

**UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION**

Modernizing Electricity Market Design)

Docket No. AD21-10-000

**POST-TECHNICAL CONFERENCE COMMENTS
OF PJM INTERCONNECTION, L.L.C.**

PJM Interconnection, L.L.C. (“PJM”) submits the following initial comments in response to the Federal Energy Regulatory Commission’s (“Commission”) December 6, 2021 Notice Inviting Post-Technical Conference Comments (“December 6 Notice”).¹ The scope of the December 6 Notice consists of the staff-led technical conferences held on September 14 and October 12, 2021.² Those technical conferences were convened to discuss potential reforms to energy and ancillary services markets that could, among other things, increase operational flexibility, in the context of an electricity sector with changing resource types and load profiles.³

PJM submitted comments in advance of both conferences. On September 13, 2021, PJM submitted a statement by Adam Keech, Vice President of Market Design and Economics.⁴ Mr. Keech’s statement acknowledges that the electricity system resource mix is shifting and the quantity of distributed energy resources is growing, both of which are causing a rise in uncertainty in the PJM markets.⁵ According to the statement, one way to address uncertainty is to ensure that

¹ *Modernizing Electricity Market Design*, Notice Inviting Post-Technical Conf. Comments, Docket No. AD21-10-000 (Dec. 6, 2021) (“December 6 Notice”).

² December 6 Notice at 1.

³ *Modernizing Electricity Market Design*, Supplemental Notice of Technical Conf. on Energy and Ancillary Services in the Evolving Electricity Sector, Docket No. AD21-10-000 (Oct. 7, 2021) (“October 7 Notice”); *Modernizing Electricity Market Design*, Supplemental Notice of Technical Conf. on Energy and Ancillary Services in the Evolving Electricity Sector, Docket No. AD21-10-000 (Sept. 13, 2021) (“September 13 Notice”); *Modernizing Electricity Market Design*, Notice of Technical Confs. Regarding Energy and Ancillary Services Markets, Docket No. AD21-10-000 (July 14, 2021) (“July 14 Notice”).

⁴ *Modernizing Electricity Market Design*, Public Comments of PJM Interconnection, L.L.C., Statement of Adam Keech, Vice President – Market Design & Economics, Docket No. AD21-10-000 (Sept. 13, 2021) (“Keech Statement”).

⁵ Keech Statement at 1.

the markets properly incentivize and compensate flexibility.⁶ Similarly, on October 12, 2021, PJM submitted a statement by Walter Graf, Senior Director of Economics, noting the shift toward a more uncertain market environment that calls for adopting market reforms that add flexibility.⁷ The changing energy landscape that we are observing in real time, the need for new market products, and the importance of flexible market characteristics are also represented in those and other PJM filings in this proceeding.⁸

Fundamentally, “PJM views the most critical types of flexibility necessary to be the commitment, decommitment and ramping capability of resources. The ability to dispatch a resource up or down and cycle them on or off in relatively short periods of time to maintain supply and demand balance throughout the day are important today and are anticipated to grow in importance in the future.”⁹ Flexibility itself can take on two forms. One is operational flexibility, where resources offer and operate in a flexible manner in response to price signals.¹⁰ The second is the capability that allows a resource to operate flexibly, which requires resource owners and developers to choose to invest capital in resources with these capabilities.¹¹ Ultimately, new market frameworks are needed to improve the operational and investment price signals that will drive efficient solutions to the increased need for flexibility.

⁶ *Id.*

⁷ *Modernizing Electricity Market Design*, Speaker Materials of PJM, Statement of Dr. Walter Graf, Senior Director – Economics, Docket No. AD21-10-000, at 1 (Oct. 12, 2021) (“Graf Statement”).

⁸ *Modernizing Electricity Market Design*, Post-Technical Conf. Comments of PJM, Docket No. AD21-10-000 (Apr. 26, 2021); *Modernizing Electricity Market Design*, Speaker Materials of PJM, Statement of PJM Interconnection, Docket No. AD21-10-000 (Mar. 24, 2021).

⁹ Keech Statement at 3.

¹⁰ Graf Statement at 1.

¹¹ *Id.*

PJM respectfully submits responses on selected topics in the December 6 Notice that carry forward these themes. Overall, PJM encourages the Commission to develop new market approaches that increase flexibility within the energy and ancillary services markets to adapt to the changing energy landscape.

