Performance Assessment Interval Education Workshop
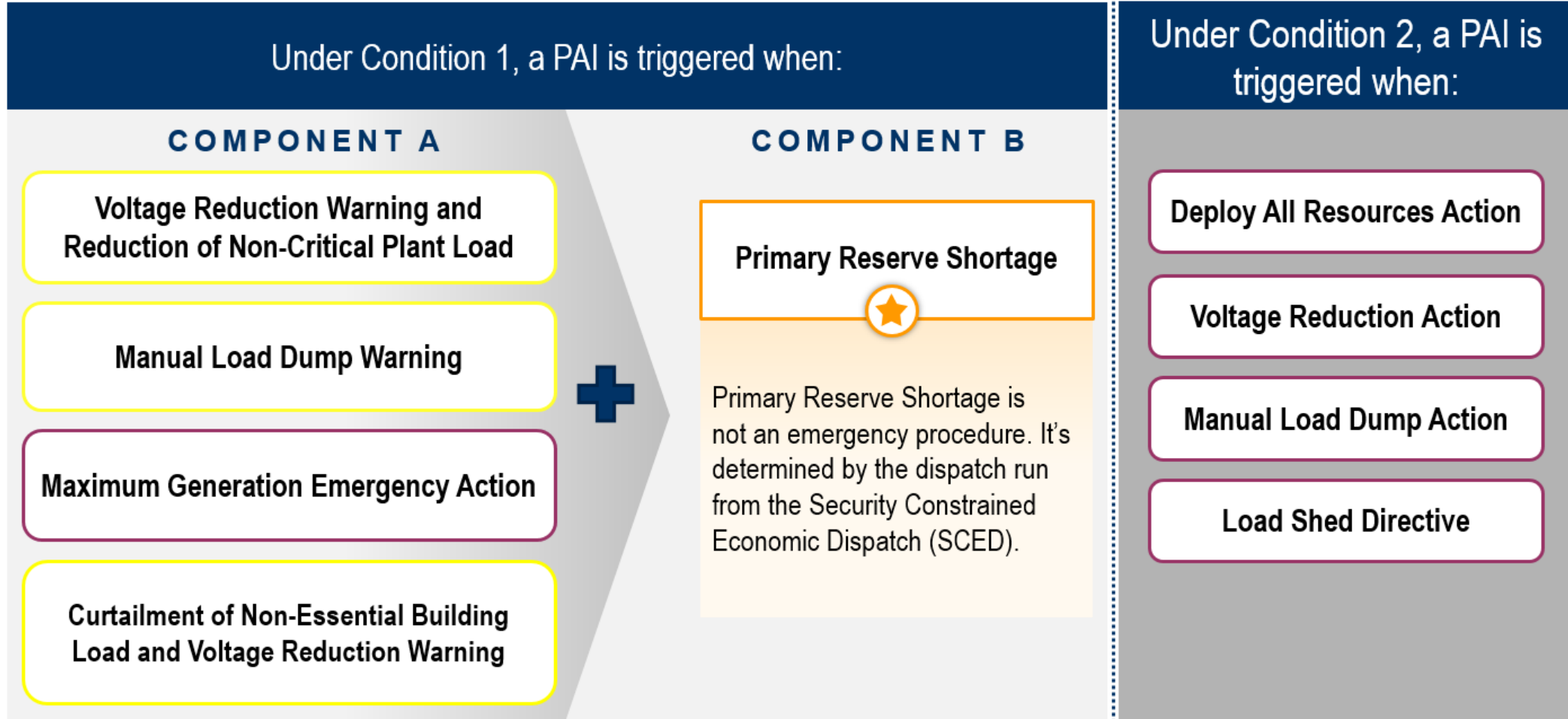
December 11, 2023

Melissa Pilong - Lead Analyst, Performance Compliance

Vijay Shah - Lead Engineer, Real-Time Market Operations

- On July 28, 2023, the Commission issued an order accepting the changes to the definition of Emergency Action, for purposes of determining Performance Assessment Intervals (PAI).
  - Docket No. ER23-1996
  - Filed on May 30, 2023 and subsequent filing on June 20, 2023
  - Effective date of July 30, 2023
  - Compliance filing August 28, 2023; Accepted October 2, 2023

Emergency Conditions: All Conditions Must Be for Reserve Zone (RTO) or Sub-Zone*

Under Condition 1, a PAI is triggered when:

COMPONENT A

- Voltage Reduction Warning and Reduction of Non-Critical Plant Load
- Manual Load Dump Warning
- Maximum Generation Emergency Action
- Curtailment of Non-Essential Building Load and Voltage Reduction Warning

+

COMPONENT B

Primary Reserve Shortage ⭐

Primary Reserve Shortage is not an emergency procedure. It's determined by the dispatch run from the Security Constrained Economic Dispatch (SCED).

