December 8, 2025

Via Electronic Filing

Honorable Debbie-Anne A. Reese, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Re: **Comments of the Pennsylvania Public Utility Commission; Docket No. ER26-455**

Dear Secretary Reese:

Please find for e-filing the Pennsylvania Public Utility Commission's Comments in support of PJM Interconnection L.L.C.'s *2025 Periodic Review of Variable Resource Requirement Curve Shape and Key Parameters* filing at Docket No. ER26-455.

Copies of this document have been served upon all parties designated on the Commission's official service list, in accordance with Rule 2010 of the Commission's Rules of Practice and Procedure.

If you have any questions, please do not hesitate to contact me.

Respectfully submitted,

Elizabeth H. Barnes
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UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

PJM Interconnection, L.L.C.   )   Docket No. ER26-455

COMMENTS OF THE PENNSYLVANIA PUBLIC UTILITY COMMISSION

The Pennsylvania Public Utility Commission (PA PUC) submits these comments in support of PJM Interconnection, L.L.C.'s (PJM) Quadrennial Review filing to update the parameters of its Variable Resource Requirement Curve (VRR Curve) that sets demand for the PJM Reliability Pricing Model. This stakeholder-backed VRR Curve substantially improves prior VRR Curve structures by preventing overcompensation of suppliers at low and high levels of net energy and ancillary services (Net E&AS) revenues.[1] At the same time, the filing maintains the ability of generators to recover sufficient revenues across those different Net E&AS levels, even if assumptions regarding the cost of new entry (Gross CONE) or expected Net E&AS revenues of the reference resource are incorrect.

I.   PJM Quadrennial Review Process

In light of the many changes in the electric industry, PJM began its tariffed Quadrennial Review one year prior to when it was required.[2] Beginning in July 2024, PJM held at least 16 meetings regarding the topic, concluding in September 2025. The

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[1] Energy and ancillary services revenues are "net" of the costs of earnings those revenues, such as fuel costs.
[2] https://www.pjm.com/-/media/DotCom/committees-groups/committees/mic/2024/20240710/20240710-item-07---quadrennial-review-of-the-vrr-curve-parameters.pdf.

process was highly engaged, and as PJM described, it resulted in six packages. The winning package[3] received supermajority support on a sector-weighted basis. Since the outset of the periodic review process, this was the first time any package "passed" in stakeholder voting, demonstrating both the cross-sectoral engagement in the process as well as the balanced nature of the resultant package. For the reasons mentioned in more detail below, the PA PUC supports PJM's *2025 Periodic Review of Variable Resource Requirement Curve Shape and Key Parameters* filing and respectfully requests the Commission approve the changes to PJM's tariff.

II.   Principles underlying the Periodic Review

The purpose of the capacity market is to provide recovery of sufficient revenue necessary to maintain our desired level of reliability beyond that revenue the energy and ancillary services markets would naturally provide. Thus, to maintain desired levels of reliability, the average quantity of revenue provided each year by all markets combined should be the Gross CONE of the market clearing resource divided by the useful life of that resource (i.e. the Reference Resource). To translate this principle into a demand curve for the capacity market alone, the market offsets the energy and ancillary services revenue from the total necessary revenue, producing Net CONE (Gross CONE – EAS Offset). The choice of the Reference Resource is a critical parameter in the periodic review for this reason.

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[3] Developed jointly between PA PUC Vice Chair Kimberly Barrow   and PJM staff.

The maximum price of the VRR Curve should not be Net CONE, but should be above Net CONE for four reasons. First, our choice of Reference Resource may not accurately reflect the market clearing resource at our desired level of reliability. Second, our estimates of the annualized Gross CONE may not be accurate. Third, our projections of Net E&AS revenues may not be accurate. Fourth, natural variation in clearing prices may occasionally result in deviation above and below long run equilibrium. A cap above that equilibrium allows for that natural deviation.

