

Balancing Operating Reserve (BOR) Credit Reform: PJM / IMM Proposal Overview

Lisa Morelli and Brian Weathers

Market Settlements

Market Implementation Committee

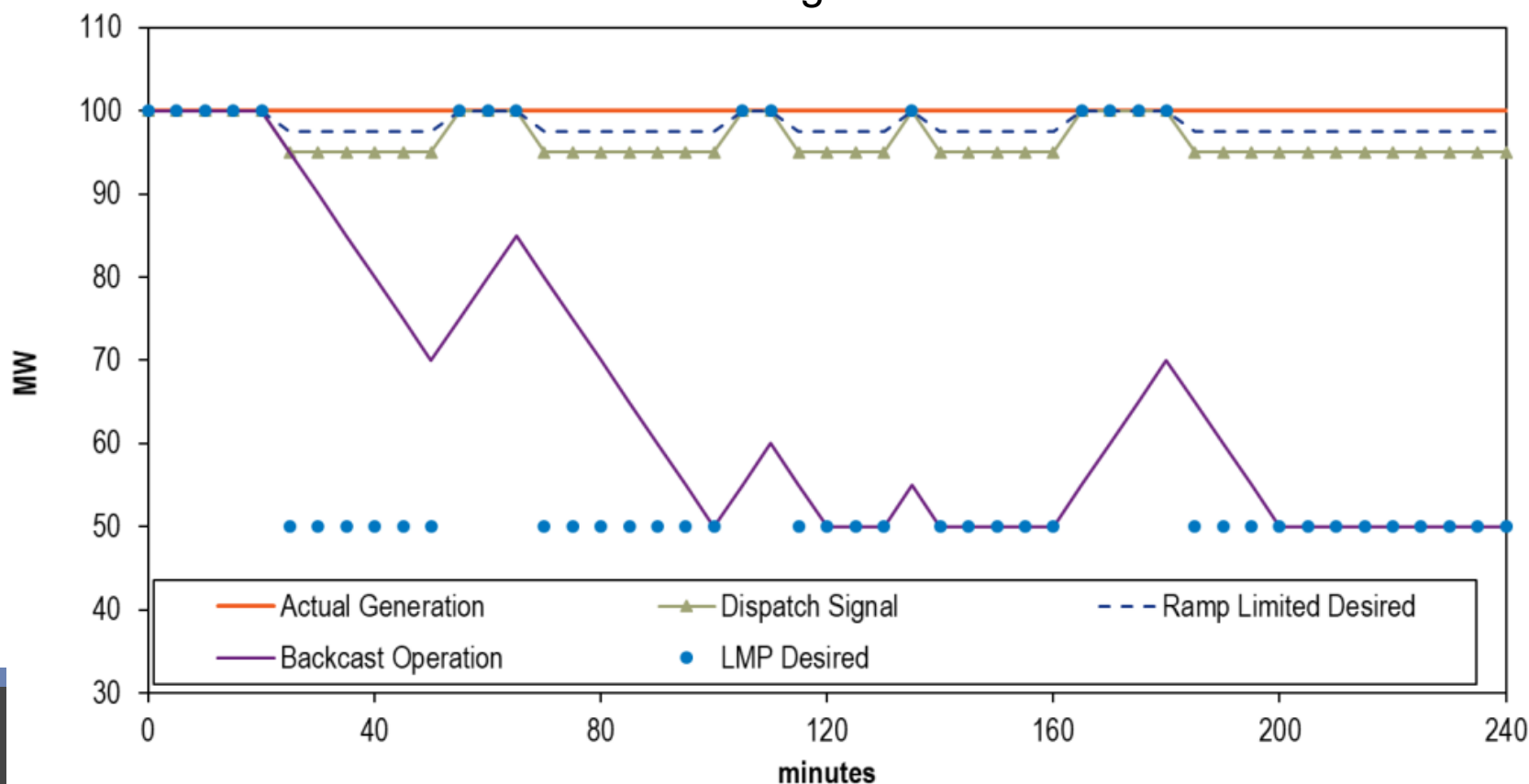
January 8, 2025

- The issue charge was initiated by PJM and the Independent Market Monitor in February, 2022.
- It aims to clarify the rules around the payment of BOR Credits to resources that do not operate as expected and strengthen incentives for resources to operate consistent with PJM's directions.
 - There is a need to address IMM and FERC concerns with the payment of significant BOR credits to resources that don't follow PJM dispatch instructions.

