



PAI Triggers Update

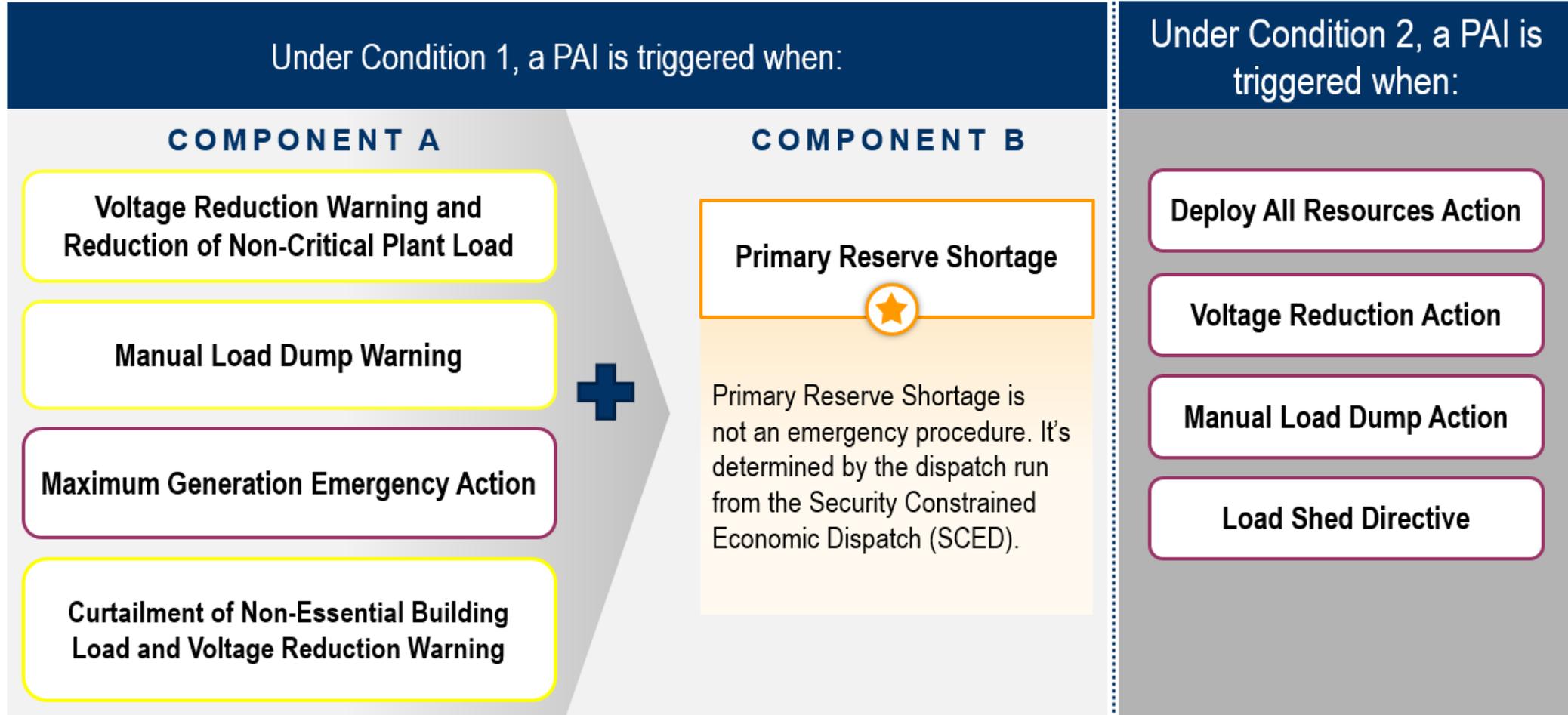
Melissa Pulong, Lead Analyst

Operating Committee

August 10, 2023

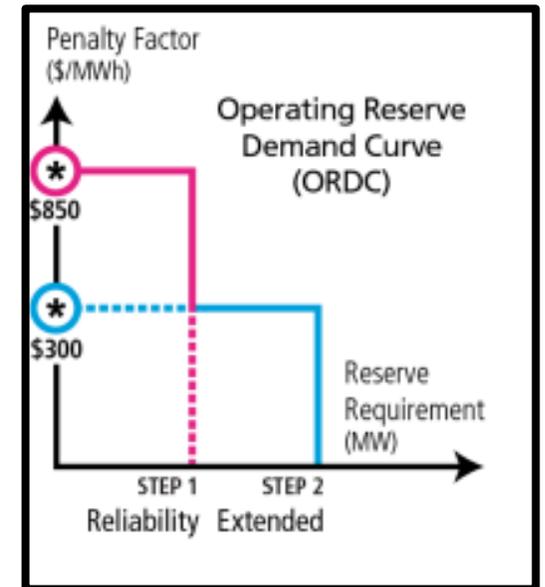
- On July 28, 2023, the Commission issued an order accepting the changes to the definition of Emergency Action, for purposes of determining Performance Assessment Intervals (PAI).
 - Docket No. ER23-1996
 - Filed on May 30, 2023
 - Effective date of July 30, 2023
- In accepting this proposal, the Commission directed PJM to submit a compliance filing by August 28, 2023 to specify the revised definition of Emergency Action, consistent with the order.

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



*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)
- Enhancements in progress to make dispatch run information available



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	
Voltage Reduction Warning and Curtailment of Non-Essential Building Load	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://www.pjm.com/-/media/markets-ops/ancillary/reserve-price-formation/mid-atlantic-dominion-subzone-bus-and-resource-list-effective-20221207.ashx> **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.