III.   PJM's Prior Variable Resource Requirement Curve

On December 30, 2024, Pennsylvania Governor Josh Shapiro filed a Complaint against PJM under section 206 of the Federal Power Act alleging that the maximum price of the VRR Curve was unjust and unreasonable. Part of the justification for the Complaint was that the VRR Curve's maximum price of the higher of 100% Gross CONE or 1.75 times Net CONE inappropriately overcompensated resources, resulting in higher costs for consumers. In support of the Complaint, the PA PUC filed comments agreeing that the use of Gross CONE as a floor on the maximum price was not economically justified. As argued in those comments, the Gross CONE backstop was put in place to address inconsistencies between historical determination of Net E&AS revenues and actual Net E&AS revenues during the future delivery years of the forward capacity market.[4] The 2022 Quadrennial Review switched to a forward Net E&AS methodology, reducing this risk.[5]

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[4] PA PUC Comments in Support of Governor Shapiro Complaint, Docket No. EL25-46, at 13-14 (Filed January 21, 2025).
[5] *Id.*

IV. PJM's Proposed VRR Curve

The proposed VRR curve addresses the problems with the prior curve and still maintains necessary compensation for generation resources. The Gross CONE backstop is not eliminated, but it is lowered significantly. Under PJM's filing, the maximum price on the VRR Curve cannot fall below 20% of the Reference Resource's Gross CONE. Because of the structure of the revised maximum price formula as well as the Reference Resource, this result is extraordinarily unlikely. For the backstop to bind under PJM's filing, Net E&AS revenues would have to be larger than 127% of a Combustion Turbine's Gross CONE. This is very unlikely, as Combustion Turbines do not run near as often as Combined Cycle facilities. The retention of this small backstop is justified at the present time. The PA PUC agrees with the reasoning of Witness Skyler Marzewski, Lead Market Design Specialist in the Market Design group for PJM Interconnection, L.L.C. (Marzewski), "[h]aving a $0 price cap may be an acceptable economic answer, but that would yield administrative problems."[6] Witness Marzewski describes that a $0 price cap will result in the Reliability Pricing Model engine to solve, but not to commit any resources. Another example of administrative problems caused by a $0 price cap is that the present tariff rules define the capacity market Non-Performance Charge Limit (i.e. the stop loss) based on the clearing price.[7] Even if the RPM engine cleared sufficient resources to maintain reliability, those resources would have effectively no performance

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[6] Marzewski Affidavit, ¶39.
[7] Tariff, Attachment DD, Section 10A(f-1).

obligation in the delivery year, as the stop loss would be immediately triggered for all resources.

In addition to effectively eliminating the backstop, the revised formula eliminates overcompensation that may occur when Net E&AS revenues are low. Under the prior formula of 1.75*Net CONE, as Net E&AS revenues fall, the expected total compensation at the maximum price approaches 1.75*Gross CONE.

$$1.75 * Gross\ CONE = \lim_{Net\ E\&AS \to 0} 1.75 * (GrossCONE - Net\ E\&AS)$$

175% of Gross CONE is substantially above the necessary compensation for a Reference Resource even when Net E&AS revenues are near zero. In such circumstances the high multiplier of Gross CONE only serves as a windfall to supply.

The updated VRR curve behaves more reasonably at low Net E&AS levels.

$$1.15 * Gross\ CONE = \lim_{Net\ E\&AS \to 0} 1.15 * GrossCONE - 0.75 * Net\ E\&AS$$

As expected Net E&AS approaches zero, capacity market compensation for the Reference Resource at the maximum price is limited to 115% of Gross CONE. For these reasons, the updated VRR Curve maximum price prevents uneconomic overcompensation at both high and low levels of Net E&AS revenues. Witness Marzewski illustrates this point in Figure 2 of his affidavit, reproduced below.

Figure 2. Price Cap Comparison as a function of gross CONE: Current and Proposed Price Cap
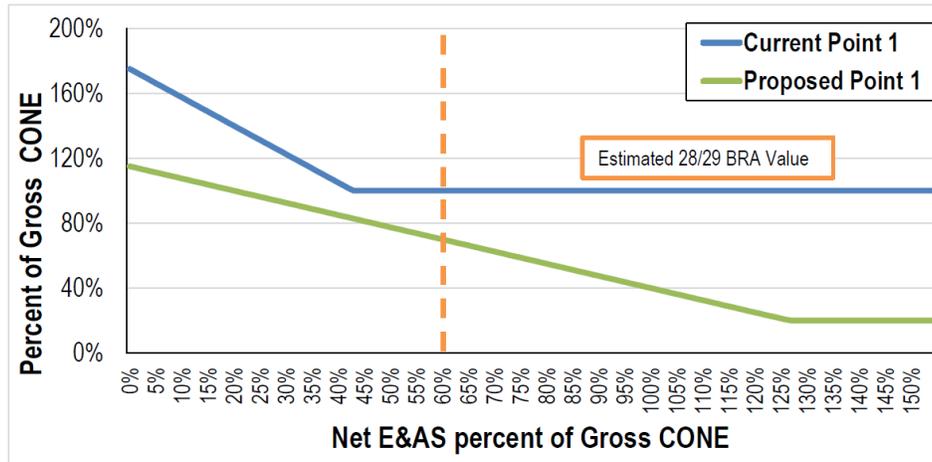
If considered from a total market perspective, the compensation for a Reference Resource at the maximum price in the capacity market[8] should be equal to Gross CONE plus a reserve margin for uncertainty across a wide range of expected values of Net E&AS revenues. As Witness Marzewski states,[9] when Net E&AS Revenues increase the total compensation reserve margin should also increase because the uncertainty of that value should be higher. The chart below demonstrates that the proposed VRR Curve provides that compensation and does so on a more stable basis than the existing curve, without imposing extreme costs on consumers.

