

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

Governor Josh Shapiro and
The Commonwealth of Pennsylvania

Complainants,

v.

PJM Interconnection, L.L.C.

Respondent.

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Docket No. EL25-46-000

**COMPLAINT OF GOVERNOR JOSH SHAPIRO AND
THE COMMONWEALTH OF PENNSYLVANIA**

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I. INTRODUCTION

Pennsylvania ratepayers face potentially the largest unjust wealth transfer in the history of U.S. energy markets due to PJM Interconnection LLC's ("PJM") capacity auctions. Three unexpected developments—(1) significant load growth; (2) the country's most snarled interconnection queue; and (3) a compressed capacity auction schedule—have collided with PJM's inapt design decisions to produce record high prices that are ineffective at delivering new power generation—the intended purpose of those high prices.

The Commonwealth of Pennsylvania, and other states PJM serves, are already experiencing the consequences. The 2025/2026 Base Residual Auction ("BRA") cleared at a price nearly ten times that of the immediately preceding auction. Even that price will almost certainly soon be eclipsed. The upcoming 2026/2027 BRA is forecast to produce a result that could be the most expensive in capacity market history.

If the auction were functioning as intended, these record-setting prices could encourage investment in new generation and preserve reliability, both of which Pennsylvania agrees are needed. Yet, as PJM's own experts have warned this Commission in recent weeks, the auction is currently structurally unable to deliver that intended result.¹ The ballooning delays in PJM's interconnection queue and increasingly compressed auction timelines conspire to foreclose any realistic possibility of market participants responding to the auction's clearing price. As PJM admits, it made changes in 2022 to the capacity auction that were designed to manage expected

¹ See *PJM Interconnection, L.L.C.*, Revisions to Reliability Pricing Model, Docket No. ER25-682-000 (Dec. 9, 2024), Attachment C, Affidavit of Dr. Samuel A. Newell at ¶ 18 (warning that consumers are exposed to the risk of "high prices that are beyond what is needed to attract new entry in the long run, but that may yet be produced in the interim period before barriers to entry can be addressed. . .") (hereinafter, "Newell Affidavit"); Attachment D, Affidavit of Walter Graf and Skyler Marzewski at ¶ 41(c) ("While market signals suggest the need for new generation resources, the transition in PJM's interconnection queue process has created a bottleneck, slowing the entry of new capacity.") (hereinafter "Graf/Marzewski Affidavit").

market conditions (an excess of supply leading to capacity over procurement) that have failed to materialize and actually starkly reversed.

PJM's capacity market is a complex construct that was not built for this environment. Under current conditions, the design of PJM's capacity market permits scant differences in supply to whiplash the market between soaring or cratering prices. Such excessive volatility is not the mark of a healthy market. No generator can rely on such outcomes to make retirement decisions, no investor can depend on them to deliver sustainable returns over time, and no consumer paying resulting double-digit bill increases can feel confident in having secured a more reliable grid as a result.

PJM itself has recognized the failures of its current design. It has proposed several partial reforms in its December 9, 2024 and December 20, 2024 Section 205 filings with this Commission,² and PJM has several more longer-term reforms underway in the stakeholder process.³ These proposals will improve matters, but even were the Commission to approve all these proposals, it would be insufficient to ensure against the unjust costs that PJM's proposed market rules threaten to impose on Pennsylvania's consumers in the next two auctions.

Without the additional changes proposed in this Complaint to the capacity auction's price cap (also described as the top point on the Variable Resource Requirement, or "VRR," curve), Pennsylvania consumers and ratepayers across the region face up to a \$20.4 billion increase in electricity bills over two years that will do extraordinarily little to ensure grid reliability.⁴ A

² Docket Nos. ER25-682-000 and ER25-785-000, respectively.

³ See Mark Takahashi, PJM Board Letter (Dec. 9, 2024) at 6, *available at* <https://www.pjm.com/-/media/DotCom/about-pjm/who-we-are/public-disclosures/2024/20241209-board-letter-outlining-action-on-capacity-market-adjustments-rri-and-sis.pdf>.

⁴ \$20.4 billion is the difference between the projected outcome of an auction conducted with the price cap changes requested by the Commonwealth and one conducted under the BRA parameters PJM has proposed in its Section 205 filings but without further changes to the price cap. If neither PJM's nor the Commonwealth's proposals are enacted, the next two auctions could cost ratepayers as much as \$74 billion without producing a meaningful market response.

chorus of dismay from major independent observers, led by PJM’s own Independent Market Monitor (“IMM”) and the Organization of PJM States (“OPSI”), has warned for months that the current price cap is too high and that the extraordinary prices consumers will pay as a result have been “significantly affected by flawed market design decisions The BRA prices do not solely reflect supply and demand fundamentals but also reflect, in significant part, PJM decisions [that] resulted in [there being] prices . . . approximately twice as high (112.1 percent) as supported by the fundamentals.”⁵ But those warnings have not been heeded and prices still risk rising beyond levels justified by current market realities. To avoid forcing consumers to pay runaway prices driven by present market failures, this Commission should (in addition to the other measures the Commission may adopt) adjust the price cap formula for PJM’s capacity auction.

