ISSUE 31: MULTI INTERVAL OPTIMIZATION PRICING METHODOLOGY

Date Raised
Late 2002.

Description
On June 23, 2004, as part of the Market Evolution Project (MEP), Multi-Interval Optimization (MIO) was implemented. With this change, the DSO real-time constrained (dispatch) sequence was modified to calculate dispatches in the constrained sequence by minimising the weighted cost of meeting the system requirements over a study period of up to 55 minutes. The shadow prices are calculated using the same methodology employed in the original "myopic" approach, i.e. the shadow prices are set based on the cost of incremental change in demand and ramp constrained resources are not allowed to set the prices.

Background
The MIO dispatch calculation consists of two steps. The first step performs the joint optimisation of all intervals. During this step, the non-linear constraints (ramp limits, forbidden regions, steady operation) are either linearized or ignored. The output from the first step is used to constrain the output of the units to factor in the demand requirements for the future intervals. The second step optimises each interval independently, as was done before. However, now this is done with ramp limited resources constrained on or off, using results from the first step, to ensure that they are positioned to reliably meet the future demand. This replaces the relatively crude manual, non-optimised, process that was used previously.

Why a Pricing Issue
The pricing methodology used in the MIO constrained sequence may not necessarily reflect the true marginal costs of energy and operating reserve which relates to the guiding principles of transparency and efficiency. Before the MIO calculated prices (nodal or uniform) could be used to set the market clearing prices, the following issues would need to be addressed:

- Which dispatchable resources can/can't set the market clearing prices.
- Whether to use the shadow prices from the first step or the second step.
- Compensation for resources that are constrained on/off ahead of time in order to meet future requirements. With both the constrained and unconstrained sequences using the MIO process, these units will not be identifiable as constrained on/off and will require a different type of compensation (if any).
- Which resource/system constraints should be enforced in the unconstrained sequence.

- The timing of running the unconstrained MIO sequence (same as constrained sequence, at the end of the dispatch interval or at the end of the study period).

Impacts of Issue

Market Impact

The currently calculated shadow prices may not necessarily reflect the marginal costs of energy and operating reserve. This issue should be resolved before these shadow prices are used in any analysis or the MIO calculated prices (nodal or uniform) are used to set the market clearing prices.

Participant Impact

[To be developed]

IMO Processes and Procedures Impact

A change to the shadow price calculation methodology in the constrained sequence require potentially significant software changes. Any change to the price calculation methodology that affects the market clearing prices (from the unconstrained sequence) will require Market Rule and software changes with significant expense.

Related Issues

004: Use of 12-Times Ramp rate in the Dispatch Unconstrained Algorithm.
005: Simultaneous Use of Ramping Generation Units for Energy and Operating Reserve.
027: Difference in Inputs Between Unconstrained and Constrained Real-Time Sequences.

Options Considered

[To be developed]

Selected References

[To be developed]