Balancing Operating Reserve – Proposal Updates

Brian Weathers, Sr. Lead Consultant
Market Settlements Development
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Today's Presentation

Goals:

- Describe the approach to the following in the proposed Balancing Operating Reserve (BOR) credit calculation methodology:
  - Reactive Services calculation change to use Tracking Desired
  - Impacts of offering parameters less flexible than the parameter limits
  - Accounting for ambient temperature changes in Tracking Desired MW Calculations
  - Handling of Tracking Desired MW when off SCED or during inconsistent SCED dispatch
  - Market suspensions

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Reactive Services Credits

- Generators whose active energy output is increased at the request of PJM for the purpose of maintaining reactive reliability are entitled to make whole credits.
- Despite some implementation differences, the reactive services credit calculations are patterned off of BOR Credits.
- This brings them in scope for this issue charge so that alignment with the BOR Credit calculation can be maintained.
- The proposal updates the reactive services make whole credit calculation to use Tracking Desired MW.

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Reactive Services Make Whole: Status Quo

- The calculation makes the unit whole when brought online or kept online for the purpose of supporting reactive reliability. This is based on comparing the cost of the MW provided to the revenue (value) earned from the MW provided.
- Data Utilized
  - Real-Time MW = Actual Output of the generator
  - LMP Desired MW = Intersection of MW and LMP on the incremental offer curve. This is zero when LMP is less than the incremental energy cost at minimum output.
  - Energy Offer Cost = Incremental Energy Offer Cost of the area under the curve for the range of LMP Desired MW to Real-Time MW
  - Revenue = (Real-Time MW minus LMP Desired MW) multiplied by the Five Minute LMP at the generator bus
- Make-Whole payment = MAX(Energy Offer Cost – Revenue,0)/12

*Status Quo on this slide structured the same as the proposal, instead of the simplified structure in M28. The calculations are equivalent.

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Reactive Services Make Whole: Proposal

The proposal modifies the calculation to use Tracking Desired MW rather than LMP Desired MW and limits make whole if not following dispatch.

- Data Utilized
  - Real-Time MW = Actual Output of the generator
  - Tracking Desired MW = Tracking Desired MW reflective of any request to increase energy output to support reactive reliability
  - Energy Offer Cost = Incremental Energy Offer Costs of the area under the curve for the MIN(**Tracking Desired MW**, Real-Time MW). The MIN function parallels the step 1 and step 2 calculation of the proposed BOR credit changes.
  - Revenue = MIN(Real-Time MW, Tracking Desired MW) multiplied by the Five Minute LMP at the generator bus
- Calculation
    - Make-Whole payment = MAX(Energy Offer Cost – Revenue,0)/12

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Impacts of PLS Parameters on BOR Credits

The tariff states that a Generation Capacity Resource that operates outside of its unit-specific parameters will not receive Operating Reserve Credits nor be made whole for such operation when not dispatched by PJM unless the market seller can demonstrate it was the result of an actual constraint.

- The current rules could benefit from clarity on when a parameter violation impacts the calculation of BOR credits and how.
- This rule also lacks clarity on the consequence of violating PLS parameters when operating on a price schedule.

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Parameter Limits: Status Quo Implementation

- Conditions that trigger impacts to BOR Credits:
  - A parameter submitted on a parameter-limited schedule (cost or price PLS) is less flexible than the defined parameter limit AND the reduced flexibility impacted the commitment or dispatch of the unit
  - There is currently no impact if the unit is running on a price schedule.
- Impact to BOR Credits:
  - Resources are not made whole for the losses incurred.
  - The intervals that are not made whole are:
    - Any interval in which turn down ratio is violated
    - Any interval in an extended commitment for all other parameters (intervals beyond the parameter limited min run time)

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Parameter Limits: Proposed Implementation

Conditions that trigger impacts to BOR Credits:

- A parameter submitted on a parameter-limited schedule (cost or price PLS) is less flexible than the defined parameter limit OR
- A unit running on a price schedule and all of the following conditions occur:
  - The trigger to consider parameter limited schedules in the commitment decision is met (Failed TPS, Hot/Cold Weather Alert or other defined condition)
  - The price schedule is chosen as the cheapest schedule
  - The submitted parameter was less flexible than the parameter limit for any of parameters used in determining the cheapest schedule on at least one of the parameter limited schedules
    - Turn Down Ratio
    - Minimum Run Time

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Parameter Limits: Proposed Implementation

Impact to BOR Credits:

- If the applicable parameter impacts the dispatch level of the unit:
  - The unit remains eligible for BOR Credits
  - The unit will not be made whole for costs outside of startup costs in the intervals where the parameter is less flexible and Tracking Desired MWh = Eco Min or Eco Max
- If the applicable parameter is one that can impact the commitment decision for the unit in a way that could lead to running the unit for longer than it otherwise would have:
  - The unit becomes **ineligible** for BOR Credits for the commitment period

PLS violations that impact BOR credits are very infrequent. Over the past several years, there have only been a handful of instances where BOR credits were forfeited due to parameter violations.