Root Causes of Elevated Uplift Paid to Units Not Following Dispatch

The existing metrics used to determine if a resource is following dispatch only measure how well a unit follows dispatch in a single interval.

- A resource can fail to follow consistently over multiple intervals but still be flagged as following dispatch and therefore receive significant uplift payments for MW not otherwise desired and receive minimal to no deviation charges.



Compared to the dispatch signal or Ramp Limited Desired, actual generation is close to the desired MW and the unit looks like it is following dispatch

Backcast analysis that assumes the resource followed instructions from the beginning shows the resource did not operate where PJM would have wanted the unit.

Root Causes of Elevated Uplift Paid to Units Not Following Dispatch

- The tariff lacks specificity around what it means to be "Operating as Requested by PJM" and therefore eligible to receive BOR credits.
- The consequences are unclear for the following scenarios:
 - Coming on late or early for a PJM commitment
 - Going offline early or too late
 - Taking a unit over as self-scheduled in the middle of a PJM commitment

During solution development, PJM and the IMM identified several additional shortcomings in the Balancing Operating Reserve Credit calculation that the proposal remedies.

1. Overly punitive outcomes for not following dispatch in some instances
 - Stems from the asymmetry in the MW used on the cost and revenue sides of the equation
2. Unequal treatment across resources that deviate from dispatch in terms of cost recovery
 - Differing opportunities to recover costs depending on whether the unit had a DA commitment or not and whether it was over or under generating

See slides 6 - 9 of the [3/11/2024 MIC special session presentation](#) for more on the above shortcomings

3. Incomplete and/or double accounting of revenues from other markets or LOC payments that leads to over or understated BOR credits

- 1 Use of a new Tracking Ramp Limited Desired MW metric to measure how well a unit follows dispatch across consecutive intervals.
- 2 Structural changes to the Balancing Operating Reserve Credit calculation
- 3 Adjustments to the periods for which resources will be eligible to receive Balancing Operating Reserve Credits
- 4 Conforming changes to the calculation of generator deviations

This proposal is jointly supported by PJM and the IMM.

Elements of the proposal will place both downward and upward pressure on uplift payments

- Overall, the proposal will reduce the uplift paid to units that consistently do not follow dispatch and will address the concerns raised by the IMM and FERC.
- Several elements of the proposal will counterbalance the reductions and in many instances could lead to units receiving additional uplift by correcting perceived flaws in the current calculation.

Change	Reduces uplift	Increases uplift
Use of Tracking Desired MW	X	X
Transition to Step 1 / Step 2 calculations	X	X
Changes to eligibility	X	X

1. Changes to Determination of Following Dispatch

The weakness of the existing Desired MW metrics is their lack of ability to determine if the unit is actually following dispatch over a period of time.

- The Dispatch Signal and the Ramp Limited Desired use actual generation as the starting point for their calculation. When a unit does not follow dispatch, these metrics do not reflect where the unit should have been over time.
 - May result in a unit being made whole for more MW than PJM really desired from the unit
 - Resources with slow ramp rates and limited intention to follow the basepoint can still receive significant uplift payments. This issue may also impact faster responding units.

In addition, using LMP Desired when determining MWs eligible to be made whole can be overly punitive

- LMP Desired ignores ramp limits and therefore it does not consider whether resources could have realistically achieved that MW level based on ramping capability.

