PJM Response to the 2024 State of the Market Report

August 2025

For Public Use

Contents

Introduction

PJM wishes to recognize the comprehensive and thorough analysis of the PJM markets prepared by Monitoring Analytics in the 2024 State of the Market Report (SOM).[1] The report serves as a valuable source of information and analysis concerning each of the markets operated by PJM. PJM encourages stakeholders to review the document and utilize, to the extent they deem appropriate, the detailed data presented in the report concerning different aspects of the PJM markets.

The SOM contained seven new recommendations that provide the perspective of Monitoring Analytics, the Independent Market Monitor (IMM) or Market Monitoring Unit (MMU) for PJM, regarding changes to the PJM market design, rules and administration intended to enhance the competitiveness, efficiency and durability of PJM's markets. The purpose of this document is to review several of the new recommendations made for 2024, and one existing recommendation made in prior SOM reports, and provide PJM's initial responses as to the applicability of the recommendations to the current market and any next steps for pursuing design enhancements related to the recommendation, including referencing currently ongoing stakeholder engagements.[2]

The 2024 SOM comes during an ongoing period of significant transformation of the PJM system, characterized by a substantial influx of new generation requests into our interconnection queue and a rapid acceleration in the deployment and output of renewable resources, particularly solar power.[3] For instance, PJM has seen a dramatic increase in solar capacity in recent years, with nearly 4,500 MW added in 2024 alone, contributing to record solar output levels, such as the 12,000 MW peak observed in April 2025.[4] (For context, a maximum of less than 4,000 MW of solar output had been observed as of the beginning of 2023, and less than 8,000 MW as of the beginning of 2025.) This rapidly evolving resource mix, coupled with significant increases in data center and other large loads and increasing load forecast uncertainty, underscores the growing importance of robust market design. PJM's reformed interconnection process is making headway, expecting to clear tens of thousands of megawatts of new generation, predominantly renewable and battery resources, by mid-2025 and aiming to process all transition projects by the end of 2026. The increasing penetration of variable resources and the changing operational landscape necessitate a heightened focus on ensuring sufficient reserves and flexibility to manage not only low-probability, high-impact events but also the inherent everyday uncertainty in net load.

Beyond specific recommendations, the SOM's analysis of market outcomes, such as energy uplift, provides information helpful to understanding the operation of PJM markets in this time of rapid transition.[5] PJM notes that periods of significant energy uplift, both during challenging system conditions like extreme weather events as well as more routine conditions such as the rapidly growing morning solar ramp, often highlight a potential misalignment: Operational actions essential for maintaining reliability may not be fully or efficiently compensated through existing energy and ancillary service (E&AS) market price signals. Such uplift can be an indicator that the market is not

[1] Monitoring Analytics, "State of the Market Report for PJM – 2024," March 13, 2025.

[2] New recommendations aimed at parties other than PJM are not discussed here.

[3] PJM Inside Lines: "PJM Generation Interconnection Reforms Continue To Produce Results," June 4, 2025.

[4] Id.

[5] Monitoring Analytics 2024 SOM Report, "Section 4 – Energy Uplift."

adequately valuing or procuring certain reliability attributes needed by the system in real time. This underscores the ongoing need for robust energy and reserve market reforms to ensure that market prices, rather than out-of-market payments, appropriately incentivize the performance and availability of resources critical for reliability.

PJM is proactively addressing these complex E&AS market design issues through dedicated stakeholder initiatives. For example, the Reserve Certainty Senior Task Force (RCSTF) is currently engaged in a comprehensive review of a wide array of potential enhancements. This includes evaluating modifications to the Operating Reserve Demand Curve (ORDC), the development of new or refined reserve and ramping products, the potential for uncertainty products to address unforeseen system needs, and enhancements to energy price formation. These efforts are geared toward creating market mechanisms that better reflect the true cost of energy reliability and ensure that resources possessing critical operational capabilities, such as flexibility and rapid response, are appropriately compensated through market-based revenues.

