Fast Response Regulation (RegD) Resources Operational Impact

Problem / Opportunity Statement

PJM has recently observed decreased benefits from large amounts of RegD resources providing regulation service. RegD resource participation percentages have at times provided up to 70% of the total effective MWs of regulation and on average RegD percentages have been above 42% of the total effective MW requirement. PJM's current regulation requirement is 700 Effective MWs on-peak and 525 Effective MWs off-peak.

Similarly, PJM has observed frequent hours when the marginal benefits factor in less than 1. During the commitment phase, the benefits factor defines the benefit and point of diminishing return for RegD resources. The point at which the benefits factor is 1, RegD and RegA resources are providing equivalent benefit to the system. The point of diminishing return, when RegD resources are less beneficial than RegA resources, is when the benefits factor goes from 1 to 0.

Based on PJM's observations of system regulation performance when RegD effective MW have exceeded 42 percent of total effective regulation, there is a concern that the marginal benefits factor used in the regulation market optimization solution is not correctly defined. The current marginal benefits function appears to over value the marginal benefits of RegD resources as a substitute for RegA. In order for the regulation market to arrange the optimal, least cost combination of RegA and RegD to meet ACE control requirements, the marginal benefits factor function needs to be accurately defined. Due to observations of too much RegD being committed in many hours, the marginal benefits factor function needs to be re-evaluated.

Additional challenges to managing system control can occur during times when there is a large percentage of RegD MWs providing regulation. This issue is caused by the RegD control signal moving in the opposite control direction than desired by dispatch. The reason for this is that the RegD signal is programmed to integrate to zero to accommodate the state of charge for energy-limited resources participating in the Regulation Market. The inherent feature of the RegD signal does not allow for sustainability at a given set point.

This scenario is seen most frequently when the RTO experiences high or low ACE during periods of rapid load changes during the morning and evening periods. During these times, the regulation signal is utilized to maintain ACE control if the load ramp briefly and instantaneously 'slows down' or 'speeds up'. During these times, larger sized units are coming on-line and offline (hydro, CTs, etc) to keep up with the load, and regulation is critical in correcting for the instantaneous changes in load and generation.

The regulation signal is utilized to ensure ACE and frequency remains balanced. When the regulation signal 'times out' for RegD resources and there is a large amount (>42%) of RegD providing the regulation service, the dispatcher is left with limited resources with which to maintain control of the system. This may lead to increased periods of ACE/BAAL excursions and increased reliance on Synchronized Reserves to supplement the temporarily depleted Regulation Reserves.

This problem warrants consideration in the PJM stakeholder process as it is a known operational issue.