- A new Tracking Ramp Limit Desired (TRLD) MW metric will be created
 - The TRLD metric differs from the current Ramp-limited desired by using the previous result as the starting point of the calculation instead of Actual Generation
 - FERC accepted the use of a tracking ramp limited desired metric in the Regulation Market Redesign filing
 - This proposal extends the use of this concept to BOR credits
 - The two metrics are similar, but not identical, as the metric used for BOR credits will be calculated after-the-fact based on actual system conditions and parameters.
- This value would replace **all three** of the existing desired MW values in the calculation of BOR credits and deviation charges

- Simplifies the calculation of Desired MW and shadow settlements
- More accurately measures how closely a resource is following dispatch over a period of time than the Status Quo metrics
 - Decreases uplift when a unit doesn't move because it better captures the impact of not following dispatch over consecutive intervals
- Acknowledges ramping limitations unlike the LMP Desired MW value that is currently used when resources are significantly deviating
 - Increases uplift as compared to the use of LMP Desired MW since LMP Desired MW can overstate what the resource could have produced and where it really would have been desired given ramp limitations

2. Changes to the Structure of the BOR Credit Calculation

- Lack of transparency – it is difficult for participants to understand how much BOR credit was forgone as a result of not following dispatch
- In some instances, the calculation may overstate the net revenues of resources that are not following dispatch
 - Stems from asymmetry in the MW used on the cost and revenue sides of the equation.
 - This can result in the make whole credit calculation recognizing a net profit that is far in excess of (or a net loss that is far less than) what the resource could have earned even if it followed dispatch in that interval.
 - Excess profit offsets losses in other intervals within the segment and therefore can reduce the make whole credit owed to the resource
- There is unequal treatment across resources that deviate from dispatch in terms of cost recovery.

The proposal will remove the complex MW comparisons in the BOR credit calculation and shift to a simplified, three part calculation:

- Step 1: Calculate BOR credits for the segment using **Tracking Desired MWh**.
 - Credit = Max (Cost @ Tracking Desired MWh – Value @ Tracking Desired MWh, 0)
 - This represents the amount of uplift the resource would have required if it produced the desired MW
- Step 2: Calculate BOR credits for the segment using **Actual RT MWh**.
 - Credit = Max (Cost @ RT MWh – Value @ RT MWh, 0)
 - This is the amount of uplift the resource requires based on how it actually operated.
- Step 3: Compare and set the resource's credit equal to the lesser of the two values.

The effect of this change is that resources are made whole to their costs, but the make whole is limited to the amount of uplift the resource would have been entitled to *if the resource provided the desired MW.*

- Simplifies the calculations by removing the complex comparisons of MWs embedded within the calculation
- Increases transparency into how much uplift was forgone as a result of not providing the desired MW
- Removes some of the more punitive effects of the calculation that stem from asymmetric MW values being used on the cost and value sides of the equation
 - This portion of the change will increase uplift since it will no longer overstate profits or underestimate losses

- The following revenues are currently included in the revenue eligible to offset costs in the BOR credit calculation:
 - Synchronized Reserve Revenue Above Costs
 - Non-Synchronized Reserve Revenue Above Costs
 - Secondary Reserve Revenue Above Costs
 - Reactive Services Make Whole Credit
 - Market Revenue Neutrality Offset
 - Day-Ahead Revenues
 - Day-Ahead Operating Reserve Credits
- The proposal will add the opportunity costs that are paid through other markets to this list of offsetting revenues in the BOR credit calculation

- Despite the name, opportunity costs are not physical costs, but rather profits (positive net revenues) the resource gave up in the energy market by providing an alternative service.
 - Example for 1 MW: cost = \$8 LMP revenue = \$10. Opportunity cost (net profit) = \$2.
- Because the profits that define opportunity costs are actually awarded via PJM revenues, excluding opportunity costs in the BOR credit calculation understates the PJM market revenues the resource received.
- This can lead to making a resource whole for DA buy back, startup or no load costs when it is not necessary because the resource actually earned sufficient revenues to cover those costs when the opportunity cost revenues are factored in.
- The following examples illustrate why this adjustment is necessary:
 - Energy LOC: [Item 03 - Operating Reserve Clarification Examples - May](#)
 - Regulation: [Item 02 - Operating Reserve Clarifications Examples - June](#)
 - Reserves: [Item 03 - Operating Reserve Clarification Examples](#)

