Storage As Transmission Asset (SATA) Phase 2 Package Summary

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Why Storage as a Transmission Asset Benefits PJM & Other RTOs

Enhancing grid reliability and operational efficiency

Strategic Value of Storage As Transmission Asset for PJM

Deferring Transmission Upgrades

Defers or avoids traditional wired solution investments while meeting the same identified transmission need as identified in RTEP.

Functions as wired solution

Functions explicitly as a transmission substitute by relieving congestion or managing power flows during post contingency constrained conditions.

Faster Deployment Alternative

Storage as Transmission Asset can be deployed within one to three years, offering faster solutions than traditional transmission projects.

Ratepayer and Policy Alignment Benefits

Lowers long-term costs, reduces siting and permitting risk, and aligns with state and federal decarbonization and grid modernization goals.

Strategic Value of Storage As Transmission Asset for PJM

FERC Order No. 890

- Qualifies as a transmission solution when planned and operated to meet identified needs

FERC Order No. 1000

- Defers or avoids traditional wires investments while meeting the same reliability or congestion drivers as transmission facilities
- Provides a faster, adaptable alternative to new lines within the regional transmission planning process

Setting the stage

Gating criteria/expectations:

- Small MW’s, local issue, high local DFAX
- Expect SATA to operate 4 hours or less
- Post-contingency (n-1), will be offline for the most part
- Solution will be similar to wired solution
- Solution will come from RTEP Planning studies, determined to be the most cost-effective solution compared to other wired solutions

- January OC SATA Education

Key Takeaways

- SATA is a price taker
- SATA does not offer into the PJM Energy Market
- Impact for wired solution vs. SATA impact is the same
- Used by Operations similar to a transmission wired solution

SATA Phase 2 Package Summary

#	Design Components[1]	Priority	Status Quo	Package A - PJM/Constellation
*	Implementation			
1	Operation of the SATA	High	None	SATA must mitigate the identified RTEP violation. SATA operating types may include: 1) Pre-contingency response (automatic) 2) Post-contingency response (automatic) 3) Local load security (automatic)

- Operation of SATA will be automatic for identified RTEP violation it was studied to mitigate.

SATA Phase 2 Package Summary

#	Design Components[1]	Priority	Status Quo	Package A - PJM/Constellation
2	Charge/Discharge of SATA	High	None	PJM establishes timeframes when charge and discharge schedules can be accomodated. Discharge occurs when needed to solve identified RTEP violation. Asset owners responsible for maintaining state of charge and submitting schedules to PJM.

- Discharge occurs to mitigate RTEP violation resource designed to resolve.
- Charge occurs after designed use, coordinated with PJM, asset owner responsible

SATA Phase 2 Package Summary

#	Design Components[1]	Priority	Status Quo	Package A - PJM/Constellation
3	Telemetry of SATA	High	None	SATA Telemetry requirements same as ESR
4	Telemetry State of Charge of SATA	High	None	SATA State of Charge requirement same as ESR
5	Metering Requirement of SATA	High	None	POI - Revenue grade meter, ESR - output telemetry standard telmetery scan rate (2-10 seconds)

- Telemetry for SATA will be same as energy storage resources and include state of charge. Metering is revenue grade meter.

SATA Phase 2 Package Summary

#	Design Components[1]	Priority	Status Quo	Package A - PJM/Constellation
6	Voltage Level	High	None	SATA will operate at intended use as per RTEP study.

- Operated at voltage as studied in RTEP

SATA Phase 2 Package Summary

#	Design Components[1]	Priority	Status Quo	Package A - PJM/Constellation
7	SATA Status	High	None	Battery is offline, available to enable for its intended use of the asset

- SATA will be considered offline and available to enable for intended use.

SATA Phase 2 Package Summary

#	Design Components[1]	Priority	Status Quo	Package A - PJM/Constellation
8	SATA Settlements	High	None	The resource payment and cost allocation for SATA for the Annual Transmission Revenue Requirement will be handled via Schedule 12 billing - Transmission Enhancement Credits. SATA resource will be paid via normal Energy Settlements for energy injections/withdrawals reported via Power Meter. To avoid double compensation, the SATA owner must account for any Energy revenues earned in the formulation of the next year's Annual Transmission Revenue Requirements. SATA resources should be modeled in separate sub-accounts to facilitate accurate accounting of Energy settlements for actual charging/discharging payments.

- Cost of service per Schedule 12 Transmission Enhancement Credits (TEC).
- As resource discharges for intended use, and charges to get ready for next use, settlements calculates amounts, kept in separate sub-account.