Under Condition 2, a PAI is triggered when:

- Deploy All Resources Action
- Voltage Reduction Action
- Manual Load Dump Action
- Load Shed Directive

Current active sub-zone is MAD.

- Effective July 30, 2023, a MW shortage of the Primary Reserve requirement (Step 1 of the ORDC), **as detected by the dispatch run from the security constrained economic dispatch**, coupled with certain emergency procedures can trigger a PAI

  – It is possible to move in and out of shortage with each approved SCED case (i.e. PAI could change status active/inactive every 5 minutes)

- In the event multiple RT SCED cases are approved for a given target time, the latest approved RT SCED case for target time will be utilized

  – PJM is required to utilize the latest approved SCED case for each target time for RT pricing (Per OA, Schedule 1, Section 2.5)
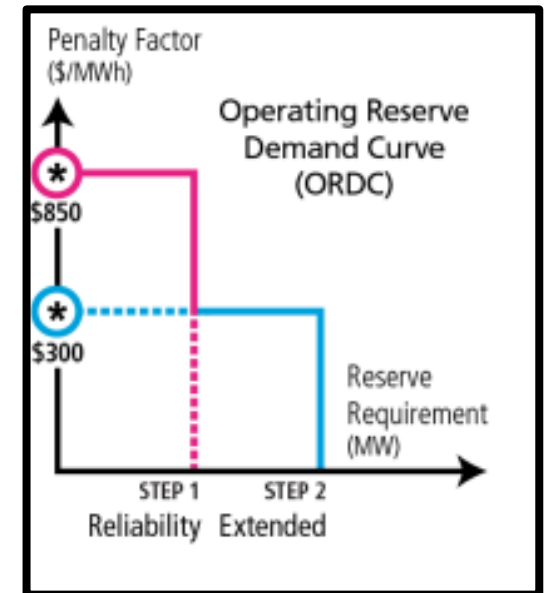
Please see appendix for details on ORDC.

Performance Assessment Interval (PAI) Trigger Matrix

Condition 1 (Component A + Component B): Emergency Procedures and Primary Reserve Shortage (triggered from the latest approved Dispatch Run case on a 5-minute interval basis)

Emergency Procedures Issuance and Reserve Area		Primary Reserve Shortage Issuance (Reserve Area)			
		RTO	MAD Only	RTO and MAD	None
		RESOURCES ASSESSED:			
Voltage Reduction Warning and Reduction of Non-Critical Plant Load	RTO	Entire RTO	All MAD resources assessed	Entire RTO	No assessment
	MAD	No Assessment		All MAD	
Manual Load Dump Warning	RTO	Entire RTO		Entire RTO	
	MAD	No Assessment		All MAD	
Maximum Emergency Generation Action	RTO	Entire RTO		Entire RTO	
	MAD	No Assessment		All MAD	
Curtailment of Non-Essential Building Load and Voltage Reduction Warning	RTO	Entire RTO		Entire RTO	
	MAD	No Assessment		All MAD	

Condition 2: Emergency Procedures

Emergency Procedures Issuance and Reserve Area		Resources Assessed
MAD	Deploy All Resources Action	**MAD** resources assessed
	Voltage Reduction Action	
	Manual Load Dump Action	
	Load Shed Directive	
RTO	Deploy All Resources Action	**Entire RTO** resources assessed
	Voltage Reduction Action	
	Manual Load Dump Action	
	Load Shed Directive	

Notes:

- Determination of shortage conditions is subject to the Real-Time LMP Verification process following the operating day.
- The list of currently effective MAD resources can be found using the following link: https://dataminer2.pjm.com/feed/sync_pri_reserves_resources_list/definition. **NOTE**: All RPM capacity committed resources have an obligation to respond and are subject to assessment.
- The above list under Conditions 1 & 2 is inclusive of all potential Emergency Procedures that could trigger a PAI. Any other Emergency Procedures (including, but not exclusive to Primary Reserve Alert, Maximum Generation Emergency/Load Management Alert, etc.) **are not** PAI triggers.

