ISSUE 13: IMPACT OF OUT OF MARKET SOURCES OF RESERVE ON THE MARKET

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Description
The IMO may use 'out-of-market' sources of reserve in response to an operating reserve shortfall in the real-time constrained sequence.[1] Operating reserve shortfalls occur when either the total amount of available MW offered in the market for a class of operating reserve is less than the IMO's requirement for that class of reserve, or when the total amount of available MW offered for energy and operating reserve is insufficient to simultaneously satisfy both the energy demand and the full operating reserve requirement.

The use of these 'out-of-market' control actions can impact market prices in two ways. First, the use of these control actions can contribute to differences between the pre-dispatch and real time prices as they are typically employed in real-time only. Second, the use of these control actions may cause the real-time prices to fall, even at times when demand is increasing; the 'out-of-market' sources of operating reserve may need to be carried only in the constrained sequence yet, its implementation also affects the unconstrained sequence where prices are determined. At times the price decrease can significantly understate the actual conditions in the market.

Background
Industry standards authorities such as the North American Electric Reliability Council (NERC), Northeast Power Coordinating Council (NPCC) and the IMO establish reliability standards with respect to operating reserve requirements. The IMO must meet the NERC and NPCC standards on a continuous basis. It is the IMO's objective to have those requirements satisfied first through the use of market sources (via the IMO-administered market's offer and bid process).

However, at times the market offer and bids may be insufficient to fully satisfy the energy and OR requirements. Under such conditions, the IMO can, according to industry policy and the market rules, supplement the market provided operating reserve with operating reserve resources that cannot

[1] Chapter 5, Section 4.5.6A of the Market Rules. The use of 'out-of-market' sources of reserve is also covered under Market Manual 7.4 IMO-Controlled Grid Operation Policies.

currently be offered via the normal market mechanisms. These are termed 'out of market' sources of reserve. They include:

- 3% voltage reduction – The energy that can be made available by reducing end use voltages by 3% can be used for 30-minute and 10-minute non-synchronised operating reserve. ***Note: Voltage would be reduced at the time of activation only***.
- 5% voltage reduction – The energy that can be made available by reducing end use voltages by 5% can be used for 10-minute non-synchronised OR. ***Note: Voltage would be reduced at the time of activation only***.
- Temporarily disregard 30-minute requirements – The IMO is permitted based on NPCC criteria to forgo the acquisition of 30-minute reserve for up to four hours.
- Recallable Exports – The IMO can make a scheduled export recallable and hold the potential to cancel the export as operating reserve.

The IMO integrates the 'out-of-market' measures into the market through a manual process. When the IMO observes or expects market sources of operating reserve to be insufficient in an upcoming interval, the relevant operating reserve requirement in the real-time constrained sequence is manually reduced by the amount of the expected shortfall. The IMO focuses on the constrained sequence, as this is the schedule by which it manages system reliability. The reduction in the sequence's reserve requirement is not permitted to exceed the amount of reserve available from 'out-of-market' measures. This manual reduction in an operating reserve requirement has the effect of allowing the market to clear with available operating reserve offers. By virtue of the software formulation, this manual reduction in an operating reserve requirement in the real-time constrained sequence is also applied equally to the corresponding operating reserve requirement in the real-time unconstrained sequence for the purpose of determining clearing prices for all markets.

The application of an equal reduction in the operating reserve requirements for both the constrained and unconstrained sequences can cause the MCP to decline, even when there sufficient offers and bids available to the unconstrained schedule to meet all the requirements. The reserve shortfall is typically realized first in the real-time constrained schedule rather than in the real-time unconstrained schedule. This is a result of transmission constraints that 'bottle' energy or operating reserve capacity, making it unavailable for delivery to load in other parts of the IMO grid. It may also be a result of other factors such as the use of the actual ramping capabilities in the constrained sequence rather than the 12-times ramp rate assumption used in the unconstrained sequence or other input differences resulting from the timing differences between the two

sequences. The shortfall in the constrained schedule can often exceed the shortfall in the unconstrained schedule (there may be no "shortfall" at all in the unconstrained sequence) by as much as 300 to 400 MW. As a result, as energy demand increases and the IMO begins to detect a shortfall or pending shortfall in operating reserves in the constrained schedule, the market-clearing price, which is derived from the unconstrained schedules, may not yet be signalling the pending shortage. If the IMO reduces the operating reserve requirement by say 300 MW in both the constrained and unconstrained sequence, they will free up 300 MW of energy offers in the unconstrained sequence, thereby causing the MCP to fall. This sends a price signal to the market that there is an abundance of market resources when in fact the opposite may be true.

The manual implementation of 'out-of-market' measures in the real-time market but not the one-hour ahead pre-dispatch sequence can also contribute to the divergence between the one-hour ahead pre-dispatch price and the real-time price. The one-hour ahead pre-dispatch sequence rarely exhibits an operating reserve shortfall. Furthermore, the IMO would never manually introduce out of market sources of reserve in the pre-dispatch schedule. In contrast, the real-time constrained sequence frequently exhibits reserve shortfalls.The reason for the difference between the two sequences is due to events that occur in real-time that tighten the supply demand balance and hence threaten reliability. These can include such things as an unanticipated surge in demand, a failed import, a unit outage or under-generation by self-scheduling units. When the magnitude of the reduction in operating reserve requirement more than offsets any real-time event such as a failed import, outage etc, the result is a real-time price that is lower than the pre-dispatch price.

