UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

PJM Interconnection, L.L.C.) Docket No. ER25-785-000

MOTION FOR LEAVE TO ANSWER AND ANSWER OF THE ORGANIZATION OF PJM STATES, INC. TO THE PROTESTS OF VISTRA CORP., AMERICAN MUNICIPAL POWER, INC. AND THE INVENERGY COMPANIES

On December 20, 2024, PJM Interconnection L.L.C. ("PJM") filed revisions to its Open Access Transmission Tariff ("Tariff") to extend the Capacity Must-Offer requirement to all resources.[1] On January 10, 2025, Vistra Corp. ("Vistra"), American Municipal Power, Inc. ("AMP"), as well as Invenergy Wind Development North America LLC, Invenergy Solar Development North America LLC, and Invenergy Storage Development LLC (collectively "Invenergy") filed Protests to PJM's proposed Tariff revisions.[2] The Organization of PJM States, Inc. ("OPSI"), respectfully submits this Motion for Leave to Answer and Answer to these Protests.[3]

I. MOTION FOR LEAVE TO ANSWER PROTESTS

[1] PJM Interconnection L.L.C, Extending the Capacity Must-Offer Requirement to All Generation Capacity Resources, Docket No. ER25-785 (Dec. 20, 2024) ("Must-Offer Filing").

[2] Protest of Vistra Corp. (Jan. 10. 2025) ("Vistra Protest"); Protest of American Municipal Power, Inc. (Jan. 10, 2025) ("AMP Protest"); Motion to Intervene and Protest of Invenergy Wind Development North America LLC, Invenergy Solar Development North America LLC, and Invenergy Storage Development LLC (Jan. 10, 2025) ("Invenergy Protest").

[3] OPSI's following members support these Comments: Delaware Public Service Commission, Public Service Commission of the District of Columbia, Illinois Commerce Commission, Kentucky Public Service Commission, Maryland Public Service Commission, Michigan Public Service Commission, New Jersey Board of Public Utilities, North Carolina Utilities Commission, Pennsylvania Public Utility Commission, Tennessee Public Utility Commission, Virginia State Corporation Commission and Public Service Commission of West Virginia. The Indiana Utility Regulatory Commission and Public Utilities Commission of Ohio abstained.

Although the Commission's rules do not permit the filing of answers to protests as a matter of right, the Commission regularly accepts otherwise impermissible answers if such responses will assist the Commission's understanding of the record and aid its decision-making.[4] The following answer will help clarify important legal considerations and provide the Commission with additional quantitative data that will help it evaluate the validity of certain factual claims made in this docket. As such, the Commission should grant OPSI leave to answer these Protests.

II. ANSWER

The current categorical exemption of renewable and storage capacity resources from the must-offer requirement costs consumers billions of dollars per year and unjustly and unreasonably leaves them exposed to the widespread exercise of market power. Yet under current market conditions, this multi-billion dollar cost to consumers only buys renewable and storage projects owners protection from a remote risk of suffering a small reduction in their annual revenue. Indeed, as shown below, were another Winter Storm Elliott-like event to occur, the maximum possible collective loss of every renewable and storage resource owner in PJM would come to less than 2% of the cost load paid to maintain the must-offer exemption in the 2025/2026 Base Residual Auction ("BRA"). Protesters' contrary assertions that eliminating the must-offer exemption is unnecessary or fails to provide benefits commensurate with the burdens

[4] *See, e.g.*, *Nw. Corp.*, 170 FERC ¶ 61,266, at P 10 (2020) (accepting answer to an answer because it provided the Commission with information that assisted the decision-making process); *PJM Interconnection LLC*, 138 FERC ¶ 61,062, at P 14 (2012) (accepting answers to a protest and to an answer for the same reason).

placed on resource owners are without merit.[5] The Commission's statutory duty to ensure just and reasonable rates justifies eliminating the must-offer exemption prior to the 2026/2027 BRA.

PJM's proposal to eliminate the must-offer exemption before adopting a more granular capacity market is just and reasonable under the current prevailing tight capacity supply conditions. This is because such conditions make it extremely likely that the next few capacity auctions will clear at prices that are sufficient to pay any plausible non-performance penalties several times over. That said, OPSI reiterates its position that PJM should transition to a more granular capacity market that betters aligns non-performance penalty risk with a resource's expected performance as soon as possible. This will help ensure non-performance penalty risk does not become excessive in a potentially lower capacity price environment. Until PJM can implement these more holistic reforms, the Commission must balance the current *de minimis* risk that non-performance penalties will exceed capacity revenues against the multi-billion-dollar costs the must-offer exemption imposes on consumers. The only just and reasonable way to balance those interests absent further reforms to the capacity market or non-performance penalties is to simply eliminate the must-offer exemption.

A. The Commission Must Eliminate the Current Must-Offer Exemption Before the Next Base Residual Auction, as It Unjustly and Unreasonably Enables the Potential Exercise of Market Power.

Commission precedent establishes that market rules that create the mere *potential* for the widespread exercise of market power are unjust and unreasonable.[6] The Courts have upheld this

[5] *See, e.g.*, Invenergy Protest at 2 ("[T]he *de minimis* benefits of PJM's proposal [to eliminate the must-offer exemption] are significantly outweighed by its harms."); Vistra Protest at 4-6 (arguing that the must-offer exemption does not raise market power concerns); AMP Protest at 15-17 (arguing that the must-offer exemption does not raise market power concerns).

[6] *See PJM Interconnection, L.L.C.*, 187 F.E.R.C. ¶ 61,051, at P 25 (2024) ("*PJM*") (citing *Indep. Mkt. Monitor for PJM v. PJM Interconnection, L.L.C.*, 178 FERC ¶ 61,121, at P 24 (2022)) ("PJM's proposal

standard.[7] The evidence submitted by PJM and the Independent Market Monitor ("IMM") in this docket demonstrates the current must-offer exemption does just that. Protesters attempt to distract attention from this simple point by implying PJM's filing is only justifiable if it can prove that the must-offer exemption has resulted in the *actual* exercise of market power and arguing that PJM has failed to make that showing.[8] The Commission should disregard these irrelevant arguments.