SATA Phase 2 Package Summary

#	Design Components[1]	Priority	atus Quo	Package A - PJM/Constellation
9	Interconnection Queue Entry	High	None	Ineligible to enter the interconnection queue
10	Market Participation	High	None	Ineligible to partipate in PJM markets, SATA is a price taker when operated for intended purpose, energy only resource, no capacity value.

- Not allowed in Queue
- Does not participate in PJM markets, no capacity value

Anticipated Impacts to Tariff/OA

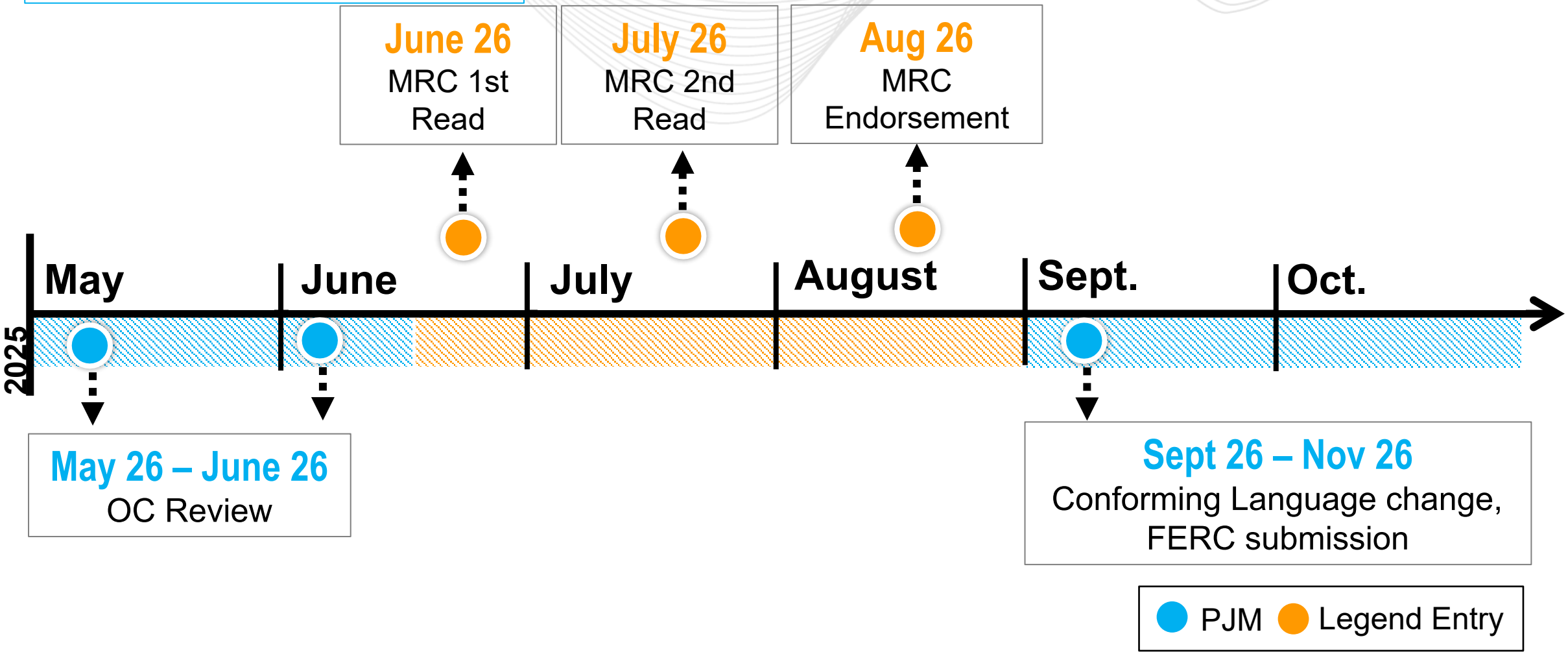
- Schedule 12 – Determination in how to determine the cost of recovery as Transmission Enhancement Credit (TEC)
- Schedule 6 – delineate the details of SATA proposal including but not limited to:
  - Capital cost, useful life, replacement schedule and cost, and other costs
  - Violation(s) addressed, how it addresses reliability issue, capability, assurances, lifecycle costs/comparisons, operating characteristics