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[8] Total compensation is expressed as Cap + Net E&AS revenues.
[9] Marzewski Affidavit, ¶ 30.

Cap + Net E&AS vs E&AS (0–150% of Gross CONE)
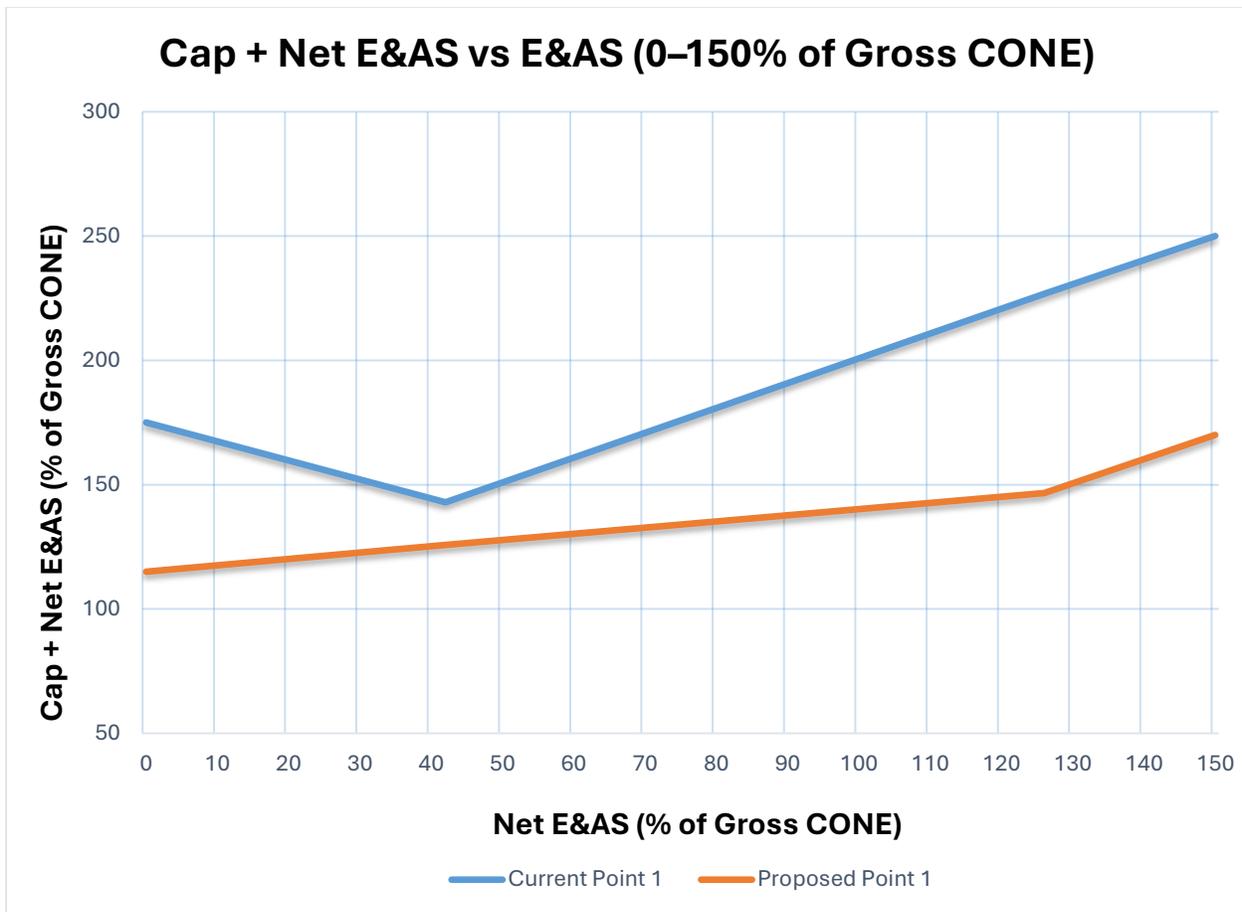
The choice of "conservative estimators"—the multiples used to adjust Gross CONE and Net E&AS—used by PJM are reasonable.[10] In order to determine the appropriate hedge on Net E&AS uncertainty, Witness Marzewski describes that the calculated standard deviation of energy net revenue for a Combustion Turbine is 31% and the same number for a Combined Cycle is 32%. Appropriate economic judgment was used to adjust these figures downward. The full uncertainty of Net E&AS revenues need not be recovered every year. In some years the projected Net E&AS revenues will be an underestimate of real-time revenues. The operation of the proposed curve will dampen