The challenge lies in designing market rules that effectively value these attributes, especially under conditions of uncertainty and system stress, without creating undue market distortions. This involves grappling with difficult questions regarding, for instance, how to accurately price ramping capability over different time frames, how to ensure resource availability during both routine operations and low-probability, high-impact events, and how to structure ancillary services to precisely meet evolving grid needs, including the need to manage variability from a rapidly expanding renewable fleet and the unique characteristics of certain large load additions. The Federal Energy Regulatory Commission (FERC) has consistently encouraged RTOs/ISOs to develop market-based solutions that minimize reliance on uplift payments, emphasizing the importance of transparent price signals that reflect all costs, including those associated with reliability.[6]

While the MMU's detailed uplift analyses often focus on the application and refinement of existing uplift calculation rules and cost recovery – an essential function for ensuring current market rules are applied correctly and for identifying inefficiencies – PJM's E&AS reform initiatives are exploring more foundational changes. The goal is to evolve the market design itself so that operational needs are more directly translated into market prices and product definitions, thereby reducing the circumstances that lead to uplift. PJM believes that by enhancing market design to better compensate resources for the reliability services they provide, we can foster a more efficient and resilient grid.

PJM looks forward to continuing to engage in productive discussions on these topics with Monitoring Analytics, members and other stakeholders as it remains committed to maintaining forward progress toward more competitive and efficient wholesale electricity markets.

[6] Federal Energy Regulatory Commission, "Energy Price Formation" landing page.

Responses to Selected Recommendations From the 2024 SOM Report

Energy Market

The MMU recommends, in order to ensure effective market power mitigation, that PJM commit all resources that fail the TPS test on their cost-based offers, that the Market Seller designate the cost-based offer if there is more than one, and that PJM implement this solution as soon as possible.

PJM Response

PJM has adopted the recommendation to commit resources on their cost-based offers when they fail the Three-Pivotal Supplier (TPS) test. This approach was detailed in PJM's filing to the Federal Energy Regulatory Commission (FERC) in Docket No. ER24-2905 ("Revisions to the Schedule Selection Process for Offer Capped Resources ... to Accommodate Next Generation Markets Project Enhancements"). This filing outlines that for resources of Market Sellers failing the TPS test, PJM will only commit such resources on their cost-based offer.

Regarding the selection among multiple cost-based offers (e.g., for dual-fuel resources), PJM's FERC-approved methodology, as described in the aforementioned filing, is to select the cost-based offer that results in the lowest dispatch cost, determined by a formulaic approach. While the MMU has expressed a preference for the Market Seller to designate the cost-based offer in such instances, FERC reviewed PJM's proposal, including the MMU's alternative, and found PJM's approach to be just and reasonable in its Order issued on Oct. 25, 2024 (189 FERC ¶ 61,060). PJM believes its approach ensures a consistent, transparent and economically sound selection that mitigates potential market power, while also being computationally manageable for the market clearing engine.

The primary outstanding element of the MMU's recommendation relates to the implementation timeline. The MMU advocates for implementation "as soon as possible." PJM plans to implement these changes concurrently with the deployment of its Next Generation Energy Market (nGEM) clearing engine. This timing is critical due to the significant software development and integration efforts required. As detailed in our ER24-2905 filing, implementing these schedule selection revisions within the initial nGEM software build avoids unnecessary delays and duplicative coding efforts, and ensures the new market clearing engine can effectively handle the enhanced modeling for combined cycle, energy storage and hybrid resources from its inception.

The MMU protested PJM's proposed nGEM-aligned implementation timeline at FERC, advocating for immediate implementation. However, in its Oct. 25, 2024 Order (189 FERC ¶ 61,060), the Commission accepted PJM's proposed revisions with an indefinite effective date tied to nGEM implementation, stating: "Therefore, we find that PJM has demonstrated good cause for waiver of the Commission's prior notice requirements. We believe an undefined effective date is reasonable and recognize PJM's commitment to implement the proposed changes as soon as nGEM is placed in production for both the real-time energy market and day-ahead energy market regardless of the status of the multi-configuration based model."

PJM remains committed to implementing these important market power mitigation enhancements as part of the nGEM project, consistent with the FERC-approved plan.

Capacity Market

The MMU recommends that the reference resource be a CT rather than a CC. The MMU recommends that the ELCC value used to convert the gross CONE in ICAP terms for a CT to the gross CONE in UCAP terms be the ELCC based on winter ratings.

PJM Response

Regarding the first part of the recommendation, PJM will be using the combustion turbine (CT) as the Reference Resource for auctions through Delivery Year 2027/2028. In its filing in Docket No. ER25-682-000, PJM proposed to retain the CT as the Reference Resource. This proposal was accepted by FERC in its Order issued Feb. 14, 2025 (190 FERC ¶ 61,088). As the MMU's recommendation on this point was first reported in Q3 2024, PJM's subsequent filing and FERC's order have affirmed this direction for the near term. PJM is also currently undertaking its periodic Quadrennial Review of capacity market demand curve parameters, which include a comprehensive evaluation of candidate Reference Resources [including (CT), combined cycle (CC) and battery energy storage systems (BESS)] for future Delivery Years.

