

ISSUE 18: PRICING AND ALLOCATION OF LINE LOSSES

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Description

The unconstrained (market) sequence yields a uniform market clearing price that is applied across all of Ontario (i.e. all connection points/buses in Ontario) and separate uniform market clearing prices for each intertie zone. Ontario is represented by one node and all of the load and generation in Ontario is assumed to be connected to this one node. Actual losses in Ontario are modelled as additional load that is applied to this node in order to balance the actual measured generation with demand. All generators and loads receive/pay the same market clearing price. The cost of the actual losses¹ (i.e. the difference between the total dollars paid to generators and the total dollars paid by loads) is recovered in the hourly uplift that is paid by all loads. Each intertie zone is represented by one node. The exports to and imports from that zone are assigned to its node.

The constrained sequence yields individual shadow or nodal prices for specified connection points (buses or nodes) within the network model of the Ontario electricity system (IMO-controlled grid) and each intertie zone. The transmission line losses are currently modelled and accounted for as static penalty factors (see issue 19: Node Loss Factors). The formulation of the dispatch algorithm effectively adjusts (multiplies) the bid and offer prices at each delivery point by these penalty factors. The dispatch of resources takes into account the effect of incremental losses (i.e. the change in losses arising from the associated changes in resource output or consumption) in determining the least price dispatch of the system. Consequently, the relevant incremental losses are reflected in the shadow prices of each node. Since incremental losses are normally higher than actual losses, the expectation is that an over-collection (i.e. settlement surplus) would result if the shadow prices were used for settlement. Any such surplus would be returned to the market on a pro-rata basis via the hourly uplift charge.

Background

The second phase of the Day Ahead Market (DAM) project recommended the use of Location Marginal Prices (LMP) or nodal prices as the basis for calculating dispatches and prices, however this decision was reversed in phase three. An analysis of the LMP shadow prices produced by the real-time constrained sequence identified that there were significant differences between the uniform

¹ The fact that additional higher priced generation must be dispatched to supply the energy consumed by line losses is captured in the market clearing price. Typically, the market clearing price will be set by that additional generation.

prices and the weighted average of LMP prices. These differences can be attributed to the following factors, of which the differing treatment of losses is one:

- The use of 12X ramp in the unconstrained sequence compared to 1X ramp in the constrained sequence.
- Different treatment of losses
- Transmission and area operating reserve constraints are not included in the unconstrained sequence.
- The constrained and the unconstrained sequences are executed at different times.

Why a Pricing Issue

Ontario's current uniform pricing method is based on a set of computations that ignore geographically varied characteristics of the transmission system and, as a result, generates prices that do not reflect the cost of delivering energy to different locations in the transmission system. Ontario's current pricing scheme simplistically treats the transmission system as if it were a copper plate. In reality, under any given set of circumstances, different locations on the power grid face different capabilities, requirements and constraints. In the absence of transmission constraints and losses, the cost of delivering energy to each location on the grid would be the same. However, because of transmission constraints and losses, the cost of delivering energy to different locations on the grid varies. This salient fact is ignored in Ontario's current pricing method and is accounted for after the fact through uplift charges.

The shadow prices appropriately allocate the losses to each node but require true-ups via the hourly uplift to account for the difference between incremental and actual losses. The line losses were found to be a significant contributor to nodal price differentials across Ontario's electricity system.

Impacts of Issue

Market Impact

Due to the above, current market clearing prices in Ontario do not fully reflect the costs of delivering energy to specific locations on the transmission system to meet geographically varied supply and demand conditions while respecting physical constraints. While the hourly uplift charges reflect the costs of losses, by virtue of their myriad of components, they do not provide effective price signals. This process reduces overall price transparency and blunts efficient market signals. The different treatment of losses contributes to the observed difference between the uniform price and nodal prices currently calculated and published by the IMO.

Participant Impact
[To be developed]

IMO Processes and Procedures Impact

Any change to the way line losses are priced and allocated will need to be considered as a part of the bigger issue of how market clearing prices are calculated. This will include pricing energy, constraints and losses. Major changes to the DSO and the Commercial Reconciliation System (CRS) may be required.

Related Issues

002: Publishing nodal price data
016: Historical analysis of nodal prices
022: Pricing physical constraints
019: Node loss factors