Why a Pricing Issue

The manual implementation of 'out-of-market' sources of reserve is a pricing issue for two reasons. First, the use of these control actions can contribute to differences between the pre-dispatch and real time prices. These differences undermine the transparency of price signals and hence at times the ability of market participants (loads, or generators) to efficiently manage their operations. Second, the use of these control actions may cause the real-time prices to fall at times when shortage conditions are worsening. This can undermine efficient dispatch by not signaling to loads, importers, exports and generators the need for future action. The failure to induce the efficient response to shortage conditions could also perpetuate or accentuate the shortage conditions and possibly lead to degradation in system reliability. Furthermore, these actions tend to remove "shortage prices' from the overall market. This can undermine efficient investment decisions.

Impacts of Issue

Market Impacts

This issue impacts the guiding principles of efficiency and market transparency.

Participant Impact

[To be developed]

IMO Processes and Procedures Impact

[To be developed]

Previous Analysis or Study of the Issue

In 2003, the IMO's Market Pricing Issues team studied the implications of the manual use of 'out-of-market' control actions. They identified two potential resolutions: one, allowing the Dispatch Scheduling Algorithm (DSO) to use it's existing capability to automatically utilize 'out of market' resources when a shortage exists in Real-time; or two, applying a price to each of the 'out of market' resources and directly inserting these resources into the market as Operating Reserve offers. The team decided on the latter approach.

On July 3, 2003, the IMO Board approved market rule amendment (MR-00235-R00-R05) that introduces control action operating reserve (CAOR) in the market. This initiative authorizes the IMO to include standing offers in the market for the following control action sources:

- the load that would be reduced if the IMO implemented a 3% voltage reduction;
- the load that would be reduced if the IMO implemented a 5% voltage reduction; and
- not meeting the thirty-minute reserve requirements in accordance with reliability standards.

The IMO has implemented 400 MW of CAOR in the market as both ten-minute reserve and thirty-minute minute reserve. The ten-minute reserve is offered at a price of $30.1 while the thirty-minute -minute reserve is offered at a price of $30.00.2

The remainder of the control actions (i.e., not meeting the thirty-minute reserve requirements or recallable exports) have not been assigned a price and are still implemented manually at times of expected shortfalls.

[2] For discussion of the selection of the prices for this reserve see http://www.theimo.com/imowebpub/200405/mo_pres_PricingTeamProposal_2003Jun18.ppt

Introducing CAOR into the market via an offer for reserve promises to mitigate some of the previous pricing concerns raised regarding the manual implementation of 'out-of-market' sources of operating reserve. First, placing a price on the various forms of reserve (3% voltage reductions etc) improves market transparency. These forms of reserve will be used when they are economic based on the price rather than on an ad hoc basis when a shortage condition arises. Second, automatic scheduling of these sources of reserve via the dispatch scheduling optimizer (DSO) will prevent the 'counter-intuitive' prices where prices fall as demand is increasing. Finally, the automatic scheduling of these sources of reserve, in a sense, de-couples the scheduling of the operating reserve in the constrained and unconstrained sequences. Whereas in the past, the amount of 'out-of-market' operating reserve carried in the constrained and unconstrained sequence was the same, by incorporating the CAOR into the market via an offer, it will be scheduled only when it is economic to do so in each sequence. This will prevent the 'out-of-market' sources of operating reserve from interfering with the unconstrained sequence and hence the uniform Ontario prices when it is not economic.

The introduction of CAOR into the market does raise other issues. In particular, what is the appropriate price for the CAOR? If the CAOR is priced too low, it may be scheduled before other resources. This would undermine the efficient dispatch of resources. Second, the CAOR is often scheduled in pre-dispatch ahead of imports. It may also be scheduled before the start of a fossil unit. If the CAOR is priced too low then it would interfere with the efficient selection of resources in pre-dispatch. These issues will be discussed in an upcoming issue note.

Related Issues

- 006: Impact of Out of Market Resources on the Market
- 014: Hour(s)-Ahead Price Signal Uncertainty
- 027: Timing Differences Between Unconstrained and Constrained Real-time Sequences

Selected References

IMO Market Rules. Chapter 5: System Operations and Physical Markets
http://www.theimo.com/imoweb/manuals/marketdocs.asp
The Market Surveillance Monitoring Report On The IMO-Administered Electricity Markets for the Period November 2003 to April 2004
http://www.theimo.com/imoweb/pubs/marketSurv/ms_mspReport-20040614.pdf

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MARKET PRICING ISSUES Discussion Paper prepared by the Market Pricing Issues Team May 28th, 2003
http://www.theimo.com/imoweb/pubs/consult/mktOps/mo_paper_PricingIssues_20030528.pdf