Concerning the second part of the recommendation – that the Effective Load Carrying Capability (ELCC) value used to convert Gross CONE in Installed Capacity (ICAP) terms for a CT to Unforced Capacity (UCAP) terms be based on winter ratings – PJM acknowledges the importance of accurately reflecting resource capabilities across all seasons. The methodologies for ELCC calculations, including how to best recognize the deliverable winter capability of resources, especially when it may exceed summer ICAP and Capacity Interconnection Rights (CIRs), are complex. These specific considerations are actively being discussed and evaluated within the PJM stakeholder process, notably through the ongoing work of the Effective Load Carrying Capability Senior Task Force (ELCCSTF). In May 2025, PJM presented on a potential approach to analyze and accredit resource winter capability beyond summer ICAP and CIRs. The PJM package to move forward with this change (among others) was endorsed by stakeholders at the ELCCSTF in July 2025 and is pending a vote at the Markets and Reliability Committee as of publication. PJM is committed to working with stakeholders to develop appropriate and robust ELCC methodologies that accurately reflect a resource's full contribution to system reliability throughout the year.

PJM believes its current approach and ongoing stakeholder initiatives align with the intent of the MMU's recommendations to ensure a reliable and economically efficient capacity market.

Interchange Transactions

The MMU recommends eliminating the mechanism that defines FFE and M2M payments. These mechanisms are not consistent with markets and are not needed for efficient interface pricing. The MMU recommends that PJM file with the Commission to eliminate the FFE calculation and M2M payment of the PJM and MISO joint operating agreement.

PJM Response

PJM acknowledges the MMU's recommendation and detailed analysis concerning the Firm Flow Entitlement (FFE) and Market-to-Market (M2M) payment mechanisms within the PJM-MISO Joint Operating Agreement (JOA). The PJM-MISO JOA, including its FFE and M2M provisions, was established over two decades ago to facilitate

coordinated congestion management and reliable operations across one of the largest and most complex interregional seams in North America.

PJM believes that it is valuable to distinguish between the two core components of this recommendation: the calculation of FFEs and the overarching M2M coordination process. PJM understands the MMU's position that these mechanisms, particularly the FFE values based on 2004 market flows, may no longer accurately reflect current system topology, market dynamics or interregional flow patterns, and that this can lead to financial settlements that may not align with the principles of efficient market pricing.

Firm Flow Entitlement (FFE) "Freeze Date." The PJM-MISO seam has experienced a significant evolution over the past two decades, including substantial changes to generation mix, load patterns, and transmission infrastructure, and a fundamental inversion of the predominant direction of net energy flow. The persistence of the 2004 FFE "freeze date" can create financial settlements that are disconnected from the drivers of congestion on the system today. This specific issue has been the subject of extensive and protracted discussions among PJM, MISO, the Congestion Management Process (CMP) Council Members and the Joint and Common Market (JCM) stakeholder group. These discussions have consistently highlighted the challenges in reaching a consensus on an appropriate update to the FFE values, given the significant financial implications and differing perspectives on historical investments and property rights. PJM agrees that the current FFE construct merits a high-priority resolution.

Market-to-Market (M2M) Coordination. The broader M2M mechanism, in which FFEs are a key input, provides the foundational framework for coordinated dispatch and congestion management between PJM and MISO. Eliminating the entire M2M payment mechanism, as the MMU recommends, is a significantly larger and more complex undertaking than resolving the FFE issue. A complete removal would necessitate the development and implementation of an entirely new framework for managing interregional congestion to ensure reliable operations are maintained across the seam. While PJM is open to exploring all options for improving interregional market efficiency, we believe the more immediate and tractable priority is to address the known inequities stemming from the outdated FFE values.

Path Forward. PJM is committed to ensuring that its interregional coordination mechanisms promote economic efficiency and reliability. Any modification to these core components of the JOA and associated CMP agreement is a complex undertaking that requires:

- Bilateral agreement with MISO and the CMP Council members, as any changes must be mutually agreed upon by all impacted parties
- Extensive stakeholder processes to ensure thorough vetting and consultation within both the PJM and MISO communities
- A joint FERC filing under Section 205 of the Federal Power Act to amend the JOA

While the FFE "freeze date" issue has proven particularly intractable, PJM remains open and committed to reengaging with MISO and stakeholders to explore potential enhancements or alternatives. PJM believes that any future modifications must carefully balance improved interregional planning, current market realities, current system modeling and power flows, and the overarching goal of efficient and reliable interregional operations. The MMU's analysis, including the financial impacts of the current mechanisms, provides important data for these considerations.