1. Market Rules that Enable the Potential Widespread Exercise of Market Power are Unjust and Unreasonable.

The Commission has unequivocally held that "a serious risk of widespread exercise of market power" is "unjust and unreasonable."[9] Furthermore, the Commission presumes that actors with market power will exercise that power if market-wide rules enable them to do so.[10] Thus, market-wide rules that give sellers the *ability* to exercise widespread market power create a serious risk that such market power will in fact be exercised. They are therefore unjust and unreasonable.[11] In other words, market rules that create the *potential* for the widespread exercise

would create the *ability* for Market Sellers to exercise market power, which the Commission has found unjust and unreasonable." (emphasis added)).

[7] See e.g. *New England Power Generators Ass'n, Inc. v. FERC*, 757 F.3d 283, 297 (D.C. Cir. 2014) (approving FERC's conclusion in favor of mitigation because the "potential" for market power is high); *Vistra Corp. v. FERC*, 80 F.4th 302, 315 (D.C. Cir. 2023), cert. denied sub nom. *Elec. Power Supply Ass'n v. FERC*, 144 S. Ct. 2578 (2024) (upholding FERC-approved scheme designed to "act as a counter to *potential* exertion of market power." (emphasis added)).

[8] *See, e.g.*, Invenergy Protest at 15-16 (arguing that proactively mitigating "the *potential* risk of physical withholding . . . is an insufficient basis to justify applying the must offer requirement to intermittent, storage, and hybrid resources" (emphasis in original)).

[9] *Indep. Mkt. Monitor for PJM v. PJM Interconnection, L.L.C.*, 178 FERC ¶ 61,121, at P 24 (2022) ("*Indep. Mkt. Monitor*").

[10] *See PJM Interconnection* at P 25, n.67 (citing *Indep. Mkt. Monitor* at P 83) ("*PJM*") ("[T]he Commission has found that it is reasonable as a matter of economic theory when establishing market-wide mitigation rules to assume that a seller with market power has an incentive to exercise it.").

[11] *See id.* at P 25 (citing *Indep. Mkt. Monitor* at P 24) ("PJM's proposal would create the ability for Market Sellers to exercise market power, which the Commission has found unjust and unreasonable.").

of market power are unjust and unreasonable, even if they have not yet resulted in the *actual* exercise of market power.

Consequently, whether the must-offer exemption has in fact resulted in the exercise of market power is irrelevant. Only two factors matter. The first is whether the must-offer exemption enables categorically exempt resources to exercise market power by physically withholding them. The second is whether the ability to exercise such market power is widespread enough—that is, possessed by a sufficiently large amount of categorically exempt capacity—to materially affect capacity market clearing prices.

2. The Evidence Submitted by PJM and the IMM Establishes that the Must-Offer Exemption Enables the Widespread Exercise of Market Power.

The evidence submitted in this docket shows that owners of a significant amount of capacity currently exempt from the must-offer requirement can profitably withhold that capacity and materially affect capacity prices. PJM's Chief Economist, Dr. Walter Graf, testified in his affidavit "that nearly half of exempt generation capacity—over 5,000 MW UCAP—is held in portfolios of Capacity Market Sellers that have the incentive and ability to exercise unilateral market power and profitably withhold capacity for generation portfolio benefits."[12] Dr. Graf further testified that "[a]pproximately 1,600 megawatts ("MW") Unforced Capacity ("UCAP") of categorically exempt generation resources" did not offer into the 2025/2026 BRA.[13] The IMM has calculated that the withholding of those 1,600 MW UCAP increased the revenues capacity resources received in the 2025/2026 BRA by 39.3%, costing consumers approximately

[12] Attach. C, Aff. of Dr. Walter Graf on Behalf of PJM Interconnection, L.L.C., at P 16 (Dec. 20, 2024) ("Graf Affidavit").

[13] *Id.* at P 11.

$4.1 billion.[14] Thus, the withholding of an amount of capacity equal to *less than a third* of the total amount of capacity that has "the incentive and ability to exercise unilateral market power" due to the must-offer exemption inflated capacity costs by nearly 40% and cost consumers billions of dollars in the last capacity auction.

These facts prove that the current must-offer exemption creates "a serious risk of widespread exercise of market power."[15] First, Dr. Graf's testimony directly establishes that owners of exempt capacity have not only the ability, but the economic incentive, to withhold that exempt capacity to drive capacity prices higher and earn more revenue on their non-exempt capacity.[16] That is more than enough to establish a serious risk that market power will be exercised under Commission precedent.[17] Second, Dr. Graf's testimony and the evidence provided by the IMM likewise show that withholding just a fraction of the capacity with the ability and incentive to exercise market power can inflate capacity revenues by nearly 40% percent and cost consumers billions. That constitutes the ability to materially affect capacity prices by any measure.[18] Consequently, the must-offer exemption enables a sufficiently large

[14] Comments of the Independent Market Monitor for PJM at 6-7 (Jan. 10, 2025) ("IMM Comments").

[15] *Indep. Mkt. Monitor* at P 24.

[16] Graf Affidavit at P 16; *see also id. at* P 17-19 (explaining the distinction between possessing market power and being able to profitably exercise it); *id.* at P 20 (explaining how Dr. Graf concluded that over 5,000 MW UCAP of exempt capacity "was held in portfolios with at least hundreds of megawatts of must offer exempt generation capacity and sufficiently large portfolios of non-exempt resources so as to be able to benefit from strategic market power withholding").

[17] *See PJM* at P 25, n.67 (citing *Indep. Mkt. Monitor* at P 83) ("[T]he Commission has found that it is reasonable as a matter of economic theory when establishing market-wide mitigation rules to assume that a seller with market power has an incentive to exercise it."); *id.* at P 25 (citing *Indep. Mkt. Monitor* at P 24) (noting that rules that create "the ability for Market Sellers to exercise market power" are "unjust and unreasonable").