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Categorization of Parameters

Parameter	Impacts Dispatch Level	Impacts Commitment Decision*
Turn Down Ratio	Yes	No
Minimum Down Time	No	Yes
Minimum Run Time	No	Yes
Maximum Number of Daily Starts	No	Yes
Maximum Number of Weekly Starts	No	Yes
Startup Time	No	Yes
Notification Time	No	Yes
Maximum Run Time	No	No

**Impacts the commitment decision in a way that could lead to running the unit for longer than it otherwise would have*

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Impacts of Limiting Dispatchable Range

- The issue charge also sought to clarify the impacts of offering limited flexibility on the determination of following dispatch and BOR credits.
- This includes consequences for clamping applicable min and max operating limits after being committed
- Based on stakeholder feedback, PJM and the IMM have updated the proposal that was previously presented in April 2024 to allow for minor changes (ambient temperature updates) without triggering impacts to BOR credits or deviations

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Dispatchable Range Status Quo

- To determine if a unit's limits have been clamped, PJM compares the Real-time limits to the Day-ahead limits. A unit's limits have been clamped if either of the following are true:
  - Real-time Economic Minimum is less than or equal to the greater of 105% of the Day-ahead economic minimum or Day-ahead economic minimum plus 5 MW
  - Real-Time Economic Maximum is greater than or equal to the lesser of 95% of the Day-Ahead Maximum or the Day-Ahead Maximum minus 5 MW.
- Impact of limiting the dispatchable range:
  - Dispatch LMP Desired MW (non-ramp limited desired) is calculated using the most flexible dispatchable range
    - Min of the Day-Ahead minimum and Real-Time minimum outputs
    - Max of the Day-Ahead maximum and Real-Time maximum outputs

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Dispatchable Range Proposal

- Limited Dispatchable range is defined as:
  - A reduction to Real-time Maximum or an increase to Real-time Minimum **by more than 5%** compared to:
    - When committed Day-Ahead, the Day-ahead limits
    - When committed in Real-Time, the limits at the time of commitment
  - The addition of the 5% comparison is to allow for minor changes (ambient temperature), which will not trigger the opening of the limits.
- Impact of limiting the dispatchable range
  - Tracking desired will use the most flexible dispatchable range as the limits for the unit (min of the mins, max of the maxes)

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Exceptions to Tracking Desired MW Calculations

The Tracking Desired MW calculations will have special handling for periods with dispatch exceptions.

- Off SCED Periods:
  - The zonal dispatch rates sent via EMS, rather than the dispatch run LMPs, will be used calculate the tracking desired MW during periods in which the SCED application is not utilized for Real-time dispatch
- Inconsistent SCED dispatch
  - During intervals in which SCED is providing dispatch signals inconsistent with the resource's offer data, the tracking desired MW will be set to the SCED basepoint.
  - This adjustment will be initiated when:
    - Requested by the Market Seller
    - PJM identifies that a PJM issue caused the dispatch anomaly

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Market Suspensions

- A Market Suspension is defined as:

"The inability of the Office of the Interconnection to clear the Day-ahead Energy Market prior to 11:59 p.m. on the day before the affected Operating Day due to the extraordinary circumstances, as further described in Operating Agreement, Schedule 1, section 1.10.8(d) and the parallel provisions of Tariff, Attachment K-Appendix, section 1.10.8(d), or the inability of the Office of the Interconnection to produce Zonal Dispatch Rates for a total of seven (7) or more Real-time Settlement Intervals within a clock hour, for the purposes of the Real-time Energy Market, as further described in Operating Agreement, Schedule 1, section 1.11.6 and the parallel provisions of Tariff, Attachment K Appendix, section 1.11.6."

- There are special BOR credit settlement provisions during market suspensions.
- Market suspensions are extreme system or market failures. None have occurred to date.

