Follow-Up Education on Performance Assessments and Obligations

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Context / Purpose of this Presentation

Follow-up to discussion and a request from stakeholders at the last RASTF meeting to review ***status quo*** rules on performance expectations and obligations of capacity resources

Specific example under discussion at the time was considering performance and obligations of a solar resource at night

Focused on clarifying distinction between obligations under the energy market must offer requirements and the Expected Performance level of committed generation capacity resources during Performance Assessment Intervals (PAIs) under status quo rules

Review of Status Quo Obligation Requirements for Generation Capacity Resources

Energy Market Must Offer Obligation

- Committed Generation Capacity Resources must offer their available capacity in the energy market (to the extent it has not been rendered unavailable by an outage)

Must offer quantity:

- **Conventional Generation:** ICAP equivalent of the committed UCAP MW
- **Intermittent / Storage:** Must offer but quantity may vary hour to hour from capacity commitment

PAI Expected Performance

- Committed Generation Capacity Resources assessed against their "Expected Performance" level when in an Emergency Action that triggers a PAI

Expected Performance quantity:

- **All Generation:** Committed UCAP MW * Balancing Ratio

- A shortfall is assessed if performance falls below Expected Performance, unless qualified for an excusal:
  - On a generator planned or maintenance outage approved by PJM
  - Was not scheduled to operate or scheduled down by PJM, unless the reason the MW were not scheduled was due to an operating parameter limitation of such resource or submission of a market-based offer higher than cost-based offer

Illustrative Example 1 (PAI at Noon)

Scenario

- PAI occurs **at noon** in the summer for RTO
- Balancing Ratio (B) for the PAI = 80%
- Three of the units assessed shown in table to the right
  - Two thermal units, one on a forced outage
  - 1 solar unit, forecast and scheduled MW at 80 MW during this PAI

	Thermal 1	Thermal 2	Solar 1
Installed Capacity / Nameplate MW	100	100	100
EFORd (%) or ELCC Rating (%)	10%	30%	65%
Committed UCAP MW	90	70	65
Forced Outage MW	-	100	-
Energy Market Must Offer Obligation	100	0	80
Scheduled MW	100	0	80
PAI Actual Performance	100	0	80
PAI Expected Performance (UCAP * B)	72	56	52
PAI Performance Shortfall / Bonus	28 MW (Bonus)	56 MW (Shortfall)	28 MW (Bonus)

Takeaway:

- All units satisfied energy market must offer obligation
- Thermal 2 failed to satisfy PAI obligation and subject to penalty charges (not excused for forced outage); Thermal 1 and Solar 1 both performed above PAI obligation and eligible for bonus credits.

Illustrative Example 2 (PAI at Night)

Scenario

- PAI occurs **at night** for the RTO
- Balancing Ratio (B) for the PAI = 80%
- Three of the units assessed shown in table to the right
  - Two thermal units, one on a forced outage
  - 1 solar unit, forecast and scheduled MW at zero during this PAI

	Thermal 1	Thermal 2	Solar 1
Installed Capacity / Nameplate MW	100	100	100
EFORd (%) or ELCC Rating (%)	10%	30%	65%
Committed UCAP MW	90	70	65
Forced Outage MW	-	100	-
Energy Market Must Offer Obligation	100	0	0
Scheduled MW	100	0	0
PAI Actual Performance	100	0	0
PAI Expected Performance (UCAP * B)	72	56	52
PAI Performance Shortfall / Bonus	28 MW (Bonus)	56 MW (Shortfall)	52 MW (Shortfall)

Takeaway:

- Again, all units satisfied energy market must offer obligation
- No change from Example 1 in PAI results for Thermals 1 and 2; however, Solar 1 performed below PAI obligation in this example and subject to penalty (not excused for inability to provide MW at night)

Additional Reference Material on Status Quo Performance and Obligation Rules

RASTF Education on KWAs 4, 5 and 6:
item-02---education-on-capacity-resources.ashx (pjm.com)

PAI Settlement Summary:
performance-assessment-settlement-summary.ashx (pjm.com)

MIC Education on PAIs:
20200923-item-03-pai-education.ashx (pjm.com)

Appendix: Prior Education on PAIs

Performance Obligation of CP Resources

OATT, Attachment DD, Section 5.5A Capacity Resource Types

- "Capacity Performance Resources are Capacity Resources which, to the extent such resources cleared in a Reliability Pricing Model Auction or are otherwise committed as a Capacity Resource, are obligated to deliver energy during the relevant Delivery Year as scheduled and/or dispatched by the Office of Interconnection during the Performance Assessment Intervals."
- "Capacity Performance Resources that fail to meet this obligation will be subject to a Non-Performance Charge, unless excused pursuant to Tariff, Attachment DD, section 10A(d)t."

Performance windows for certain resource types:

– Summer-Period CP Resources: June – October and following May of Delivery Year

– Winter-Period CP Resources: November – April of Delivery Year

– Demand Resources: 10 AM – 10 PM (Jun – Oct. and following May); 6 AM – 9 PM (Nov. – Apr.)

Performance Assessment Interval

- Performance Assessment Interval (PAI) shall mean each Real-time Settlement Interval for which an Emergency Action has been declared by PJM.
- Emergency Actions shall mean any emergency action for locational or system-wide capacity shortages that either utilizes pre-emergency mandatory load management reductions or other emergency capacity, or initiates a more severe action.
- Performance is assessed for each interval that PJM declares specific actions or warnings.
- Compare a resource's Expected Performance against Actual Performance for each Performance Assessment Interval.

