Operating Reserve Clarification Updates

Brian Weathers, Sr. Lead Consultant
Market Settlements Development
March 11, 2024

Agenda

- Matrix Updates
- Uplift Methodology Updates
- Example Calculation Updates

Matrix Updates - Eligibility During Ramp Up – Component 1a

Option A
Status Quo plus Resources without a soak process are eligible up to 30 minutes prior to start of commitment only if incremental energy offer price mw pairs remain less than or equal to the first hour of PJM commitment.
Added the following clarification: If deemed to be ineligible, incremental and no load costs in those intervals will be ineligible for cost recovery; however, start up costs will still be eligible for make whole payments in the first hour/interval of commitment based on the committed schedule.

Eligibility During Ramp Down – Component 1c

Original Solution	Updated Solution Option A
Remove universal 3 hour limit and replace with resource type-specific limit -Coal Resources/Solid Fuel NUG/OIL/GAS Steam Resource = 90 Minutes, -CT Resources = 30 Minutes, -Combined Cycle Resources = 45 Minutes -Wind/Solar/Hydro/Battery = 0 minutes -Nuclear = Not eligible Resource type-specific limit were developed utilizing historical resource type data - thresholds based on 90th percentile evaluation	Remove universal 3 hour limit and replace with resource type-specific limit based on 90th percentile evaluation of historical shut down times. -Coal Resources/Solid Fuel NUG/OIL/GAS Steam Resource = 120 Minutes, -CT Resources = 30 Minutes, -Combined Cycle Resources = 45 Minutes -Wind/Solar/Pump Storage/Run of River/Battery – equal to the self scheduling notification times as documented in M11 Section 2.3.3 (currently 20 minutes) -Nuclear = Not eligible PJM and the IMM will perform analysis every two years utilizing historical shut down time data only for pool scheduled commitments. From this sample population, the 90th percentile shall be used to determine eligibility thresholds. This process shall be documented in manual 28. Analysis results will be shared with stakeholders prior to new thresholds becoming effective.

Eligibility During Ramp Down – Component 1c

Distribution of historical release time data

Unit Type	Minutes Shutdown Time (bin)														
	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210
CC	546	1,577	1,370	360	77	28	18	12	*	*	*	*	*	*	*
CT	18,197	5,823	325	36	15	*	*	*			*	*	*	*	
ST	60	157	182	161	99	64	37	33	21	9	*	10	*	*	*

* *Indicates less than four unique market participants were in the sample population. Data cannot be shared in compliance with Manual 33 Section 6.1*

Concerns with the Current Balancing Operating Reserve Credit Calculation

PJM and the IMM reconsidered the structure of the existing make whole calculation in response to stakeholder discussion and feedback received at our January 2024 committee meeting.

- 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 value 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 can reduce the make whole credit owed to the resource

Review Status Quo Make Whole Calculation

Make Whole Credit	=	Cost			-	Value									
Overview	=	RT MW Used	*	$/MWh Offer	-	(Balancing Value MW Used	-	DA MW)	*	RT LMP	+	DA Revenue	+	DA Operating Reserve Credit	
Detail	=	**Min**(Operating Reserve Desired MW, RT MW)	*	$/MWh Offer	-	(**Max** (Min(DA MW, Op Res Desired MW), RT MW)	-	DA MW)	*	RT LMP	+	DA MW * DA LMP	+	DA Operating Reserve Credit	

This minimizes the cost that can be recovered through the make whole calculation to no more than the MW actually desired by PJM

This maximizes the positive value that can be used to offset any costs, reducing the uplift when the resource over generates. Similarly, when the resource generates below the desired MW, it excludes any negative buy out from the resource's DA position beyond that which was the result of PJM's dispatch instructions, thus reducing uplift and shifting the cost responsibility to the generator.

Are the Net Revenues resulting from the Cost minus Value portion of the existing calculation overstated?

Other Observations About the Current Calculation

There is unequal treatment across resources that deviate from dispatch in terms of cost recovery.