[18] Importantly, whether some or all of the specific 1,600 MW UCAP withheld in the 2025/2026 BRA were owned by sellers with the ability to profitably exercise market power is irrelevant to this analysis. Consequently, the Commission should ignore meritless arguments that PJM has failed to demonstrate market power concerns because the Graf Affidavit does not specify whether some or all of the 1,600 MW

amount of capacity to profitably withhold to deem the resulting exercise of market power "widespread."

The current must-offer exemption is therefore unjust and unreasonable.[19] Of course, PJM need not prove that the current must-offer exemption is unjust and unreasonable to eliminate it via a Tariff amendment proposed under Section 205 of the Federal Power Act. But the fact that the exemption is unjust and unreasonable provides ample justification for doing so. If the Commission has sufficient reason to find a tariff provision unjust and unreasonable and order its elimination under its Section 206 authority,[20] a public utility necessarily can justify doing the same under the lower bar set by Section 205. Moreover, as shown below PJM's proposed solution for remedying this problem is just and reasonable.

B. Eliminating the Must-Offer Exemption Without Changing PJM's Penalty Rules is Just and Reasonable Under Current Market Conditions, but PJM Must Align Penalty Risk with Expected Performance in Future Reforms.

Contrary to Protestors' assertions,[21] PJM's proposal strikes a balance between the risks imposed on no-longer-exempt resources and the benefits they will gain from capacity market

UCAP of capacity that was withheld in the 2025/2026 BRA was part of the 5,000 MW UCAP of capacity that possesses the ability to profitably exercise market power. *See, e.g.*, Vistra Protest at 5 ("[W]e have no information about whether the exemption itself is being used by resource owners with the ability to and incentive to exercise market power. Without these details, it is impossible to assess these market power claims."). The salient point is that owners of exempt capacity with the ability to profitably withhold it could generate a similar or even greater market impact by withholding 1,600 MW UCAP or more in future auctions.

[19] *See Indep. Mkt. Monitor* at P 24.

[20] *See* 16 U.S.C. § 824e(a) (directing the Commission to replace rates it finds are unjust and unreasonable following "a hearing held upon its own motion or upon complaint" with a just-and-reasonable replacement rate).

[21] *See, e.g.*, Invenergy Protest at 3-5 (arguing that PJM's proposal fails to provide adequate compensation to resources for requiring them to bear penalty risk, and is therefore "confiscatory" and by extension unjust and unreasonable); Vistra Protest at 11 ("PJM's proposal . . . will result in previously exempt capacity market sellers being forced to accept capacity commitments that do not compensate them for the risks and costs they incur. This will produce confiscatory rates.").

participation that is just and reasonable under market conditions that will prevail for the foreseeable future. In all probability capacity market clearing prices will provide enough revenue to pay for any plausible non-performance penalty assessments several times over, such that resources will increase their net revenue even if they completely fail to perform in another black swan grid emergency like Winter Storm Elliott. Even in the extremely unlikely event that capacity prices will not be high enough to generate sufficient capacity revenue to offset such penalties, the maximum loss intermittent wind and solar resources could sustain from capacity market participation is an insubstantial fraction of their total revenues. Their maximum possible losses also pale in comparison to the cost to consumers of maintaining the must offer-exemption.

In short, resources that are currently exempt from the must-offer requirement are highly likely to profit from capacity market participation and bear minimal downside risk from participating. Such conditions are more than enough to ensure that resources newly subject to the must-offer requirement will have a reasonable opportunity to recover the costs of capacity market participation. It is therefore just and reasonable to require, as an interim measure, that such resources offer into the capacity market under the current penalty structure while PJM works to develop and implement a granular capacity market that aligns penalty risk with expected performance.

1. Capacity Market Revenues are Likely to Be at Least Five Times Greater than the Maximum Possible Penalty Assessment from Another Winter Storm Elliott for the Foreseeable Future.

As demonstrated in the Technical Appendix to this filing, under PJM's current penalty structure a resource would only need a BRA clearing price of $53.40 per MW-day to fully offset

the maximum possible penalty assessment from another Winter Storm Elliott.[22] If the Commission accepts that changes to the penalty rate PJM has proposed in Docket No. ER25-682-000, the needed clearing price would only be $36.65 per MW-day.[23] IMM simulations indicate that next BRA can be expected to clear at price in the vicinity of $300.00 per MW-day, even if the IMM's various proposed market corrections—including but not limited to the elimination of the must-offer exemption—are implemented.[24] The Commonwealth of Pennsylvania's expert witness in Docket No. EL25-46-000 similarly projects that capacity clearing prices in the next BRA will be between $265 per MW-day and $500 per MW-day, with the precise value depending on what market reforms are implemented before then.[25] Consequently, it is extremely likely that clearing prices in the next few auctions will greatly outweigh the highest possible penalties that could result from an Elliott-like event. This means a rational owner of a categorically exempt capacity resource that lacked market power would likely bid into the capacity market, even if they assumed an Elliott-like event would occur in the relevant delivery year *and* that they would be completely unable to perform during the event.[26]

[22] Technical App., *infra*, at 6, tbl.1.

[23] *See id.* at 6-7; Transmittal Letter, Docket No. ER25-682-000 at 69-70 (Dec. 9, 2024) (proposing to replace the current Locational-Deliverability-Area-specific penalty rate with a uniform penalty rate across the entire PJM footprint equal to the RTO-wide net cost of new entry for the reference resource).

[24] *See* Comments of the Independent Market Monitor for PJM, Docket No. ER25-682-000, at 6 (Jan. 6, 2025) ("Including the corrections proposed by the Market Monitor, the Market Monitor's simulations show that prices that reflect expected supply and demand conditions in the 2026/2027 BRA can be reasonably expected to be . . . $302.90 per MW-day . . . ."); *see id.* at 2 (arguing that PJM should include reliability must run capacity in the capacity supply stack, lower the maximum price on the variable resource requirement curve, eliminate the must-offer exemption, and account for the winter ratings of thermal resources to determine their contribution to winter reliability).