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[10] Marzewski Affidavit, ¶¶ 19, 35.

the effect of those underestimations, ensuring sufficient revenues. Further, in consecutive auctions, the variation of Net E&AS revenues is lower. The calculated standard deviation for a rolling two-year average of energy net revenues for a Combustion Turbine is substantially lower than the single year standard deviation. This indicates that if a resource clears multiple years in a row—a likely result if hitting the maximum price—the uncertainty will be accounted for.

The proposed curve also addresses all the justifications for the VRR Curve maximum price to be above Net CONE described earlier. The prior curve accounted for these reasons through a very large multiplier of Net CONE, but was flawed for the reasons set forth. The function of MAX(1.15*CONE – 0.75*Net E&AS, 0.2*CONE) accounts for underestimation of CONE, it accounts for overestimation of Net E&AS revenues, and it accounts for natural variation in clearing price.

V.   Reference Resource Selection

The choice of Reference Resource is determined based on multiple factors. In addition to economic viability, the at the outset of the stakeholder proceeding, Brattle also put forward several other factors including feasibility to build at scale by the delivery year, compliance with regulations going forward and ability to operate in support of reliability when needed, the ability to accurately assess Net CONE of the selected resource, and having a stable reliability contribution across the four delivery years until

the next periodic review.[11] The PA PUC is supportive of PJM's detailed evaluation of these factors in the choice of a Combustion Turbine as a Reference Resource.[12]

In addition to these, another factor includes the consequence of the Reference Resource due to other PJM tariff rules beyond the VRR curve. For example, because Net CONE is the basis of the basis for capacity market Non-Performance Charges in PJM,[13] if Net CONE falls to very low levels, performance incentives in emergencies will also fall. Comparing the Combined Cycle against a Combustion Turbine, a Combined Cycle is far more likely to have a Net CONE of zero, which occurred for the 2025/2026 Base Residual Auction before Commission intervention.[14] Some stakeholders expressed concern in the Quadrennial Review that the possibility of Net CONE falling to zero with a Combined Cycle Reference Resource would necessitate a further stakeholder process to revise real-time penalty structures resulting from the capacity market rules. Given that a Combustion Turbine was also a reasonable choice for a Reference Resource, and that the stakeholder process would have to occur rapidly ahead of the 2028/2029 Base Residual Auction, this issue may have contributed to the significant preference among stakeholders for a Combustion Turbine over a Combined Cycle.

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[11] Slide 4, https://www.pjm.com/-/media/DotCom/committees-groups/committees/mic/2024/20241024-special/item-1---quad-review-october-meeting---brattle-presentation---updated.pdf
[12] See PJM Filing at 23-25.
[13] Tariff, Attachment DD, Section 10A(e).
[14] PJM Interconnection L.L.C, Docket No. ER25-682, 190 FERC P 61088 (Order issued February 14, 2025).

VI.   Conclusion

For these aforementioned reasons, the PA PUC supports PJM's *2025 Periodic Review of Variable Resource Requirement Curve Shape and Key Parameters* filing and respectfully requests the Commission approve the changes to PJM's tariff.

Respectfully submitted,

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Dated: December 8, 2025

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that I am on this date serving a copy of the foregoing document upon each person designated on the official service list compiled by the Federal Energy Regulatory Commission in accordance with the requirements of Rule 2010 of the Commission's Rules of Practice and Procedure.

Respectfully submitted,

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Dated: December 8, 2025