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Market Suspension BOR Status Quo

- No special calculation of Desired MW. Desired MW is not used during a Market Suspension since the system is not being actively dispatched via SCED.
- BOR credits are calculated using Actual RT MWh (no desired MW) and available parameters
- Charges are allocated using the ratio share of real-time load plus export transactions.
  - Deviations do not get assessed BOR charges since all charges are allocated to load plus exports.

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Market Suspension Proposal

Status quo

plus

In the event of a market suspension, if PJM and the IMM determine the unit was **significantly** deviating from commitment or dispatch instructions, the unit will be **ineligible** for uplift.

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Contact

Operating Reserve Clarifications

Facilitator:
Nick Disciullo,

Nicholas.disciullo@pjm.com

Secretary:
Joey Tutino,

Joseph.Tutino@pjm.com

SME/Presenter:
Brian Weathers,

Brian.Weathers@pjm.com

Operating Reserve Clarifications

Potential Solution Options - Balancing Operating Reserve Credit Matrix Updates

Member Hotline

(610) 666 – 8980

(866) 400 – 8980

custsvc@pjm.com

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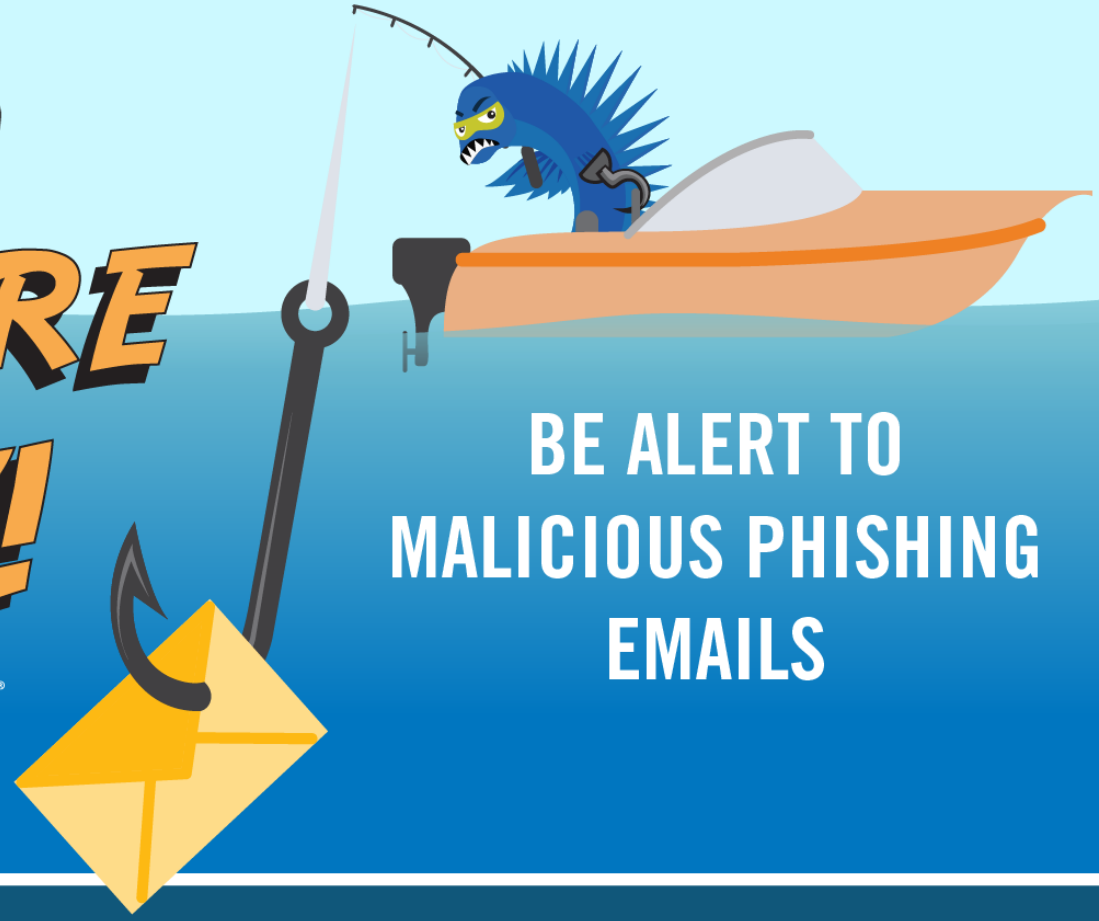

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