[25] *See* Complaint of Governor Josh Shapiro and the Commonwealth of Pennsylvania, Decl. of Kris Aksomitis at P 35-38, Docket No. EL25-46-000 (Dec. 30, 2024).

[26] Actual market behavior further supports this conclusion. The data Dr. Graf presents shows that about 85% of the generation capacity exempt from the must-offer requirement in the 2025/2026 BRA nonetheless *voluntarily* bid into the BRA. Specifically, of the 10,796 MW UCAP of exempt capacity in

2. The Maximum Possible Net Loss Wind and Solar Resources Could Suffer as a Result of Non-Performance Penalties from Another Winter Storm Elliott Are Insignificant in Comparison to Their Total Revenues.

For reasons explained in the Technical Appendix, the maximum net loss for a solar resource is well under 1% of the annual revenue it can earn from energy and renewable energy certificate ("REC") sales.[27] The maximum net loss for a wind resource is similarly less than 2% of its annual energy and REC revenue.[28] Both wind and solar resources routinely experience greater fluctuations in their annual generation—and thus their annual energy and REC revenue, even if they are selling via a fixed price power purchase agreement—as a result of normal year-to-year variations in weather conditions.[29] Solar and wind resources can thus reasonably be expected to have the financial capability to withstand such penalties without imperiling their ability to service debt or materially impairing their overall profitability.

Thus, even extreme tail risks do not materially change the value proposition of capacity market participation. A renewable resource is far more likely to earn several times more in capacity revenue than it could lose due to any plausible non-performance penalty. That is more than sufficient to demonstrate that capacity market participation presents a reasonable

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the 2025/2026 BRA, only about 1,600 MW UCAP choose to not bid in—meaning approximately 9,200 MW UCAP voluntarily chose to bid into the BRA. *See* Graf Affidavit at P 11, P 12, tbl.1.B. Thus, owners of the overwhelming majority of exempt capacity have already decided that the financial benefits of capacity market participation outweigh the risks of penalties even under the current penalty structure.

[27] *See id.* at 9-10.

[28] *See id.* at 10-11.

[29] *See id.* at 11.

opportunity to recover capacity costs, and that by extension, a must-offer requirement is not confiscatory.

3. The Cost to Consumers of Maintaining the Must-Offer Exemption Vastly Exceeds the Benefits to Exempt Resources.

When assessing whether PJM's instant proposal is just and reasonable, the Commission should also consider the extreme disparity in cost to consumers and benefits to exempt resource owners the current must-offer exemption creates. If every single exempt generation resource both bid into the BRA and failed to produce *any* energy during another Elliott-like event, the maximum possible combined losses those resources could suffer would only come to about $70.1 million.[30] For clarity, that $70.1 million represents the total possible losses for *every* renewable and energy storage resource in the PJM footprint put together, *not* the maximum loss that an individual resource could suffer. That $70.1 million loss is less than 2% of the $4.1 billion the must-offer exemption cost load in the last BRA.[31] Furthermore, as only about 15% of exempt generation capacity withheld in the last BRA,[32] in practice that $4.1 billion cost to consumers only protected a subset of exempt capacity owners from a *potential* loss of roughly $10.4 million.[33] In short, the current must-offer exemption is forcing consumers to pay billions of dollars to insure resource owners from the *mere possibility* of having to suffer a loss that is a tiny fraction of that cost.

[30] *See* Technical App., *infra*, at 12.

[31] *See* IMM Comments at 6-7.

[32] *See* Graf Affidavit at P 11 (noting that approximately 1,600 MW UCAP of exempt generation capacity did not bid into the 2025/2026 BRA); *id.* at P 12, tbl.1.B (showing that the total amount of exempt generation capacity in the 2025/2026 BRA was 10,796 MW UCAP)

[33] *See* Technical App., *infra*, at 12.

4. Though PJM's Proposal is Just and Reasonable as An Interim Measure, Especially When Considering the Status Quo's Cost to Consumers, Future Reforms Must Better Align Penalty Risk with Expected Performance.

OPSI acknowledges that PJM's filing is not perfect. But the just-and-reasonable standard does not demand perfection. Neither should the Commission make the perfect the enemy of the good. Whatever drawbacks PJM's proposal may have, it remedies a manifestly unjust-and-unreasonable flaw under which consumers are overcharged billions of dollars per year to protect for-profit resource owners from the mere risk of suffering losses that are miniscule in comparison. For that reason, the Commission should approve PJM's present proposal to eliminate the must-offer exemption as a just-and-reasonable improvement over the status quo. That said, PJM must build on the present interim reforms by developing and implementing a granular capacity market that properly aligns penalty risk with expected performance to ensure its proposed changes remain just and reasonable under changed market conditions.

C. If the Commission Finds that PJM Has Failed to Show that Its Proposal is Just and Reasonable, the Commission Must Eliminate the Must-Offer Exemption Using Its Section 206 Authority.

Though OPSI believes PJM's proposed elimination of the must-offer exemption satisfies its Section 205 burden, if the Commission disagrees, it cannot leave consumers exposed to the multi-billion dollar costs of the must-offer exemption for even one more BRA. As shown above, the current must-offer exemption is unjust and unreasonable because it creates a serious risk of a widespread exercise of market power. The legitimate benefits it provides to exempt resources owners—protection from the risk of losing roughly $10 million—pale in comparison to burdens it places on consumers—an increase in capacity costs of over $4 billion in the last BRA alone. There is no justification for charging consumers so much for so little benefit, especially when they are not even the party that is receiving the benefit.

