ISSUE 05: SIMULTANEOUS USE OF RAMPING GENERATION UNITS FOR ENERGY AND OPERATING RESERVE

Date Raised
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Description
Generating units' can increase (or decrease their output at no more than their physical ramping capability. Consequently, if a unit is increasing its output in response to an energy dispatch, the amount of additional energy that it could provide, if it was activated as operating reserve is limited by the unit's total ramping capability.

Background
The pre-dispatch Dispatch Scheduling and Optimisation (DSO) sequences include a constraint that limits the sum of the energy and all types of operating reserve in any hour to the unit maximum output using its initial output and its energy ramp capability. This will ensure that the facility is not scheduled to provide more energy and / or OR than it is physically capable of providing in the first hour. However, for time periods beyond the next one, the DSO effectively assumes a zero change in energy dispatch and therefore double counting of ramp capability for energy and OR can occur.

The real time DSO sequences partially factor in the ramping capability used to meet the energy requirements when the operating reserve is scheduled. The energy increase in the dispatch interval (5 minutes) is subtracted from available unit ramping capability when scheduling operating reserve or vice versa. If the above unit is scheduled to increase its energy output by 25 MW in the dispatch interval, the available total 10 minute reserve will be reduced to 25 MW and the available total 30 minute reserve will be reduced to 125 MW. None of the other control areas impose this constraint.

Why a Pricing Issue
The simultaneous use of ramping generation units for energy and operating reserve impacts both the market and the reliability of the power system. If the units that are ramping for energy are allowed to provide reserve based on their full ramping capability (pre-dispatch sequences and all other control areas), more operating reserve will be available in the market but some of the scheduled reserve may not be available for activation when a contingency occur. This will depend on the time of the energy loss contingency. If the contingency and associated activation of operating reserve happens at the beginning of energy ramping the reserve will not be available. In the other hand, if the contingency

happens at the end of energy ramping, the unit will be available to provide the scheduled reserve.

The opposite is true if the units are allowed to provide operating reserve based on the remaining ramping capability after the ramping capability used for energy is excluded. This will mean that available total 10 minute operating reserve will be limited to (10 * ramp rate minus the expected energy increase over the next 10 minute period). The available total 30 minute operating reserve will be limited to (30 * ramp rate minus the expected energy increase over the next 30 minute period

The expected energy increase beyond one interval (5 minutes) could not be determined until Multi-Interval Optimization was implemented and put into service on June 23, 2004. With MIO in service, the expected energy increases in the next 10 minutes and 30 minutes are now known. Should the dispatch algorithm formulation be revised to more accurately determine the available operating reserve by considering the expected energy increases, or stay with the partial adjustment or remove the partial adjustment to be consistent with other control areas

Impact of Issue

Market Impact

Full adjustment of available operating reserve to account for expected energy increases would reduce the amount of available reserve in the market. Prices for both energy and reserve will go up and shortages will be more frequent. The scheduled reserve will be fully available to replace generation lost due to contingencies. If the constraints that recognise the physical capability of a unit to provide both energy and operating reserve are ignored, the opposite will happen. Partial adjustment (status quo) is somewhere in between.

Participant Impact

[To be developed]

IMO Processes and Procedures Impact

Changes to the Market Rules and the DSO would be required.

Related Issues

004: Use of the 12-times ramp rate in the dispatch unconstrained algorithm
016: Historical analysis of nodal prices
017: Comparison of operating reserve prices in congestion pricing and uniform pricing regimes