- Emergency Procedures (12/11/23)

- ICCP / DNP Communication (12/12/23)

- New Data Miner Feeds (12/12/23)

  – Preliminary

  – Final

- PJM Now

- PJM Website

- New language in all the banners related to PAI

  - New language on following slide image

- The PAI Guidance tab has been removed

- Places that used to say "PAI" (e.g. "PAI Only" checkbox on the Postings page) now say "PAI Trigger"

NOTE: Active PAI Trigger Message banner in Emergency Procedures application will be displayed when any of the Emergency Procedures listed under Condition 1 or 2 are active for any region (including TO zone, sub-zone, or non-reserve zone region) regardless of whether or not component B (primary reserve shortage) exists.

Emergency Procedures - Test

Feedback

Postings

A PAI Trigger EP Message is active.
Go to Data Miner for further information on PAI.

Drill: A PAI Trigger EP Message is active.
Go to Data Miner for further information on non-Drill PAI events.

| Postings | Message Definitions | Message Priorities | Postings Report | Regions | Emergency Bid Form |

Effective From * 11/28/2023 Effective To * 11/30/2023 Regions ⌄ Message Types ⌄ PJM Drill Include ⌄ ☐ Active Only ☑ PAI Triggers Only Profile PJM Default Profile ⌄ Reset

XML

Last Updated: 11.30.2023 08:37:00 Filters: 11/28/2023 to 11/30/2023; Include PJM Drill; PAI Only

Records Per Page: 15 ⌄ « ‹ (1 of 1) › »

History	Msg ID	Priority	Message Type	Effective Start Time	Regions	Emergency Message	Effective End Time
		All ⌄					
⊙	105388	■ Action	Maximum Generation Emergency Action	11.22.2023 14:42	PJM-RTO	**Active PAI Trigger Message Type** A Maximum Generation Emergency Action has been issued.	
⊙	105372	■ Action	DRILL - Maximum Generation Emergency Action	11.21.2023 09:22	MIDATL	**Drill: Active PAI Trigger Message Type** A Maximum Generation Emergency Action has been issued.	
⊙	105371	■ Action	Maximum Generation Emergency Action	11.21.2023 09:21	DOM	**Active PAI Trigger Message Type** A Maximum Generation Emergency Action has been issued.	

Records Per Page: 15 ⌄ « ‹ (1 of 1) › »

All times are in EPT

- There is an option for generating entities to receive preliminary PAI Triggers via SCADA/ICCP if condition 1 or 2 are met:
  - PAI Event Telemetry Values
    - 0 = Invalid
    - 1 = PAI Event
    - 2 = No PAI Event
    - 3 = PAI Drill
- Requesting PAI Trigger via ICCP or DNP:
  - **DNP**: Send email to PJMDNPSCADA@pjm.com
  - **ICCP**: Send email to PJMTelemetrySupport@pjm.com
  - Element 'CPEVENT'
- For more information on this request, please see Q12 in the [Generator Onboarding FAQ](#)

- Data Miner will have 2 new feeds for Performance Assessment Intervals:
  - Five Minute PAI Intervals Feed
    - Preliminary intervals provided in real-time, during an event
    - Results from Condition 1 and 2 will be outputted to the feed
    - Data will populate every 5 minutes, indicating the following values
      - No PAI
      - PAI in Active Subzone Only
      - PAI in RTO and Active Subzone

- Verified Performance Assessment Intervals Feed
  - The final, verified intervals which will be used in Settlements
  - Data will only be available if a PAI has occurred
  - Data will be available within 2 business days following the event

*Only the final set of data provided in the Data Miner Feed constitutes PJM's declaration of Emergency Actions for purposes of Performance Assessment Intervals

Link to TRN Environment: https://dataminer2-train.pjm.com/feed/fivemin_pai_interval

*Sample Data Only

Data Miner – Verified Intervals

Link to TRN Environment: https://dataminer2-train.pjm.com/feed/final_pai_interval

