be evaluated in pre-dispatch as a single transaction, not as a separate import and a separate export.

Quantity 'X' of a linked wheel transaction would be scheduled in pre-dispatch when:

- Linked wheel bid price for the quantity 'X' \geq (sink pre-dispatch intertie zone price *minus* source pre-dispatch intertie zone price); and
- Applicable tie line limits not binding.

³ Source and sink would be neighbours to Ontario i.e. New York, Michigan, Quebec, Manitoba or Minnesota

The linked wheel would be evaluated separately in both the pre-dispatch constrained and unconstrained sequences, so that other transactions and internal resources are appropriately scheduled in both sequences. This will also ensure that intertie congestion prices (ICPs) are determined correctly in the pre-dispatch unconstrained sequence.

Evaluation and scheduling of intertie transactions (imports, exports and linked wheels) would be done on the basis of the measured benefit of the transaction:

- Benefit of import transaction measured as “source pre-dispatch intertie zone price *minus* import offer price”.
- Benefit of linked wheel transaction measured as “linked wheel bid price *minus* (sink pre-dispatch intertie zone price *minus* source pre-dispatch intertie zone price)”
- Benefit of export transaction measured as “sink pre-dispatch intertie zone price *minus* export bid price”.

Linked wheel, import and export transactions, as well as internal supply and consumption, evaluated simultaneously and scheduled, subject to the following constraints:

- Linked wheel injection MW quantity at source equal to linked wheel withdrawal MW quantity at sink;
- Benefit of individual transaction is positive;
- Source intertie line capacity not exceeded; and
- Sink intertie line capacity not exceeded.

The linked wheel transaction quantity scheduled in the pre-dispatch constrained sequence would be subject to check-out with neighbouring jurisdiction to determine the transaction quantity that will flow.

5. Recommended Linked Wheel Economic Dispatch Design – Scheduling in Real-Time

The pre-dispatch constrained schedule quantity that passes check-out, is carried forward to real-time constrained sequence. The pre-dispatch unconstrained schedule quantity is carried forward to real-time unconstrained sequence.

Design Issue – Transferring Pre-Dispatch Schedules to Real-Time:

The import and export transaction quantities scheduled in the pre-dispatch constrained sequence are transferred to the real-time constrained sequence as ‘price-takers’ i.e. import offered in real-time at -2000\$/MW export bid in at +2000\$/MW. The import and export transaction quantities scheduled in the pre-dispatch unconstrained sequence are also transferred to the real-time unconstrained sequence as ‘price-takers’. This transfer protocol ensures that the real-time schedule quantity equals the pre-dispatch scheduled quantity and that the schedule is fixed for the real-time hour. A linked wheel transaction scheduled under the existing market rules as an individual import and an individual export is also treated this way.

Under the proposed new design, how would the pre-dispatch constrained and unconstrained schedules for a linked wheel be transferred to the real-time constrained and unconstrained sequences? There remains the need to ensure that the linked wheel real-time schedule quantity equals the pre-dispatch scheduled quantity and that the schedule is fixed for the real-time hour. Would the linked wheel be a 'price-taker' in real-time? If as a 'price-taker' in real-time, what would be a linked wheel 'price-taker' bid price? \$4000/MW? If not as a price-taker, then how?

6. Recommended Linked Wheel Economic Dispatch Design – Settlements Option 1 Linked Wheel Guarantee Payment

Energy:

Energy payment = [real-time unconstrained sink intertie zone price *minus* real-time unconstrained source intertie zone price] *times* real-time constrained schedule quantity⁴

Intertie Offer Guarantee (IOG):

Not eligible. There is no "offer" price in the sense contemplated for use in IOG. See discussion of linked wheel guarantee payment below.

Congestion Management Settlement Credit (CMSC):

Not eligible – no change from current practice. It should be noted that the real-time unconstrained intertie zone prices only reflect congestion on the interties and do not reflect internal congestion between the interties.