The Federal Power Act mandates that the Commission act to protect consumers from the unjust and unreasonable rates, as well as rules and practices affecting them.[34] Consequently, the Commission has a statutory duty to prevent any unjust and unreasonable consequences resulting from the continued application of the must-offer exemption to future BRAs. Therefore, if the Commission finds that PJM has failed to show its proposed Tariff changes are just and reasonable, the Commission must eliminate the must-offer exemption and prescribe its own just-and-reasonable replacement rate using its Section 206 authority.[35]

III. CONCLUSION

For the reasons stated above, OPSI respectfully requests that the Commission grant OPSI's motion for leave to answer and approve PJM's proposed Tariff changes that will eliminate the must-offer exemption for renewable and energy storage resources. Should the Commission find that PJM has failed to show that its proposed Tariff changes are just and reasonable, OPSI respectfully requests that the Commission eliminate the must-offer exemption using its Section 206 authority.

[34] *See* 16 U.S.C. § 824d(a) ("All rates and charges . . . subject to the jurisdiction of the Commission, and all rules and regulations affecting or pertaining to such rates or charges shall be just and reasonable, and any such rate or charge that is not just and reasonable is hereby declared to be unlawful."); 16 U.S.C. § 824e(a) ("Whenever the Commission . . . shall find that . . . any rule, regulation, practice, or contract affecting such rate, charge, or classification is unjust, unreasonable, unduly discriminatory or preferential, the Commission shall determine the just and reasonable . . . rule, regulation, practice, or contract to be thereafter observed . . . and shall fix the same by order.").

[35] Though the Commission could open a new proceeding under its own authority, the quickest means of effecting such a change under Section 206 would likely be acting on the Joint Consumer Advocate Complaint in Docket No. EL25-18-000. *See* Complaint of Joint Consumer Advocates, Docket No. EL25-18-000, at 35 (Nov. 18, 2024) (requesting that the Commission use its Section 206 authority to "revok[e] categorical exemptions from must-offer requirements").

Respectfully submitted,

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Dated: January 27, 2025

CERTIFICATE OF SERVICE

I hereby certify that the foregoing has been served in accordance with 18 C.F.R. Section 385.2010 upon each person designated on the official service list compiled by the Secretary in this proceeding.

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Dated at Newark, Delaware this January 27, 2025.

Appendix: Calculations of Potential Non-Performance Penalties and Their Significance Relative to Market Revenues

I. Summary

This Technical Appendix uses the provisions of PJM's Open Access Transmission Tariff ("Tariff") and publically available data to quantify (1) the size of plausible Non-Performance Charges (non-performance penalties) in relation to likely capacity revenues and (2) the maximum possible net losses Capacity Resources could suffer from repeats of Performance Assessment Interval ("PAI") events seen to date.[36] Section II calculates the Base Residual Auction ("BRA") clearing price needed for a resource to offset the maximum possible Non-Performance Charges that could occur from repeats of prior PAI events, as summarized in Table 1. Section II then shows that capacity revenues in the near future are likely to exceed the maximum possible Non-Performance Charges from a repeat of even a black swan event like Winter Storm Elliot several times over. Section III calculates the maximum possible gross and net losses wind and solar resources could suffer from Non-Performance Charges from repeats of prior PAI events, as summarized in Tables 2A and 2B. Section III also shows the maximum possible net loss from a repeat of Winter Storm Elliott amounts to less than 1% of a solar resources' annual energy and renewable energy certificate ("REC") and less than 2% of a wind's resources' annual energy and REC revenue. Finally, Section 3 shows that these maximum possible net losses are insignificant in relation to expected inter-annual variation in energy and REC revenues and the cost to consumers of maintaining the must-offer exemption.

[36] Unless stated otherwise, all capitalized terms in this Appendix have the definitions given to them in the Tariff. *See* Tariff § 1; Tariff Att. DD § 10A.

II. Non-Performance Charges are Unlikely to Exceed Annual Capacity Revenue in the Near Future Given Recent Tariff Changes and Current Capacity Market Conditions

In the near term, intermittent and storage's capacity revenues are highly likely to exceed any plausible Non-Performance Charge assessment several times over. As shown below, under current market rules the capacity clearing price needed to fully pay for the maximum possible penalties that could result from another Winter Storm Elliott-like event are a mere fraction of expected capacity market clearing prices for the next few years.

The clearing price needed to fully pay for a Capacity Resource's Non-Performance Charges is the clearing price at which the Capacity Resource's annual capacity revenue ("R") equals its total Non-Performance Charge assessment ("C") for a given Delivery Year:

$$R = C$$

Assuming that a Capacity Resource's Non-Performance Charge for every PAI in the year is constant—which would be the case if a Capacity Resource failed to produce any energy during every PAI in the Delivery Year and the Balancing Ratio is assumed to be constant—the total amount of Non-Performance Charges for the Delivery Year will simply be the Non-Performance Charge for a single PAI times the total number of PAIs ("I") in the year:

$$C = C_I * I$$

Per PJM's Open Access Transmission Tariff ("Tariff"), a Capacity Resource's Non-Performance Charge for a given PAI ("C_I") is equal to its Performance Shortfall ("S") times the Non-Performance Charge Rate ("C_R"):[37]

$$C_I = S * C_R$$

[37] Tariff Att. DD § 10A(e).

The Capacity Resource's Performance Shortfall is its Expected Performance ("E") minus its Actual Performance ("A"):[38]

$$S = E - A$$

A Capacity Resource's Expected Performance is equal to the Balancing Ratio ("B") times its Resource Committed Capacity ("U"):[39]

$$E = B * U$$

The Non-Performance Charge Rate is the "Net Cost of New Entry (stated in terms of installed capacity) for the LDA and Delivery Year for which such calculation is performed" ("N") times "the number of days in the Delivery Year" ("D") divided by 30 and divided again by "the number of Real-Time Settlement Intervals in an hour."[40] As a Real-Time Settlement Interval is 5 minutes long by definition,[41] there are 12 in a given hour and therefore:

$$C_R = N * \frac{\frac{D}{30}}{12}$$

$$C_R = N * \frac{D}{360}$$

Given these equations, the Non-Performance Charge for a given PAI can be expressed as:

$$C_I = ((B * U) - A) * \ N * \frac{D}{360}$$

[38] *Id.* § 10A(c).