- PJM Now Mobile Application – Used for Preliminary PAI information Only!
  - Alert Settings
    - Users can view PAI interval information by tapping on "Performance Assessment Intervals" in the top section.
    - Users can allow alerts to be shown when PAIs are issued by using the toggle in the Settings section at the bottom.
  - PAI List – List of all intervals for the last 15 days in reverse chronological order and their PAI status
  - In-app Alert – Shown to the user when they are in PJM Now and a PAI is issued
  - Banner Alert – Shown to the user when they are not using the app and a PAI is used (exact style and screen location determined by the operating system)
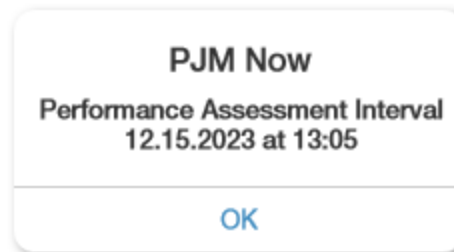 - New version of PJM Now will be available in mid-December
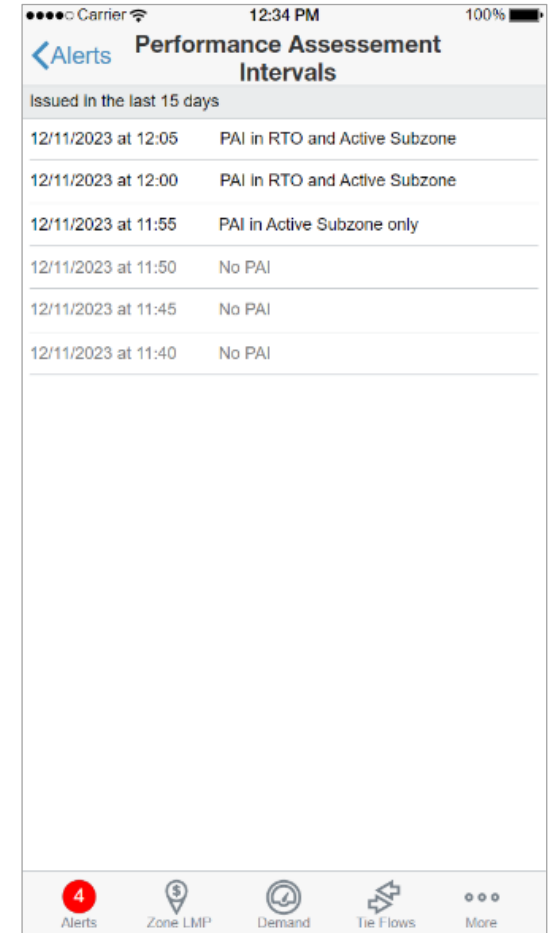
Alert Settings
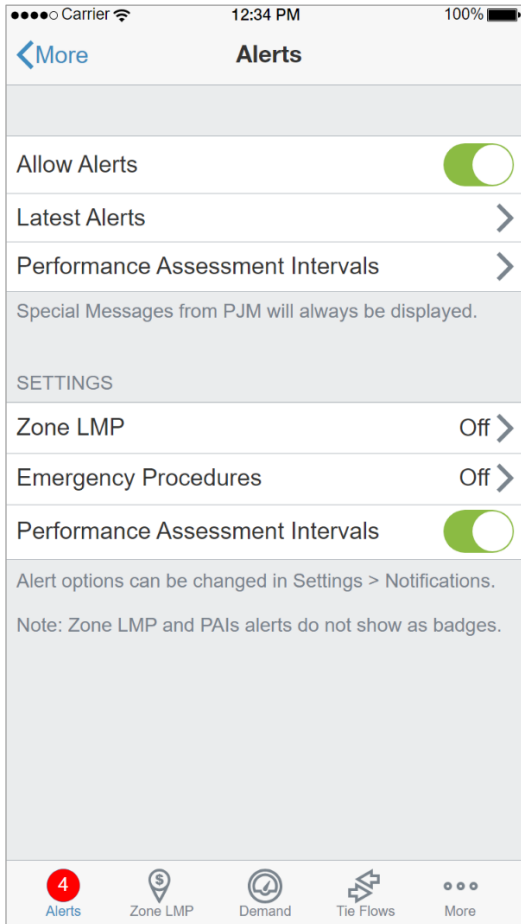
Banner Alert
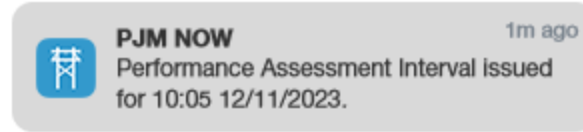
In-App Alert