3. Changes to Eligibility Rules

Only PJM-scheduled units are eligible for BOR credits

- Eligibility **begins** at the start of the PJM commitment
 - If the unit isn't online at start of commitment, eligibility starts once online
 - Units without a soak process are eligible for ~30 min prior to start of commitment if they are ramping in preparation for commitment, but this is a subjective check
- Eligibility **ends** a) after ramp down when PJM releases the unit b) when the unit is taken over as self-scheduled or c) when the unit trips.

Rules around eligibility when a unit is early or late for its commitment, as well as when a unit is taken over in the middle of its commitment, need to be clarified / strengthened.

- Eligibility will begin at the start of the PJM commitment even if the unit is not online.
 - This allows better recognition of the costs and revenues that would have stemmed from operating as requested by PJM
- Eligibility will continue through the end of the DA commitment / RT min run time and terminate thereafter, rather than terminating immediately, if the unit stops running for PJM before the end of the commitment.

- Units may receive more uplift in the following scenarios since units will now make units whole for the costs of buying out of their DA commitment:
 - Units that are late for their DA commitment due to PJM action
 - PJM releases a unit from its DA commitment early
- Units may receive less uplift under the following scenarios since the calculation will now recognize net revenues that could have been earned had the resource operated as requested:
 - Unit is late for its commitment due to market participant action
 - Unit comes online much earlier than requested by PJM
 - Unit trips before the end of its DA commitment or RT min run time
 - Unit is taken over to run for company before the end of its DA commitment or RT min run time

- Conforming changes to generation deviations
 - Replace existing desired MW metrics with Tracking Ramp Limited Desired MW metric
 - Eliminate some automatic exemptions since Tracking Ramp Limited Desired MW will account for any deviation needed to provide another service, unlike the existing desired metrics
 - MW and percentage-based exemption thresholds remain unchanged
- Conforming updates to Reactive Services Make Whole Credits

- Clarify how the following actions impact the determination of following dispatch and BOR credits
 - Offering limited flexibility (using the Fixed Gen Flag or clamping min/max limits)
 - Violating parameter limits
- Address the determination of following dispatch during a Market Suspension

Facilitator:
Foluso Afelumo, Foluso.Afelumo@pjm.com

Secretary:
Stefan Starkov, Stefan.Starkov@pjm.com

Presenters / SMEs:
Lisa Morelli, Lisa.Morelli@pjm.com
Brian Weathers, Brian.Weathers@pjm.com

BOR Proposal Overview



Member Hotline

(610) 666 – 8980

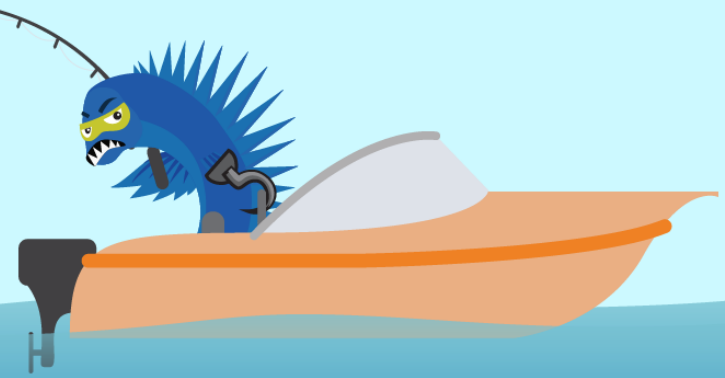
(866) 400 – 8980

custsvc@pjm.com

**PROTECT THE
POWER GRID**
**THINK BEFORE
YOU CLICK!**



**BE ALERT TO
MALICIOUS PHISHING
EMAILS**



Report suspicious email activity to PJM.
Call (610) 666-2244 or email it_ops_ctr_shift@pjm.com