I. PJM RESPONSES TO THE DECEMBER 6 NOTICE

A. On the importance of incorporating uncertainty in the market design.¹²

The record in this technical conference indicates that the Regional Transmission Organizations (“RTOs”) are in broad agreement as to the need to incorporate uncertainty in the way the various markets define and price ancillary services products to address a real and growing deficiency in the current markets. In pre-conference comments, Mr. Keech stated: “To be clear, not incorporating uncertainty into ancillary service requirements is a problem today. This problem worsens as uncertainty increases. It is akin to not increasing the minimum reserve requirement when the most severe single contingency increases.”¹³ This key message was reiterated by other RTOs as well.

In pre-conference comments, Southwest Power Pool, Inc. (“SPP”) staff described the growing challenge of integrating renewable resources into their system and operating the system reliably given the uncertainty in forecasting renewable (especially wind) output:

Given the challenges with managing these large forecast errors, SPP operators are constantly reviewing grid conditions and taking active steps to secure the system from wind forecast uncertainties. . . . However, *these operator actions do have significant consequences on market outcomes. Specifically, these actions lower prices in the energy and ancillary services markets. As SPP operators add more resources, the additional supply shifts the supply curve outward, causing otherwise economic resources to run lower on their offer curve, thus earning less revenue. These manual commitments also reduce the incidence of scarcity events.*

¹² December 6 Notice at 1 (in reference to Panel 1, Question 1).

¹³ Keech Statement at 4.

While these actions can improve system reliability, they do so by lowering prices not only in intervals without scarcity, but also during periods where scarcity would have occurred. Without products to compensate for flexibility, resources are not appropriately compensated for their services and prices are inaccurate. Moreover, *this has also led to an increase in make-whole payments*, as both economic and additional resources cannot always recover their costs.¹⁴

Comments from the California Independent System Operator Corporation (“CAISO”) staff reflected similar sentiments:

Day-ahead uncertainty, estimated as the difference of net loads between the day-ahead and real-time market, can be significant. . . . The change between the day-ahead net load forecast and real-time net load forecast is inevitable because of weather changes, outages, and forecast inaccuracies. Large imbalances between the day-ahead and real-time market can result in challenging conditions for the CAISO. When there is a risk that imbalances may become too large to address through the real-time market, the *CAISO will rely on out-of-market actions to address these imbalances*. These actions may include biasing the load forecast in the various markets and or issuing exceptional dispatches. *Although these actions are necessary for grid reliability they can undermine market price formation and dilute economic signals provided by market prices.*¹⁵

ISO-NE staff made complementary comments during Panel 4 of the September 14, 2021

Technical Conference:

I think for our region a way to think about what’s the first order priority in this entire space for managing a [renewable] transition -- at least as far as the ancillary services go, is that we have to make sure a system has sufficient energy on call, set up day ahead, scheduled to be on call, compensated for being on call, with obligations -- financial consequences if they don't deliver when they're called.

And we have to have enough of it to cover both the traditional source loss contingencies, because those standards aren't changing, or aren't going away, and we have to have enough to manage the growing uncertainties we face because of our renewable energy transition.

. . . [I]t's critical to make sure that the cost of having all that on call energy in each day's operating plan is transparently signaled through competitive market prices.

Not through uplift, not through out of market actions, or as I mentioned earlier, not by relying on latent reserves like we always have in the past, because

¹⁴ *Modernizing Electricity Market Design*, Southwest Power Pool Market Monitoring Unit Pre-Technical Conf. Comments, Docket No. AD21-10-000, at 3-4 (Sep. 13, 2021) (emphasis added).

¹⁵ *Modernizing Electricity Market Design*, Cal. Indep. Sys. Operator Corp., Prepared Statement of Rahul Kalaskar, Docket No. AD21-10-000, at 3-4 (Sep. 14, 2021) (emphasis added).

that's the only way fundamentally we're going to ensure that resource owners will continue to invest in the capabilities we need, both for now and for the evolving system of the future.

. . . I think *if we don't define those on call energy services we need precisely, price them correctly in the day ahead market, ensure they're properly compensated with the right incentives in the real time market, then we will not be paying for the services we need to manage uncertainty transparently.*

And if we don't do that, we won't have those services very long.¹⁶

For several of the RTOs, including CAISO and SPP, their comments are based on experience with substantially higher penetration of renewable resources than PJM has; the substantial concerns with price formation that PJM has identified are even more salient in those areas. The record in this proceeding underscores that the RTOs are in agreement as to the need to address growing supply and demand uncertainty in market design and outcomes, and that the particular operational challenges that each region faces are notably different and are best addressed through market design tailored to each region. PJM emphasizes the key messages that failure to incorporate uncertainty into the market, products, and price formation will lead to a lack of sufficient market incentives for exactly those flexible resources which are most valuable.