- Most resources that do not follow dispatch are not guaranteed to recover their full costs.
- Only RT-only committed resources that under generate are guaranteed to recover their costs when not following dispatch.
  - This happens because they are made whole to the cost of the RT MW produced using only the revenue earned by the RT MW produced (symmetrical MW on the cost and value side of the equation).

All resources that deviate from dispatch should receive equal treatment in terms of cost recovery.

Other Observations About the Current Calculation (continued)

- All other resources that do not follow dispatch are not guaranteed to recover all of their costs because:
  - The calculation may increase profits or decrease losses due to the asymmetry in the MW used on the cost and value sides of the equation.
    - Overgenerating resources are only made whole to the cost of the desired MW, but then the full revenue of the higher RT MW is used to offset those costs. That is, revenue from all RT MW in excess of desired looks like 100% profit.
    - DA-committed undergenerating resources are only made whole to the cost of the RT MW. And although the calculation only recognizes balancing revenues associated with the RT MW, it also excludes any buy back from the DA energy position that PJM did not direct. The exclusion of that cost either lowers the loss in an interval or increases the profit which can be used to offset losses in other intervals, which means costs may not be fully recovered.

Uplift Methodology Changes

- PJM and the IMM are offering an updated make whole calculation in response to these observations:
  - Step 1: Calculate make whole credit for the segment using Tracking MW.
  - Step 2: Calculate make whole credit for the segment using Actual RT MW.
  - 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 followed dispatch*

Proposed Update to Make Whole Calculation: Step 2 (Calculation Using Tracking Desired)

Both the Cost and Value side are calculated using *Tracking Desired*

Make Whole Credit (Tracking Desired MW)	=	Cost			-	Value									
↳	=	Tracking Desired MW	*	$/MWh Offer	-	(Tracking Desired MW	-	DA MW)	*	RT LMP	+	DA Revenue	+	DA Operating Reserve Credit	

Proposed Update to Make Whole Calculation: Step 1 (Calculation Using RT MW/Actual)

Both the Cost and Value side are calculated using *Actual Output*

Make Whole Credit (RT MW / Actual)	=	Cost			-	Value								
↳	=	RT MW	*	$/MWh Offer	-	(RT MW	-	DA MW)	*	RT LMP	+	DA Revenue	+	DA Operating Reserve Credit

Proposed Update to Make Whole Calculation: Step 3 (Compare Results of the Two Calculations)

- Segment Operating Reserve Credit calculation is now a comparison of two make whole credits floored at 0.
- Segment Operating Reserve Credit = Min {Op Reserve credit (RT MW) , Make Whole Credit (Tracking Desired MW) }) = MIN($6,500,0) = 0

Op Res Credit (RT Actual MW)	=	Cost			-	Value								
Total	=	RT MW	*	$/MWh Offer	-	(RT MW	-	DA MW)	*	RT LMP	+	DA Revenue	+	DA Operating Reserve Credit
$6,500	=	50		$20	-	(50	-	100)		$200		4500		0

Op Res Credit (Tracking Desired MW)	=	Cost			-	Value								
Total	=	Tracking Desired MW	*	$/MWh Offer	-	(Tracking Desired MW	-	DA MW)	*	RT LMP	+	DA Revenue	+	DA Operating Reserve Credit
$0	=	100		$20	-	(100		100)		$200		4500		0

Benefits of Updated Calculation

- Removes the use of profits that wouldn't have been attainable even if the resource followed dispatch, allowing for more cost recovery
- More equitable treatment across all resources that are not following dispatch
- Simplified and more intuitive

Refresher Excel Example Format Template

- Identical examples from January 2024 meeting*
- PJM added a new scenario 4 that includes new proposed and comparison calculations
- Scenario 4 includes new key points and takeaways

**original 1-3 scenarios for each example remain unchanged*

Next Steps

The calculation and examples presented at today's meeting address resources with only energy assignments.