Anticipated Impacts/Adjustment of Manuals

- 14A (New Services Queue) – Clarify SATA is not allowed into Queue
- 14D (Transmission Planning Process) - how to operate SATA if needed to charge/discharge
- 14E (RTEP Planning process) –How SATA is handled by RTEP process
- 1 (Control Center and Data Exchange Requirements) Telemetry
- 3 (Transmission Operations) – How to charge, discharge control room ops outside of deployment for RTEP use
- 12 (Balancing Operations) – How to treat as load when charging
- 18 (Capacity) – exclude SATA from capacity market

Review/Endorsement Timeline

PJM Highlighted Time Period



Key Takeaways

1	2	3
• Combined Package PJM + Constellation is being brought forward as one package	• OC will review and move Phase 2 to MRC	• MRC will review Phase 1 and Phase 2 combined package

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Storage As Transmission Asset

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Anticipated Impacts to Tariff/OA*

- Schedule 12 – Determination in how to determine the cost of recovery as Transmission Enhancement Credit (TEC)
- Schedule 6 – delineate the details of SATA proposal including but not limited to:
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* To be discussed at MRC after OC approval combined Phase 1 and Phase 2 package

Anticipated Impacts/Adjustment of Manuals*

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Interest Identification and how addressed

	Interests	Addressed:
1	How SATA will be used in Operations	Automated to address RTEP violation, operated for intended use
2	Identify telemetry & metering requirements associated with battery (SATA) operation	No status quo SATA did not exist, same requirements as ESR
3	What will be the operation procedures for deploying the SATA	Automated to address RTEP violation
4	Who is responsible for directing and operating SATA resource	PJM
5	Who is responsible for maintaining asset state of charge	SATA Owner, asset owner
6	Who is reponsible for setting and evaluating the monitoring priority and voltage levels	Transmission owner sets MP (Status quo)
7	Understand the order of operation of deploying SATA	Automated to address RTEP violation
8	What will the requirement be for size and duration of the transmission asset	To be analyzed in planning when presented as wired solution but expectations are small size (less than 10MW's) and duration less than or equal to 4 hours
9	How will SATA be deployed in terms of automation or manually implemented	Automatic
10	Define how SATA gets settled for charging/discharging operation.	Paid as transmission asset, balanced with charge/discharge price taking
11	Consider current black start reliability resource rules	No changes to black start
12	Incorporating consideration of other RTOs/ISOs SATA rules	All RTO's analyzed and incorporated into education and discussions
13	Understand market impacts of PJM's operational rules for SATA	Market impact from operation of SATA similar to wired switching solution
14	Maintaining focus on operational reliability (including clear rules)	Use cases spelled out in for use in operations
15	Ensure there are no conflicts with rules surrounding Blackstart Reliability Backstop process	No impacts
16	Minimize/eliminate impact of SATA on markets	Market impact from operation of SATA similar to wired switching solution

Previous Discussion September OC

Date:	Working Group:	Link:
November 03, 2025	Operating Committee	SATA Phase 2 - Education SATA Phase 2 - Options and Package Matrix
October 08, 2025	Operating Committee	SATA Phase 2 – Education SATA Phase 2 - Options and Package Matrix (pre-meeting) SATA Phase 2 - Options and Package Matrix (post-meeting)
September 11, 2025	Operating Committee	SATA Phase 1 Proposal SATA Phase 2 – Education SATA Phase 2 Options and Package Matrix
August 7, 2025	Operating Committee	SATA Phase 2 Issue Charge SATA Phase 2 Work Plan SATA Phase 2 Options and Package Matrix

Overall Timeline

- In June of 2020, PJM began analyzing how Energy Storage Resources SATA Problem Statement which initially began looking at all types of resources available and evaluation against planning criteria in this presentation.
- At the conclusion of working item at PC, a package was developed and approved by Planning Committee.
- The package was moved to Markets and Reliability Committee and work was put on hold.
- Phase 2, building upon Phase 1 began as a working item in August of 2025 in Operating Committee

Phase 2 Background

Guiding Principles:

- SATA participation in PJM Markets is out of scope
- SATA operations should be similar to a wired solution
- Operational procedures should be as streamlined as possible
- SATA, during phase 2, is considered transmission only and not generation

Phase 2 Deliverable:

- Detailed design for transmission only asset operation and associated manual and tariff language building on 2020 Phase 1 proposal from Planning Committee

Phase 2 Summary:

- Energy Storage that directly affects transmission power flows by injecting or withdrawing power as dispatched by transmission system operator to solve the reliability solution for which it was intended
- SATA is compensated through regulated transmission rates (rate of return)
- SATA will be operated in alignment with intended use for which it was studied through the reliability analysis in planning

SATA Operations

- Operations solution, detailed design pending outcome of working item at Operating Committee