Linked Wheel Guarantee Payment

It is proposed that linked wheels would be eligible for a payment that would compensate a market participant for the change in the participant's operating profit resulting from the transaction schedule in the pre-dispatch constrained sequence compared to the operating profit implied by the transaction schedule in the real-time unconstrained sequence.

Such a payment is justified for the following reasons:

- A market participant wishing to conduct a linked wheel must bid so as to be scheduled in both the hour-ahead pre-dispatch constrained and unconstrained sequences.
- Changes from the hour-ahead pre-dispatch to real-time are beyond the control of the market participant transacting a linked wheel. The market participant should not be exposed to financial risks that result from changes between the hour-ahead pre-dispatch and real-time.
- The payments are justified given the general benefits that linked wheels provide to the market: increased liquidity, revenues to Ontario through uplift and transmission payments. In addition, side payments are also justified on the basis that more economic dispatch of linked wheels would result in more economically efficient dispatch of other intertie transactions and domestic resources.

⁴ Energy payment could be a credit if real-time unconstrained schedule sink intertie zone price is less than real-time unconstrained schedule source intertie zone price.

Design Issue – Possibility of ‘Negative’ Guarantee Payments

The linked wheel guarantee payment is based on keeping the participant financially whole to their operating profit in the pre-dispatch constrained schedule. Is it possible the operating profit in the pre-dispatch constrained schedule is less than what is implied in the real-time unconstrained sequence? If such an outcome is possible, is it appropriate that the guarantee payment results in a ‘charge’ to the participant, not a payment?

Transmission Fee:

Pay Transmission export fee – no change from current practice as linked wheel still using Ontario transmission system.

Failure charges:

Design Issue – Subject to Failure Charges

If linked wheel transactions are eligible for a guarantee payment, should they also be subject to a failure charge if the transaction fails for reasons that are not bona fide and legitimate? Such a failure charge would be an incentive for the participant to successfully schedule in real-time a linked wheel that has a pre-dispatch schedule and a guarantee.

Other market charges:

No change from current practice.

7. Recommended Linked Wheel Economic Dispatch Design – Settlements Option 2 Linked Wheel Settled on Basis of Pre-Dispatch Constrained Sequence Prices

Energy:

Energy payment = [pre-dispatch constrained schedule sink intertie zone price *minus* pre-dispatch constrained source intertie zone price] *times* real-time constrained schedule quantity⁵

Intertie Offer Guarantee (IOG):

Not eligible. There is no “offer” price in the sense contemplated for use in IOG.

Congestion Management Settlement Credit (CMSC):

Not eligible.

Design Issue – Internal Congestion and Transmission Losses Charges

By paying on the basis of the pre-dispatch constrained sequence intertie zone prices, a linked wheel is paying for the pre-dispatch congestion on the interties, the internal congestion between the interties and the transmission losses between the interties. On that basis, it may not be appropriate that linked wheels be subject to uplift charges for CMSC and transmission losses as they are today. However, the existing uplift charges are determined on the basis of real-time conditions, not pre-dispatch.

⁵ Energy payment could be a credit if pre-dispatch constrained schedule sink intertie zone price is less than pre-dispatch constrained schedule source intertie zone price i.e. the linked wheel is flowing against congestion.

Other market charges:

No change from current practice. Refer to discussion above regarding the internal congestion and transmission losses design issue.

8. Cost of Implementation

The IESO has estimated the cost of making the system changes to enable the above design to be in the order of \$500,000. This cost estimate is based on making changes to the following market systems:

- Market Participant Interface (MPI) to allow the single transaction linked wheel offers
- Dispatch Scheduling Optimizer (DSO) to evaluate the linked wheel as single transaction against the applicable intertie zone prices

This cost estimate does not include IESO costs for settlement system changes to effect either the proposed guarantee payment (option 1) or the use of pre-dispatch constrained intertie zone prices (option 2).