PAI List

- PJM.com Markets & Operations page (https://www.pjm.com/markets-and-operations/)
  - PAI indicator in Today's Outlook section
  - End of December release – Label on the indicator will be updated to "Preliminary Performance Assessment Interval"
  - End of January release – Logic will be updated to use the new Data Miner feed. The indicator will be pink if the current interval value has an issued PAI.
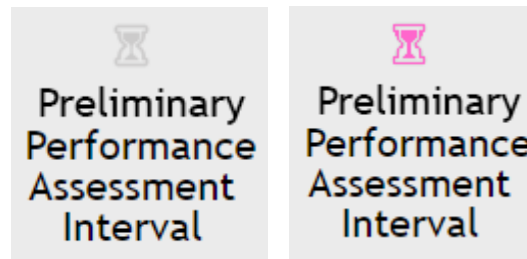
Presenter:
For Questions:
custsvc@pjm.com

Performance Assessment Interval Education

Member Hotline

(610) 666 – 8980

(866) 400 – 8980

custsvc@pjm.com

Appendix

- Manual 11, Section 2.19 Notification of a Performance Assessment Interval (New Section)

  – Describes that the initial notification of a PAI will be based on a Primary Reserve Shortage condition from the dispatch run solution

  – Provides guidance on how the indication of a potential PAI will be communicated

- Manual 13, Section 2.3.2 and 5.2

  – Modified or deleted notes regarding PAI

- Manual 18, Section 8.4A Non-Performance Assessment

  – Provides updated guidance on what would trigger a Performance Assessment Interval (PAI) and which resources would be subject to assessment

Emergency Action:

"Emergency Action" shall mean (1) any megawatt shortage of the Primary Reserve Requirement (as specified in the PJM Manuals) in a Reserve Zone or Reserve Sub-zone, inclusive of any adjustments to such requirement to account for system conditions, as determined by the dispatch run from the security constrained economic dispatch and where, as specified in the PJM Manuals, there is also a Voltage Reduction Warning and reduction of non-critical plant load, Manual Load Dump Warning, Maximum Generation Emergency Action, or the curtailment of non-essential building loads and Voltage Reduction Warning that encompasses such Reserve Zone or Reserve Sub-zone or (2) anytime the Office of Interconnection identifies an emergency and issues a load shed directive, Manual Load Dump Action, Voltage Reduction Action, or deploy all resources action for an entire Reserve Zone or Reserve Sub-zone.

- If during the execution of the pricing run, the Locational Pricing Calculator determines that a Reserve Shortage exists PJM shall deem the interval to be in a Reserve Shortage. PJM shall implement shortage pricing through the inclusion of the applicable Reserve Penalty Factors in the Real-time LMP and reserve pricing calculations.

- Additionally, two emergency procedure actions invoke shortage pricing:
  - Manual Load Dump Action
  - Voltage Reduction Action

- Shortage pricing is terminated in a Reserve Zone or Reserve Sub-Zone when demand and Reserve Requirements can be fully satisfied with generation and Demand Resources and any Voltage Reduction Action and/or Manual Load Dump Action taken for that Reserve Zone or Reserve Sub-Zone is terminated as determined by the Locational Pricing Calculator.

- Embedded within the Day-ahead and Real-time Market Clearing Engines are Reserve Demand Curves for each Reserve service (Synchronized, Primary, 30-minute) in each Reserve Zone and Sub-Zone, as applicable

  – Step 1 is set to $850 at applicable reserve requirement MW

  – Step 2 is set to $300 at applicable reserve requirement plus 190 MW (extended reserve requirement)

- The maximum energy component of LMP achievable during a Reserve Shortage is the $2,000/MWh energy offer cap, plus $1,700/MWh (two times Penalty Factors from the first step on the demand curves).

Penalty Factor ($/MWh)

Operating Reserve Demand Curve (ORDC)

$850

$300

Reserve Requirement (MW)

STEP 1 Reliability STEP 2 Extended