Therefore, while PJM cannot unilaterally file to eliminate these JOA provisions as recommended, PJM will continue to prioritize discussions with MISO and stakeholders on resolving the FFE issue. The MMU's perspective will be a valuable contribution as we work toward a more equitable and efficient framework for managing our shared seam.

Ancillary Services

The MMU recommends that PJM remove the 30 percent increase to the synchronized reserve reliability requirement.

PJM Response

The 30 percent adder to the Synchronized Reserve reliability requirement was instituted by PJM Operations in May 2023 as a temporary, precautionary measure. This action was taken in response to observed performance during Synchronized Reserve events, where the aggregate response of resources was sometimes insufficient or slower than required to reliably meet NERC and PJM criteria following a contingency. The adder is intended to ensure PJM procures a sufficient quantity of Synchronized Reserves to maintain bulk electric system reliability under these observed performance conditions.

PJM continuously monitors the performance of resources during Synchronized Reserve deployments, focusing on the speed, accuracy and magnitude of response. PJM agrees with the principle that market mechanisms should efficiently procure the necessary levels of reserves to maintain reliability, and not necessarily procure quantities based on desired but unachieved performance levels. The reliability of the system is paramount, and the Synchronized Reserve Requirement, including any temporary adders, must reflect the quantity of reserves PJM Operations deems necessary to meet NERC Reliability Standards given actual system conditions and observed resource performance.

PJM has established and communicated to stakeholders a clear approach for evaluating the potential reduction or removal of this 30 percent adder. Notably, at the March 6, 2025, Operating Committee meeting, PJM staff presented a detailed methodology outlining the performance improvement criteria that PJM would need to consistently observe before considering adjustments to the adder.[7] This presentation details the specific metrics, including a potential phased approach to reduction, and sustained performance levels required. A key criterion highlighted is the need to observe a minimum of five consecutive Synchronized Reserve events where the fleet demonstrates adequate aggregate response, such as meeting or exceeding a high percentage performance target (e.g., 95–100%) within the required 10-minute time frame.

PJM is actively working with stakeholders and tracking resource performance. Recent data indicates some improvement in Synchronized Reserve performance since the implementation of new communication protocols in December 2024, such as the electronic dispatch of reserves via an augmented dispatch signal. However, as outlined in the March OC presentation, a sustained trend of adequate performance across multiple events, consistent with the predefined criteria (including the "five consecutive events" metric), is necessary before PJM will modify the adder. PJM Performance Compliance provides monthly updates to the Operating Committee on these metrics, tracking progress against the established criteria.

[7] PJM Presentation at PJM Operating Committee, "Synchronized Reserve Requirement for Reliability," updated May 8, 2025.

PJM is committed to ensuring that the Synchronized Reserve Requirement reflects the true needs of the system. The decision to maintain or reduce/remove the 30 percent adder will be based on demonstrated, sustained improvements in resource performance, consistent with the approach presented to stakeholders, and ensuring that PJM continues to meet its NERC obligations and maintain the reliability of the bulk electric system. PJM will continue to engage with stakeholders on this issue and provide transparency regarding performance metrics and any decisions related to the Synchronized Reserve reliability requirement.

Generation and Transmission Planning

The MMU recommends that PJM establish an expedited PJM managed queue process to identify commercially viable projects that could help eliminate or reduce the need for specific RMRs or that could address specific reliability needs and allow the identified projects to advance in the queue ahead of projects which have failed to make progress, subject to rules to prevent gaming.

PJM Response

PJM appreciates the Market Monitoring Unit's (MMU) recommendation to establish an expedited, PJM-managed queue process. The objective of such a process would be to identify and advance commercially viable projects that can address specific reliability needs, particularly those arising from generator deactivations that might otherwise necessitate Reliability Must-Run (RMR) arrangements, or other emergent reliability concerns.

PJM recognizes the importance of timely and efficient solutions to maintain grid reliability, especially in light of anticipated generation retirements and evolving system conditions. The concept of an expedited pathway for projects that can offer cost-effective and timely alternatives to RMR agreements or address other acute reliability needs aligns with PJM's commitment to both reliability and market efficiency.