Appendix

- [MIC Special Session Detailed Proposal Overview](#)
- [Consolidated BOR Credit Proposal Examples](#)

The Tracking Ramp Limited Desired MW Calculation is:

- $D_t = D_{t-1} \pm \text{Ramp}_t$

Where:

- D = Tracking Ramp Limited Desired MW
- t = Calculation interval. When $t-1 = 0$, D = Actual Output.
- *Ramp* = Increase/decrease in output based on market conditions. The ramp will be calculated using the dispatch LMPs solved in every RTSCED case and the ramp rates and eco min / max values submitted by the units.

Adjustments are then made to respect:

- Regulation and Reserve Assignments
- Manual dispatch instructions

- Refer to the 'Component 6 option Details' tab in the matrix for calculation details
- A simulation spreadsheet has been created to allow participants to better understand how the tracking desired MW will behave under hypothetical conditions: [Tracking Ramp Limited Desired calculator spreadsheet](#)

Why Should an Asset Owner Endorse This Proposal?

- Overall, the proposal will reduce the uplift paid to units that consistently do not follow dispatch, so some have questioned why asset owners should endorse this proposal.
- As noted in the detailed proposal overview deck, there are numerous aspects of this proposal that are beneficial to asset owners. This appendix summarizes those benefits.

Benefit #1 - Correction of Overstated Net Revenues when Not Following Dispatch

Moving from the status quo make whole calculation to the new 3 step calculation (see slide 28) will benefit the asset owner because it corrects the instances under the status quo calculation where asset owner profits were being overestimated and losses were being underestimated when not following dispatch by using different MW on the cost and revenue sides of the BOR credit equation.

- This benefit will materialize anytime the calculation uses different MW on the cost and revenue sides of the equation today – which is most times the resource is over or under generating.

The new 3 step calculation will dramatically improve transparency into the amount of uplift that is being forgone as a result of not operating as requested by PJM. Today, it can be very difficult to understand how not coming online / offline at the expected time or following the dispatch signal impacts not only the unit's BOR credits, but also its revenues (in cases where the unit doesn't even require a make whole payment).

Going forward, a simple comparison of the net revenues under the Step 1 calculation and the Step 2 calculation will reveal the amount of uplift or additional revenue forgone by not following PJM dispatch instructions.

We expect this to be valuable enhancement to resource owners interested in performance analysis / asset optimization.

- Removing the use of LMP Desired MW in the BOR Credit calculation is a potential benefit to the asset owner. LMP Desired can currently result in an overestimation of revenue or an undercounting of costs, which results in less uplift. This happens anytime the resource is deviating by more than 20% or offers limited flexibility (in the form of clamping its economic limits or using the Fixed Gen flag). The use of Tracking Desired MWh corrects for the overestimation of revenues and undercounting of costs in these instances.

Benefit #4 – Correction of Overstated Net Revenues when Following Dispatch

The changes to the start and stop times for BOR credit eligibility will benefit asset owners under a number of circumstances where they are following PJM instructions because in these instances the current calculations do not account for all of the costs the resource incurs. These changes will lead to more uplift under the following conditions.

- If PJM starts a unit after the start of its DA commitment, the cost of buying out of the unit's DA commitment before the unit comes online will now be included in the make whole calculation. Today these costs are ignored, resulting in an overstatement of net revenues, which potentially lowers uplift.
- If PJM releases a unit before the end of its DA commitment, the cost of buying out of the unit's DA commitment after the unit goes offline will now be included in the make whole calculation. Today these costs are ignored, resulting in an overstatement of net revenues, which potentially lowers uplift.
- If PJM does not commit a flexible resource (CTs with ≤ 2 hour min run time and 2 hour startup and notification time) in RT for the entirety of its DA commitment, the cost of buying out of the unit's DA commitment when the unit is offline and any LOC credits paid will now be included in the make whole calculation. Today these costs and revenues are ignored, resulting in an overstatement of net revenues, which potentially lowers uplift.