Performance Assessment Interval

Performance Assessment Interval (PAI) shall mean each Real-Time Settlement Interval for which an Emergency Action has been declared by PJM.

PAI Triggers:

Steps 1–10 in Sections 2 and 5 of Emergency Procedures Manual 13
Pre-Emergency Load Management Reduction Action (30, 60 or 120 minutes)
Emergency Load Management Reduction Action (30, 60 or 120 minutes)
Primary Reserve Warning
Maximum Generation Emergency Action
Emergency Voluntary Energy-Only Demand Response Reduction Action
Voltage Reduction Warning & Reduction of Critical Plant Load
Curtailment of Non-Essential Building Load
Deploy All Resources Action
Manual Load Dump Warning
Voltage Reduction Action
Manual Load Dump Action

Section 5.7 of Emergency Procedures Manual 13
Load Shed Directive

Warnings
Actions

Hot Weather Alerts and Cold Weather Alerts **ARE NOT** triggers

Assessed Resources

- Performance assessment encompasses all resources (including energy-only) located in the area defined by the Emergency Action
  - When Emergency Procedures are called for the RTO or a given Zone, all resources in the defined region included in assessment
  - For sub-zonal events that are a result of a transmission-related emergency, the list of units assessed are based on ability to help the constraint
  - Performance of Demand Resources is only evaluated if dispatched for 30 minutes or more of the clock hour
  - External Generation Capacity Resources included in the assessment if such external resources would have helped resolve the declared Emergency Action

Expected Performance

Resource Type	Expected Performance
Generation Capacity Resource	Committed UCAP * Balancing Ratio
Demand Resource	Committed ICAP *(adjusted to account for linked registrations that were not dispatched)*
Energy Efficiency Resource	Committed ICAP
Price Responsive Demand (effective with 2022/2023 DY)	Nominal PRD Value Committed *(adjusted to account for any PRD registrations in the Emergency Action Area that were not subject to compliance measurement)*
Qualifying Transmission Upgrade	Committed UCAP
Energy-Only Resources	0 MW
Energy Imports	0 MW

Expected Performance during a PAI is calculated based on resource type and CP commitments on the day of PAI.

Actual Performance Calculations

Resource Type	Actual Performance
Generator/Storage	Metered Energy Output + Reserve/Regulation Assignment
Demand Response	Load Reduction + Reserve/Regulation Assignment
Energy Efficiency	PJM Approved Post Installation Load Reduction
Qualifying Transmission Upgrade (QTU)	Committed UCAP value if in service, otherwise 0 MW
Net Energy Imports	Net Energy Imports – Net Energy Exports – Energy from External Generation Capacity Resource. If negative, actual performance is 0 MW.
Price Responsive Demand (PRD) *	The sum of the actual load reduction for PRD registrations measured for compliance

* Effective in the 2022/2023 Delivery Year

Calculation of Performance Shortfalls

Initial Performance Shortfall =

Expected Performance – **Actual Performance**

- **Positive number** indicates potential under-performance (shortfall)
- **Negative number** indicates potential over-performance (Bonus Performance)

- Performance shortfalls are determined for each PAI separately
- A positive initial performance shortfall may be adjusted downward due to Excused MW:
  - Approved Generator Planned Outage or Generator Maintenance Outage
  - Not scheduled to operate or scheduled down (unless this was due to an operating parameter limitation or submission of a market-based offer higher than cost-based offer)
- Note: Performance of Demand Resources in the PAI is netted within a seller's portfolio to determine a net positive or negative shortfall MW for the seller

Non-Performance Charge

Committed resource with a positive Final Shortfall MW for PAI/PAI Area is subject to **Non-Performance Charge =**

Final Shortfall MW for PAI/PAI Area × **Non-Performance Charge Rate ($/MW-interval)**

Non-Performance Charge Rate is based on yearly Net CONE (for CP commitments), a divisor (i.e., an assumed 30 Emergency Action hours per year), and the number of Real-Time Settlement Intervals in an hour.

Non-Performance Charge Rate

CP Non-Performance Charge Rate ($/MW-interval) =

[(LDA Net CONE ($/MW-day in ICAP terms) for which the resource resides * Number of days in DY) / 30] / Number of Real-Time Settlement Intervals in an hour.

If LDA Net CONE = $300/MW-day,

the Non-Performance Charge Rate =

[($300/MW-day * 365 days) / 30] / 12 = $304.17/MW-interval

Modeled LDAs and respective Net CONE values are provided in DY BRA Planning Parameters posted on Capacity Market (RPM) web page.

Stop-Loss

- Stop-loss provisions limit the total Non-Performance Charge that can be assessed on each Capacity Resource.
- **The maximum yearly Non-Performance Charge =**

  1.5 * Applicable LDA Net CONE * 365 days * max daily CP UCAP MW commitment from June of the Delivery Year through the end of the billing month for which the Non-Performance Charge was assessed.

  Stop-loss for Seasonal Capacity Performance Resource considers the number of days in the applicable season .

Allocation of Bonus Dollars

- Revenue collected from payment of Non-Performance Charges is distributed to resources (of any type, even if they are not Capacity Resources) that perform above expectations during each PAI.
  - The credit is based on the ratio of its Bonus Performance quantity to the total Bonus Performance quantity (from all resources and PRD Providers for the same PAI).
  - The bonus performance credit rate on a per MW basis may fall below the penalty rate, particularly when there are a large number of Excused MW during a PAI

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