B. On capacity markets and the forward procurement of flexibility products.¹⁷

PJM believes that today's existing forward capacity market serves a distinct reliability goal and sends a distinct investment signal that is different from the goals and signals to be achieved from energy and ancillary service products. As a result, these two products are not simply substitutes for one another—forward ancillary service procurement should not be seen as a substitute for forward procurement of capacity.

¹⁶ *Modernizing Electricity Market Design*, Transcript of Sep. 14, 2021 Technical Conf., Docket No. AD21-10-000, 224:21-226:19 (Sept. 14, 2021) (emphasis added).

¹⁷ December 6 Notice at 5-6 (in reference to Panel 3, Question 5a-b).

PJM recommends that the Commission’s focus remain on supporting necessary revisions to existing products, such as PJM’s real-time operating reserve procurement, rather than focusing on devising forward procurement mechanisms. As previously described, “it is appropriate that any new products needed to maintain operational reliability be efficiently procured and priced in the operating time frame first, before considering a forward procurement. In general, transparent price signals that are aligned with real-time system conditions will best incentivize optimal operations and investments.”¹⁸ Only accurate real-time pricing can provide the appropriate signals and incentives for making efficient use of the flexible resources that exist on the system.

Intermediate-term forward ancillary service procurement constructs could in theory help to support the markets’ ability to provide investment incentives to resources needed for reliability. But focusing on these markets, at the expense of maintaining effective energy and capacity markets, in PJM, would be sub-optimal. As described above, such a forward market for flexibility attributes could not substitute for appropriate pricing signals in the operating timeframes. Implementing a forward market without the right real-time pricing signals could indeed ensure sufficient flexible capacity, but it could not ensure such capacity is deployed efficiently nor compensated appropriately in real-time. Instead, such forward constructs could in the future perhaps complement efficient real-time prices in providing the necessary investment incentives for flexible resources. “Forward procurements of any ancillary service products should only be considered if the real-time prices do not incentivize sufficient investments in the resources that can provide the products.”¹⁹ PJM urges this sequencing of actions so that attention can be paid to price reform in real-time markets (as well as capacity markets that need to work complementary to those

¹⁸ Keech Statement at 6-7.

¹⁹ Keech Statement at 7.

energy markets) before the development of more complex forward looking ancillary service markets are taken on. Moreover, any such market constructs must be complementary with enhanced energy and capacity markets to ensure that reliability goals are achieved.

Finally, as noted above, such forward procurements of flexibility products would not be a substitute for the current PJM capacity construct. The PJM capacity market solves a different problem, one that would not be addressed by a forward procurement of flexibility. Indeed, events in February 2021 in Texas and the central US highlighted the immense value of reliable, dependable, fuel-secure resources even in areas with growing renewable penetration. While the future may well bring more reliability challenges driven by growing uncertainty and the need for flexibility, the value of reliable resources to meet peak load conditions will remain. This is the exact problem the PJM capacity market addresses today, and we look forward to working with stakeholders to continue to evolve the capacity construct to improve its ability to address this distinct need.

C. On the value of reserve shortage pricing.²⁰

As stated earlier, the record in this proceeding underscores that although the RTOs are in agreement as to the key guiding principles governing shortage pricing, the particular operational challenges that each region faces are notably different and reflect the different resource mix in each region. For this reason, the technical conference testimony underscores that Commission efforts to ‘align’ shortage pricing across RTOs, although attractive for simplicity, may prove of limited value and slow down efforts to address each region’s specific needs.

²⁰ December 6 Notice at 3 (in reference to Panel 2, Question 3).

PJM continues to pursue solutions to address the needs found in its region. In March 2019, PJM filed a proposed set of tariff changes to improve the function of its reserve markets²¹ by addressing three problem areas:

- A Synchronized Reserve product that is separated in to two products – Tier 1 and Tier 2 – with disparate rules around commitment, compensation, and performance penalties;
- An Operating Reserve Demand Curve (“ORDC”) which fails to (1) recognize the need for the value of reserves to reflect uncertainty on the system, and, (2) allow for all actions taken by system operators to maintain reserves to be transparently reflected in prices; and
- The misalignment of reserve products between the day-ahead and real-time markets which does not adequately procure forward reserves and leads to inefficient commitment and pricing outcomes.²²

The environment that has led to these problem areas and thus causing PJM to make this important change is described in PJM’s filing letter²³ and clearly addressed in supporting testimony from Drs. William W. Hogan and Susan L. Pope. They explain:

As summarized here and discussed further by PJM, the existing PJM operating reserve market design fails to support economic efficiency in a number of ways. Elements of the current operating reserve market construct in PJM were developed in stages in prior years and, as a result, are not explicitly founded in a principled theory connecting the composite operating reserve market design to sustainable, just and reasonable rates. In addition, changing circumstances, such as increasing variability in net load due to intermittent resources, have revealed problems where the prices for different types of reserves do not reflect their underlying economic values or provide the needed support for efficient, reliable operation. The existing operating reserve markets in PJM can and should be replaced by an enhanced design that better meets the standard of just and reasonable rates.²⁴