[39] *Id.* The Balancing Ratio is essentially all actual Capacity Resource output (including generation, storage discharging, net energy imports, and demand response load reductions) in PJM during a PAI divided by the total capacity of all generation and storage resources in PJM, but cannot exceed a value of 1. *Id.* A Capacity Resource's Resource Committed Capacity is "the total megawatts of Unforced Capacity of the Capacity Resource committed" in the relevant Delivery Year. *Id.*

[40] *Id.* § 10A(e).

[41] Tariff § 1.

For C_I to be constant across all given PAIs in a given Delivery Year, B, U, A, N, D must also be constant. By definition, U, N and D will be constant for any given Delivery Year. To calculate the maximum possible value for C—and thus calculate the clearing price needed to cover the worst-case Non-Performance Charge assessment—one must assume values for B and A that maximize C_I. The highest possible value for B (the Balancing Ratio) is 1 per the Tariff,[42] while A (a Capacity Resource's Actual Performance) cannot be lower than zero. Thus, under the worst-case, Non-Performance Charge maximizing assumptions that $B = 1$ and $A = 0$ for all PAIs in a given Delivery Year:

$$C = \big((B * U) - A\big) * N * \frac{D}{360} * I$$

$$C = \big((1 * U) - 0\big) * N * \frac{D}{360} * I$$

$$C = (U - 0) * N * \frac{D}{360} * I$$

$$C = U * N * \frac{D}{360} * I$$

It therefore follows that the capacity revenue needed to fully offset a Capacity Resource's maximum possible Non-Performance Charge assessment is given by the following equation:

$$R = U * N * \frac{D}{360} * I$$

A Capacity Resource's annual capacity revenue, R, equals its Resource Committed Capacity, U, times the BRA clearing price ("P"), times the number of days in the given Delivery Year ("D"):

$$R = U * P * D$$

[42] Tariff Att. DD § 10A(c).

It therefore follows that:

$$U * P * D = U * N * \frac{D}{360} * I$$

The U and D on both sides of the equation cancel out, simplifying this equation to:

$$P = N * \frac{1}{360} * I$$

$$P = \frac{N * I}{360}$$

Thus, the clearing price needed to fully offset the maximum possible Non-Performance Charge assessment in a given Delivery Year is equal to the Net Cost of New Entry ("Net CONE") in the relevant Locational Deliverability Area ("LDA") times the number of PAIs in the Delivery Year, divided by 360.

Using this formula, one can calculate the clearing price needed to offset the maximum possible Non-Performance Charges if the PJM region were to see repeats of prior PAI events. To date, PJM has only seen three events that have triggered PAIs—one on May 19, 2018 that triggered 6 PAIs, one on October 2, 2019 that triggered 24 PAIs, and Winter Storm Elliot in 2022, which triggered 277 PAIs.[43] These are shown in the table below using both the highest Net CONE value in any LDA ($263.32 per Installed Capacity, "ICAP," MW-day) as well as the RTO-wide Net CONE ($180.76 per ICAP MW-day) for the 2025/2026 BRA.[44] Also note that

[43] *See Performance Assessment Interval Final Balancing Ratio*, PJM, https://dataminer2.pjm.com/feed/pai_final_balancing_ratio (last visited Dec. 10, 2024). Note that finding the PAI data requires manually setting a time period to search that is no longer than 365 days. This means one must submit multiple queries to the system to find the data for all relevant Delivery Years.

[44] PJM, 2025-2026 RPM Base Residual Auction Planning Parameters (2024), https://www.pjm.com/-/media/DotCom/markets-ops/rpm/rpm-auction-info/2025-2026/2025-2026-planning-period-parameters-for-base-residual-auction.xlsx. Note that PJM is now proposing to replace the LDA-specific Net CONE values used to calculate Non-Performance Charges with the uniform, RTO-wide Net CONE value. *See* Transmittal Letter, Docket No. ER25-682-000, at 69-73 (Dec. 9, 2024).

due to PJM's recent changes to the definition of an Emergency Action, which is the trigger for a PAI,[45] under the current Tariff Winter Storm Elliott would have only triggered 73 PAIs instead of 277.[46] Consequently, Table 1 below provides the "break-even" clearing price for Winter Storm Elliot under both the old and new version of the Tariff:

Table 1: BRA Clearing Price ($ per MW-day) Needed to Offset Non-Performance Charges				
	May 29, 2018 Event (6 PAIs)	October 2, 2019 Event (24 PAIs)	Winter Storm Elliott, Current Tariff Provisions (73 PAIs)	Winter Storm Elliott, Prior Tariff Provisions (277 PAIs)
RTO Wide Net CONE ($180.76 per MW-day)	$3.01	$12.05	$36.65	$139.08
Highest LDA Net CONE ($263.32 per MW-day)	$4.39	$17.55	$53.40	$202.61

Note that these break-even clearing prices are well-below the nearly $270 per MW-day clearing price seen in the last BRA. Market simulations performed by the Independent Market Monitor also predict that we should expect to see clearing prices in the vicinity of $300 per MW-day, even if the various flaws that inflated the clearing price in the last BRA are addressed.[47] That is about six times greater than the clearing price of $53.40 per MW-day needed to pay for the highest possible penalties that could result from another Winter Storm Elliot under PJM's current rules, and more than eight times greater than the clearing price of $36.65 per MW-day that would

[45] *See* Tariff § 1 ("'Performance Assessment Interval' shall mean each Real-time Settlement Interval for which an Emergency Action has been declared by the Office of the Interconnection . . . .").

[46] *See* Transmittal Letter, Docket No. ER24-99-000, at 97 (Oct. 13, 2023).