- The calculation also applies to resources that also have ancillary service assignments or manual dispatch instructions; however, adjustments to the RT MW and/or the Tracking Desired MW used in the calculation are needed to prevent double counting of revenues/costs across markets.
- PJM and the IMM plan to discuss these adjustments at the next committee meeting.

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 – Desired MW Calculations

Member Hotline

(610) 666 – 8980

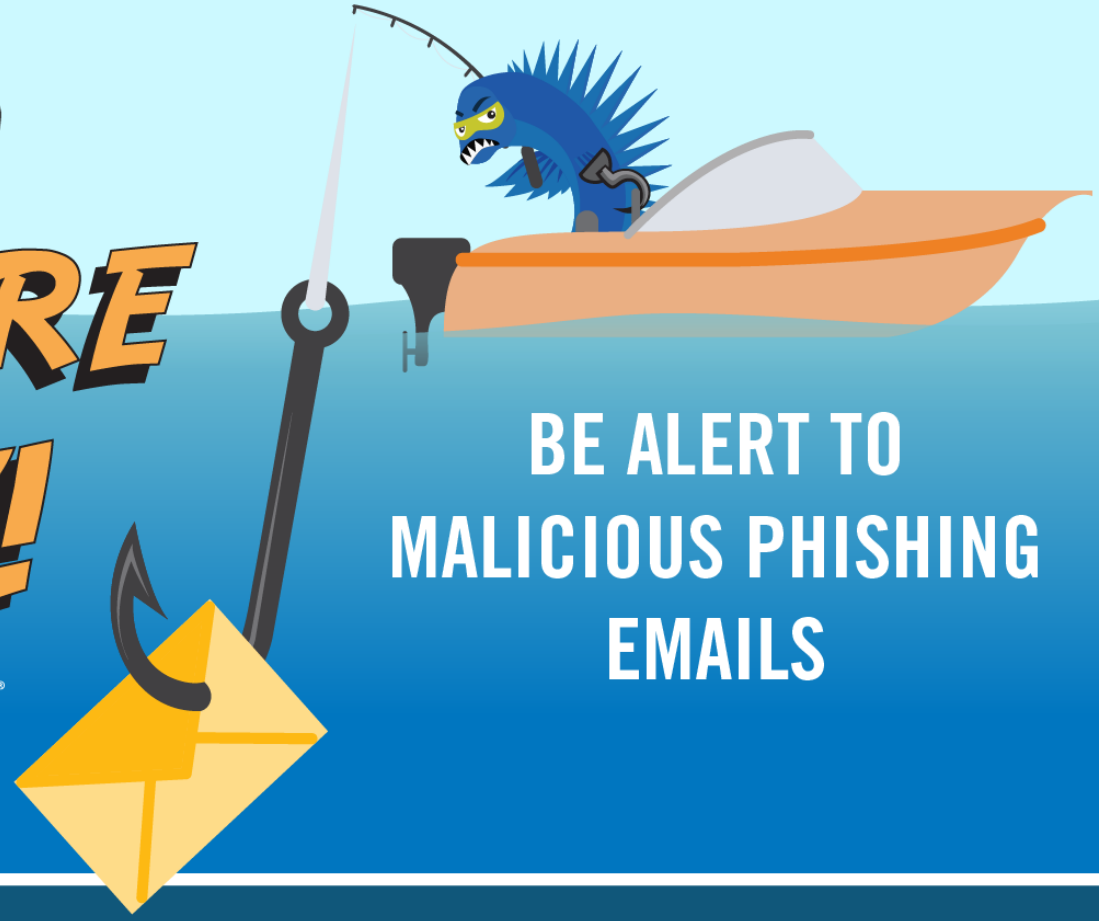
(866) 400 – 8980

custsvc@pjm.com

PROTECT THE POWER GRID

THINK BEFORE YOU CLICK!

pjm



BE ALERT TO MALICIOUS PHISHING EMAILS

Report suspicious email activity to PJM.

Call (610) 666-2244 or email it_ops_ctr_shift@pjm.com