The issues highlighted by the MMU's recommendation are currently central to an active and comprehensive PJM stakeholder initiative. The "Enhancements to Deactivation Rules" issue charge, as revised and approved by PJM stakeholders, has an expanded scope that directly encompasses the exploration of these topics. Specifically, Key Work Activity #5 of the issue charge includes: "Alternatives to Part V arrangements with deactivating generators: Development of process to identify, evaluate, and procure alternative solutions to reliability violations, in lieu of a Part V arrangement with the deactivating generator, including mechanisms for compensation. Such solutions could involve, but are not limited to, new generation assets, energy storage, demand-side solutions and transmission system enhancements including alternative transmission technologies. This process may include, but is not limited to, consideration of generation replacement proposals submitted by a deactivating generator (i.e., CIR transfers), or accelerated interconnection processing for resources that would alleviate short-term, local reliability issues. Different procurement structures, including request for proposals, should be considered [...]"

This stakeholder process will provide a forum for detailed education, discussion and development of potential solutions, including the feasibility and design of mechanisms for accelerated interconnection processing for reliability-critical projects, as well as considerations for preventing gaming and ensuring fairness.

PJM is actively engaged in this stakeholder process and is committed to working collaboratively with its members and the MMU to evaluate various approaches, including the concepts put forth in the MMU's recommendation. PJM believes an inclusive stakeholder process is the most appropriate venue to thoroughly vet and develop durable and

effective solutions to these complex issues. PJM will continue to assess the best path forward based on the outcomes and insights gained from these ongoing discussions.

Transmission Constraint Penalty Factor

> *The MMU recommends that PJM explicitly state its policy on the use of transmission penalty factors including: the level of the penalty factors; the triggers for the use of the penalty factors; the appropriate line ratings to trigger the use of penalty factors; the allowed duration of the violation and when the transmission penalty factors will be used to set the shadow price. The MMU recommends that PJM end the practice of manual and automated discretionary reductions in the control limits on transmission constraint line ratings used in the market clearing software (SCED) and included in LMP. (Priority: Medium. First reported 2015. Status: Partially adopted 2020.)*

PJM Response

PJM notes the MMU's status of this recommendation as "Partially adopted 2020." To facilitate a more productive dialogue and ensure PJM fully understands any remaining concerns, we would welcome further clarification from the MMU on which specific aspects of its recommendation it believes have been addressed and which remain outstanding. PJM has, for instance, established and documented its policy on the use of TCPFs in PJM Manual 11, Section 2.17 ("Transmission Constraint Penalty Factors") and in Schedule 1, Section 5.6 ("Transmission Constraint Penalty Factors") of the PJM Operating Agreement. These documents outline the levels, triggers and application of TCPFs in setting Locational Marginal Prices (LMPs).

Regarding the MMU's recommendation to end reductions in control limits (Control Percentages or CPs) in RT SCED, PJM wishes to clarify its operational practice. PJM system operators adjust RT SCED CPs for individual constraints not as an alteration of the facility ratings provided by Transmission Owners, but as a necessary real-time reliability measure. These adjustments are made to ensure that transmission constraints are managed within the time frames required by NERC Reliability Standards and PJM's own operational procedures, as detailed in PJM Manual 3, Section 1 ("Transmission Operations Requirements"). Factors necessitating such CP adjustments include, but are not limited to, insufficient or delayed generation response to dispatch signals, unexpected interchange schedule deviations, rapid changes in renewable resource output (solar and wind), and unanticipated load impacts on specific constraints. Lowering CPs is a tool PJM system operators must use today to effectuate timely redispatch and maintain system reliability.

PJM is aware of statements made by the MMU attributing a significant portion of the 2024 LMP increase to PJM's application of TCPFs and CP adjustments.[8] PJM respectfully disagrees with the characterization and the analytical methodology underlying these conclusions. The IMM's analysis appears to be based on a counterfactual approach rather than actual RT SCED case reruns incorporating the dynamic nature of system operations. Even if reruns were performed, such static analyses would not accurately capture the real-time impacts, as they do not reflect the dispatch instructions that would have been sent to resources and the subsequent system responses.

[8] Monitoring Analytics Press Release, "Market Monitor Finds PJM Wholesale Electricity Markets Competitive," March 13, 2025.

PJM maintains that its system operators' actions are driven by the imperative to uphold reliability in a dynamic operating environment and are consistent with established NERC standards and PJM procedures. PJM remains committed to transparent operations and is willing to further discuss with the MMU its documented policies regarding TCPFs and constraint management to ensure mutual understanding and address any specific, outstanding concerns.