[47] *See* Comments of the Independent Market Monitor for PJM, Docket No. ER25-682-000, at 6 (Jan. 6, 2025) ("Including the corrections proposed by the Market Monitor, the Market Monitor's simulations show that prices that reflect expected supply and demand conditions in the 2026/2027 BRA can be reasonably expected to be . . . $302.90 per MW-day . . . .").

be needed if the Commission approves the Tariff revision PJM is proposing in Docket No. ER25-682-000.[48]

III. The Maximum Possible Net Losses from Non-Performance Charges for Solar and Wind Resources Are an Insignificant Portion of Their Net Energy and Renewable Energy Certificate Sale Revenue

One can also calculate the capacity Non-Performance Charges assessed per MW UCAP of Resource Committed Capacity in a given Delivery Year for given Net CONE ("N") value and number of PAIs ("I"). As shown above, when making worst case assumptions about both the Balancing Ratio and Capacity Resource performance, a Capacity Resource's Non-Performance Charge for a given Delivery Year is:

$$C = U * N * \frac{D}{360} * I$$

Assuming a 365-day delivery year, then on a per-MW UCAP of Resource Committed Capacity basis the formula simplifies to:

$$C = 1 * N * \frac{365}{360} * I$$

$$C = \frac{73}{72} * N * I$$

With this formula, we can calculate the per-MW UCAP penalty for various scenarios, as shown in Table 2A below:

[48] *See* Transmittal Letter, Docket No. ER25-682-000 at 69-70 (Dec. 9, 2024) (proposing to replace the current LDA-specific Non-Performance Charge rates with a uniform Non-Performance Charge rate across the entire PJM footprint equal to the RTO-wide Net CONE for the Reference Resource).

Table 2A: Capacity Non-Performance Charges per MW UCAP of Resource Committed Capacity				
	May 29, 2018 Event (6 PAIs)	October 2, 2019 Event (24 PAIs)	Winter Storm Elliott, Current Tariff Provisions (73 PAIs)	Winter Storm Elliott, Prior Tariff Provisions (277 PAIs)
RTO Wide Net CONE ($180.76 per MW-day)	$1,099.62	$4,398.49	$13,378.75	$50,765.94
Highest LDA Net CONE ($263.32 per MW-day)	$1,601.86	$6,407.45	$19,489.34	$73,952.69

Note that these amounts correspond to total penalties. The maximum net loss an Intermittent Resource would be exposed to from being forced to offer into the capacity market would be only a third of these values. This is because on January 30, 2024 in Docket No. ER24-99-000 the Commission approved various PJM-proposed changes to the capacity market provisions of the Tariff, including a change to the "stop loss" provision that limits the maximum Non-Performance Charges a Capacity Resource can be assessed in a given delivery year.[49] Specifically, the Commission approved a new section in Attachment DD to the Tariff that in relevant part provides:

> Effective with the 2025/2026 Delivery Year and subsequent Delivery Years, the Non-Performance Charges for each Capacity Performance Resource . . . shall not exceed a Non-Performance Charge Limit equal to 1.5 times the RPM Base Residual Auction clearing price times the number of days in the Delivery Year . . . times the megawatts of Unforced Capacity committed by such resource . . . .[50]

[49] *PJM Interconnection, L.L.C.*, 186 FERC ¶ 61,080, at P 234-35 (2024) ("2024 Capacity Market Reform Order").

[50] Tariff Att. DD § 10A(f-1).

As the Commission explained, this provision limits the maximum loss a Capacity Resource owner can sustain due to Non-Performance Charges in a given year to "its entire capacity market revenue plus an additional 50 percent of that revenue."[51] That in turn means the maximum net loss a Capacity Resource can sustain in a given year due to Non-Performance Charges is 50% of its capacity market revenue, which is a third of the maximum Non-Performance Charge assessment. The maximum possible net losses from capacity market participation in these various scenarios per MW UCAP of committed capacity is given in Table 2B below:[52]

Table 2B: Maximum Net Losses from Capacity Market Participation per MW UCAP of Committed Capacity				
	May 29, 2018 Event (6 PAIs)	October 2, 2019 Event (24 PAIs)	Winter Storm Elliott, Current Tariff Provisions (73 PAIs)	Winter Storm Elliott, Prior Tariff Provisions (277 PAIs, Old Stop-Loss Limit)
RTO Wide Net CONE ($180.76 per MW-day)	$336.54	$1,466.16	$4,459.58	$50,765.94
Highest LDA Net CONE ($263.32 per MW-day)	$533.95	$2,135.82	$6,496.45	$73,952.69

These net losses from Non-Performance Charges would only amount to a minuscule portion of a solar facility's net revenue from energy and renewable energy certificate ("REC") sales. According to the 2023 State of the Market Report, in 2023 a new solar facility would have earned $29,171 to $78,683 per ICAP MW-year in net revenue from the energy market and

[51] 2024 Capacity Market Reform Order at P 235.

[52] Note that the maximum losses for Winter Storm Elliott under the old rules are the same as the gross charges listed above due to the old stop-loss limit being much higher).

another $106,338 to $304,609 per ICAP MW-year in net revenue from REC sales.[53] The lowest combined energy and REC revenue for solar was $153,718 per ICAP MW-year (in the DPL zone).[54] As the Class ELCC rating for 1-axis tracking solar in the 2026/2027 BRA is 13%,[55] that corresponds to $153,718/0.13 ≈ $1,182,446 per MW UCAP-year. That is $1,182,446/$4,459.58 ≈ 265 times greater than the maximum possible per MW-UCAP net loss a solar resource could suffer if a Winter Storm Elliott scenario were to repeat itself under PJM's current rules, with the modifications to the Non-Performance Charge rate PJM is proposing in ER25-682.[56] Even without those modifications, this is still $1,182,446/$6,496.45 ≈ 182 times greater than the maximum net loss a solar resource could suffer with a Non-Performance Charge Rate set at the highest LDA Net CONE value in the 2025/2026 BRA. In other words, were another Winter Storm Elliott to occur, in the worst case scenario a solar facility would suffer a net loss of less than a single percent of its annual energy and REC revenue.