Interim Method for PAI Awareness

While interim method for monitoring Primary Reserve Shortage is not an exact match to the defined PAI trigger, participants should use Emergency Procedures as main indicator for when a PAI may occur (where Emergency Action is defined as Emergency Procedure + Primary Reserve Shortage).

Emergency Procedures

Regions

Postings | Message Definitions | Message Priorities | Postings Report | PAI Guidance | **Regions** | Emergency Bid Form

Name ↑↓	Type ↓	States ↓	Description ↓	Parent Region ↓	Reserve Areas ↓
AECO	Transmission Zone	NJ	Atlantic City Electric (Exelon)	MIDATL	PJM-RTO, MAD
BGE	Transmission Zone	MD	BGE (Exelon)	MIDATL	PJM-RTO, MAD
DOM	Control Area	NC, VA	Dominion Virginia Power	SOUTHERN	PJM-RTO, MAD
DPL	Transmission Zone	DE, MD, VA	Delmarva Power (Exelon); including Accomack & Northampton counties in VA	MIDATL	PJM-RTO, MAD
FE-JC	Transmission Zone	NJ	Former GPU: Jersey Central Power & Light (FirstEnergy; FE-East)	MIDATL	PJM-RTO, MAD
FE-ME	Transmission Zone	PA	Former GPU: Met-Ed (FirstEnergy; FE-East)	MIDATL	PJM-RTO, MAD
FE-PN	Transmission Zone	PA	Former GPU: Penelec (FirstEnergy; FE-East)	MIDATL	PJM-RTO, MAD
MIDATL	Region	DC, DE, MD, NJ, PA, VA	PJM Mid-Atlantic Region/CZ; including Accomack & Northampton counties in VA	PJM-RTO	PJM-RTO, MAD
PECO	Transmission Zone	PA	PECO (Exelon)	MIDATL	PJM-RTO, MAD
PEPCO	Transmission Zone	DC, MD	PEPCO (Exelon)	MIDATL	PJM-RTO, MAD
PPL	Transmission Zone	PA	PPL Electric Utilities	MIDATL	PJM-RTO, MAD
PSEG	Transmission Zone	NJ	PSE&G (PSEG)	MIDATL	PJM-RTO, MAD
RECO	Transmission Zone	NJ	Orange & Rockland: Rockland Electric Company	MIDATL	PJM-RTO, MAD
SMECO	Transmission Zone	MD	Southern Maryland Electric Cooperative	MIDATL	PJM-RTO, MAD
SRE	Transmission Zone	NJ	Silver Run Electric, subsidiary of LS Power	MIDATL	PJM-RTO, MAD
UGI	Transmission Zone	PA	UGI Electric Service	MIDATL	PJM-RTO, MAD

- Monitor [Emergency Procedures Tool](#) for applicable procedures (see Condition 1, Component A and Condition 2 on Slide 3)
- Note that applicable procedure must be issued for PJM-RTO or MAD reserve areas in order to potentially trigger a PAI
- MAD mapping can be referenced under the ‘Regions’ tab → Reserve Areas

Shortage Pricing Indicator



- Primary reserves assigned in the dispatch run are not presently posted in Data Miner in Real-Time
- For close real-time proxy, monitor Shortage Pricing* indicator on [PJM.com](https://www.pjm.com)
- Reserve MW quantities from the dispatch run are currently posted on a one business day lag in the [Real-Time Ancillary Service Market Results](#) feed in Data Miner

*Although the Shortage Pricing indicator is reflective of results from the pricing run from the security constrained economic dispatch solution, it can provide a close real-time proxy for the dispatch run results.

- PJM is actively working on an implementation plan regarding “PAI awareness” mechanisms, with impacted changes to the following applications:
 - Data Miner
 - PJM Now
 - PJM.com
 - ICCP
 - Emergency Procedures
- Due to the complexities involved in order to accurately provide this notification, an exact implementation date is not available at this time
 - Goal is to implement ahead of winter operations
- PJM will keep members updated on the status of these software changes through the Tech Change Forum

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PAI Triggers



Member Hotline

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Appendix



Draft Compliance Redlines to Emergency Action Definition

Emergency Action:

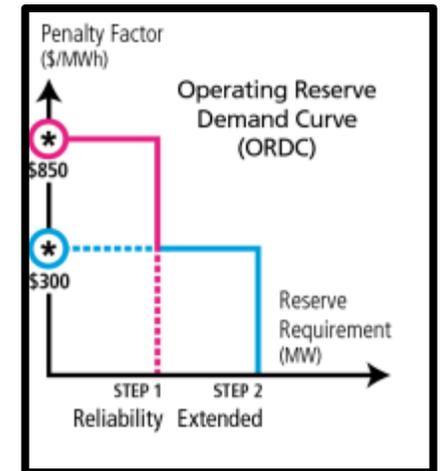
“Emergency Action” shall mean (1) any megawatt shortage of the Primary Reserve Requirement (as specified in the PJM Manuals) in a Reserve Zone or Reserve Sub-zone, inclusive of any adjustments to such requirement to account for system conditions, as determined by the dispatch run from the security constrained 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 ~~Emergency~~ Generation Emergency Action, or the curtailment of non-essential building loads and ~~V~~voltage ~~R~~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.

Proposed language for compliance filing is consistent with PJM’s June answer.

- 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).



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