The filing also describes the reliability challenges PJM faces on a day-to-day basis:

In addition to [Intermediate Term Security Constrained Economic Dispatch (“IT SCED”)] case biasing, which is the most prevalent manual method to scheduling

²¹ *PJM Interconnection, L.L.C.*, Tariff Filing regarding Enhanced Price Formation in Reserve Markets, Docket No. ER19-1486-000 (Mar. 29, 2019) (“PJM Price Formation Filing”).

²² PJM Price Formation Filing at 3-4.

²³ PJM Price Formation Filing at 4-9.

²⁴ PJM Price Formation Filing, Attachment C, Exhibit 1, PJM ORDC Report at 1.

additional reserves, the generation dispatchers may also take out-of-market actions to commit additional generating reserves manually. This will occur for conditions the IT SCED bias is not directly able to account for, such as the need for longer lead generation that must be committed prior to the IT SCED two-hour window or if there is a locational need for the reserves due to major transmission constraints.

As stated above, the PJM dispatchers need to utilize the bias and out-of-market commitments to account for load, generation, and interchange forecasting errors. Under the status quo, this practice of biasing and committing generation outside of the market cannot change. Limiting the generation dispatcher's ability to account for forecast uncertainty through biasing IT SCED and/or taking out-of-market actions, without developing a market mechanism to ensure availability of sufficient reserves, would lead to operating reliability. That is not acceptable.²⁵

PJM's proposed solution to address these challenges consists of three principal reforms:

- consolidate the Tier 1 and Tier 2 products into one product, called Synchronized Reserve, with uniform commitment, compensation, and performance obligations to meet all Synchronized Reserve needs;²⁶
- revise the current ORDC to recognize that sellers could have legitimate opportunity costs during shortage conditions from foregoing energy market sales (or load reductions) in order to commit as reserves; and by changing the ORDC curve shape based on a systematic, probabilistic quantification of the same categories of load and supply uncertainties that PJM operators are currently trying to address when they bias dispatch schedules or take other out-of-market actions to guard against PJM falling short of its minimum reserve requirements;²⁷ and
- align the day-ahead and real-time reserve markets to ensure that the reserves needed for real-time operation are recognized on a forward basis during the scheduling processes for the next operating day.²⁸

²⁵ PJM Price Formation Filing, Attachment E, Affidavit of Christopher Pilon, at PP 18-19.

²⁶ PJM Price Formation Filing at 9.

²⁷ *Id.*

²⁸ *Id.*

PJM's proposed reforms and compliance filing were accepted by the Commission²⁹ but several key components of the holistic reforms were subsequently reversed.³⁰ PJM continues to advocate for these changes as a just and reasonable solution and views them as an effective way to maintain the reliability of the PJM's markets and operations.³¹

In addition to those reforms, and in response to the significant market outcomes observed in the Electric Reliability Council of Texas in the winter of 2021, PJM and its stakeholders are working on 'circuit breaker' provisions that would result in capping energy and reserve market clearing prices during sustained periods of extreme scarcity pricing. These provisions would serve to protect the integrity of the market during unforeseen circumstances such as those observed last winter.

II. CONCLUSION

PJM appreciates the opportunity to respond to the December 6 Notice. The changing energy landscape is driving an increase in uncertainty in the energy and ancillary markets. Thus, new and updated market approaches are needed to keep pace with uncertainty and ensure the continued reliable and cost-effective operation of the grid. PJM looks forward to working with the Commission and stakeholders on this matter.

²⁹ *PJM Interconnection, L.L.C.*, 171 FERC ¶ 61,153 (2020), *order on reh'g*, 173 FERC ¶ 61,123 (2020). The Commission also accepted PJM's compliance filing. *PJM Interconnection, L.L.C.*, 173 FERC ¶ 61,134 (2020), *order on reh'g*, 174 FERC ¶ 61,180 (2021).

³⁰ *PJM Interconnection, L.L.C.*, 177 FERC ¶ 61,209 (2021) (order on voluntary remand).

³¹ *PJM Interconnection, L.L.C.*, Request for Rehearing, Docket Nos. EL19-58-007 and ER19-1486-004 (Jan. 21, 2022) (request for rehearing of the Commission's Order on Remand).

Respectfully submitted,

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CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document on those parties on the official Service List compiled by the Secretary in these proceedings.

Dated at Audubon, Pennsylvania this 4th day of February, 2022.

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