According to the 2023 State of the Market Report, in 2023 a new onshore wind facility would have earned $52,834 to $65,591 per ICAP MW-year in net revenue from the energy market and another $59,274 to $76,693 per ICAP MW-year in net revenue from REC sales.[57] The lowest combined energy and REC revenue for onshore wind was $113,370 per ICAP MW-

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[53] Monitoring Analytics, *State of the Market Report for PJM 2023 Volume 2: Detailed Analysis* 408 tbl. 7-29, 409 tbl. 7-32 (2024), https://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2023/2023-som-pjm-vol2.pdf

[54] *Id.* This is greater than the sum of the minimum end of the individual energy market and REC net revenue ranges because the zones with the lowest energy and lowest REC net revenue are not the same.

[55] *ELCC Class Ratings for the 2026/2027 Base Residual Auction*, PJM, https://www.pjm.com/-/media/DotCom/planning/res-adeq/elcc/2026-27-bra-elcc-class-ratings.pdf (last visited Jan. 9, 2025).

[56] PJM Interconnection, L.L.C., Transmittal Letter, Docket No. ER25-682 at 69-70 (Dec. 9, 2024) (proposing to establish a uniform Non-Performance Charge rate across the entire PJM footprint equal to as the RTO-wide Net CONE for the Reference Resource).

[57] Monitoring Analytics at 406 tbls. 7-19, 7-22.

year (in the PE zone).[58] As the Class ELCC rating for onshore wind in the 2026/2027 BRA is 34%,[59] that corresponds to $113,370/0.34 ≈ $333,441 per MW UCAP-year. That is $333,441/$4,459.58 ≈ 75 times greater than the maximum possible per MW-UCAP penalty a solar resource could suffer if a Winter Storm Elliott scenario were to repeat itself under PJM's current rules, with the modifications to the Non-Performance Charge rate PJM is proposing in ER25-682.[60] Even without those modifications, this is still $333,441/$6,496.45 ≈ 51 times greater than the maximum net loss an onshore wind resource could suffer with a Non-Performance Charge rate set the highest LDA Net CONE value in the 2025/2026 BRA. In other words, were another Winter Storm Elliott to occur, in the worst case scenario an onshore wind facility would suffer a net loss of less than two percent of its annual energy and REC revenue.

An occasional reduction in annual revenues of 1% or less and 2% or less for solar and wind resources respectively are a relatively minor problem for their owners, as inter-annual weather variability routinely causes more significant fluctuations in their annual generation and thus their energy and REC revenue. Specifically, the average inter-annual variability ("IAV") of "annual average wind speed and solar irradiance ranges from 1% to 5% across the United States, and significantly larger variability exists seasonally and year-to-year."[61] The average IAV of

[58] *Id.*

[59] *ELCC Class Ratings for the 2026/2027 Base Residual Auction*.

[60] PJM Interconnection, L.L.C., Transmittal Letter, Docket No. ER25-682 at 69-70 (Dec. 9, 2024) (proposing to establish a uniform Non-Performance Charge rate across the entire PJM footprint equal to as the RTO-wide Net CONE for the Reference Resource).

[61] Andrew Kumler et al., *Inter-annual Variability of Wind and Solar Electricity Generation and Capacity Values in Texas*, Envtl. Res. Letters, Apr. 16, 2019, at 2, https://www.nrel.gov/docs/fy19osti/72414.pdf.

wind *generation* is even higher.[62] For example, in the ERCOT footprint the average IAV "of wind generation ranges from 2.3%-11% . . . . while the [average] IAV of solar generation ranges from 1.7%-5%."[63] Wind and solar projects need to have financing structures that are robust to these unavoidable variations in annual generation and revenue, variations that are *greater* than the net revenue loss from the worst-case penalties that could result from another Elliot-like event. Indeed, International Energy Agency data indicates that wind and solar projects in the Unites States rarely have capital structures that are more than 70% debt.[64] Thus, wind and solar projects owners likely have the ability to pay the worst penalties that could result from a Winter Storm Elliott-like event out of their annual energy and REC sales revenue while still servicing their debt. Though such penalties may notably decrease equity investors' returns in some years, such a reduction in net revenue of 2% or less is far from ruinous.

Finally, the maximum possible penalties renewable and storage resources could suffer from another Elliott-like event pale in comparison to the cost to consumers of maintaining the current must-offer exemption. As PJM's Chief Economist Dr. Walter Graf notes in his affidavit, 10,796 MW UCAP of renewable and storage capacity in the PJM footprint is currently exempt from the must-offer requirement.[65] As shown above, the maximum possible net loss any resource could sustain from failing to produce any energy during another Winter Storm Elliott event is $6,496.45 per MW UCAP. If every single renewable and storage resource in PJM both bid into

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[62] This is because wind generation is directly proportional to the *cube* of wind speed, while solar generation is directly proportional to solar irradiance. *Wind Energy*, Int'l Renewable Energy Agency, https://www.irena.org/Energy-Transition/Technology/Wind-energy (last visited Jan. 13, 2025).

[63] Kumler et al. at 1.

[64] *The Cost of Capital in Clean Energy Transitions*, Int'l Energy Agency (Dec. 17, 2021), https://www.iea.org/articles/the-cost-of-capital-in-clean-energy-transitions.

[65] *See* Aff. of Dr. Walter Graf on Behalf of PJM Interconnection, L.L.C. at 4, tbl.1.B (Dec. 20, 2024) ("Graf Affidavit").

the capacity market and failed to produce *any* energy during another Elliott like event, they collectively would suffer a maximum net loss of $6,496.45 * 10,796 = $70,135,674.20. That amounts to less than 2% of the roughly $4.1 billion that the Independent Market Monitor calculated the must offer exemption cost load in the last BRA.[66] The maximum possible net loss to the approximately 1,600 MW UCAP of renewable and storage resources that withheld in the last BRA would be of $6,496.45 * 1,600 = $10,394,320.00.[67] That is only 0.25% of what the must-offer exemption cost load in the last BRA.

[66] *See* Comment of the Independent Market Monitor for PJM at 6-7 (Jan. 10, 2025).

[67] *See* Graf Affidavit at P 11 (noting that about "1,600 megawatts ('MW') Unforced Capacity ('UCAP') of categorically exempt generation resources were not offered" in the 2025/2026 BRA).