Indeed, the auction price cap exists to ensure that the market does not exceed prices needed to incent a supply response. For the upcoming auction, that cap has been raised—for the first time—to the greater of 1.75 times PJM’s estimate of the Net Cost of New Entry (“Net CONE”) or PJM’s estimate of the Gross Cost of New Entry (“Gross CONE”).⁶ Increasing the cap in this way was primarily meant to guard against over procurement that is no longer as meaningful a risk and assumes (and makes sense only when) market participants can respond to

⁵ Monitoring Analytics, Analysis of the 2025/2026 RPM Base Residual Auction Part D (Dec. 6, 2024), at 7-8, available at https://www.monitoringanalytics.com/reports/Reports/2024/IMM_Analysis_of_the_20252026_RPM_Base_Residual_Auction_Part_D_20241206.pdf.

⁶ While either parameter could theoretically set the maximum price of the auction, and both need to be adjusted to prevent an unjust outcome, Gross CONE is expected to set the maximum price regardless of the Net CONE multiplier used if Gross CONE is permitted to operate in the forthcoming auction. See *PJM Interconnection, L.L.C.*, Docket No. ER22-2984-000, Periodic Review of Variable Resource Requirement Curve Shape and Key Parameters (Sept. 30, 2022) at 19 (“Under current estimations of gross and Net CONE . . . gross CONE would set the value.”).

the clearing price with new entry.⁷ When, as now, that is not true, the cap cannot achieve its intended purpose.

In fact, over the last four years, each of the principal motivations for introducing the higher cap to be used in the next auction has vanished. Allowing a capacity auction to proceed with a cap that, because of changing real world circumstances, fails to protect consumers across the PJM region from bearing astronomical costs that will not produce a commensurate benefit, gravely undermines public confidence in the essential fairness of PJM's capacity market and is unjust and unreasonable.

Accordingly, Governor Josh Shapiro and the Commonwealth of Pennsylvania (collectively "Commonwealth" or "Pennsylvania") are filing this Complaint against PJM under Sections 206 and 306 of the Federal Power Act ("FPA"), 16 U.S.C. §§ 824e and 825e, and Rule 206 of the Federal Energy Regulatory Commission's ("FERC" or "Commission") Rules of Practice and Procedure, 18 C.F.R. § 385.206.⁸ The Commonwealth respectfully requests that the Commission take the following further actions:

- (1) Establish a refund effective date pursuant to Section 206 as of the date of this Complaint.
- (2) Find that PJM's capacity market cap is unjust and unreasonable. Due to changes in load growth and existing constrained entry conditions for new supply, the current market cap permits the auction to clear at prices that threaten to impose enormous costs upon consumers without commensurate public benefit.

⁷ When this Commission has approved the price cap mechanism, it has done so under the bedrock assumption that the market generally "will produce accurate market signals that will encourage capacity investment . . ." which presumes the ability to make such investment. *PJM Interconnection, L.L.C.*, 182 FERC ¶ 61,073, Order Accepting Proposed Tariff Revisions (Feb. 14, 2023), at ¶ 157.

⁸ This Complaint is supported by the testimony of the Commonwealth's witness, Kris Aksomitis. Witness Aksomitis' Declaration is provided as Attachment 1, with his Report and CV included as Exhibits A and B, respectively.

- (3) Establish just and reasonable replacement rates by ordering PJM to redefine its capacity auction market cap until the next quadrennial review period. This measure is needed so that the next two auctions do not impose \$20.4 billion in unnecessary costs on consumers that provide no commensurate benefit in the public interest. The capacity price cap should be no more than 1.5 times Net CONE, and PJM should use 1.5 times the RTO Net CONE to set the minimum price cap for all Locational Deliverability Areas (“LDAs”).

The Commission and PJM should prioritize these reforms ahead of the 2026/2027 BRA.

Taking the steps above could reduce costs by up to half, saving consumers across the PJM footprint over \$20.4 billion in unnecessary costs, including approximately \$4 billion for Pennsylvania ratepayers alone.⁹ These unnecessary costs are unsustainable for consumers, and if allowed will stoke calls for deeper reforms to the capacity market, preventing the establishment of stable market rules that are critical to long-term decision making and investment.

II. BACKGROUND

A. PJM

In 1927, two Pennsylvania utilities became founding members of the world’s first regional power pool. Over the following 97 years, that entity has grown into PJM Interconnection, the nation’s largest regional transmission organization (“RTO”), coordinating the movement of wholesale electricity in all or parts of 13 states and the District of Columbia.¹⁰ Today, PJM is responsible for the reliability of the high-voltage electric power system serving 65 million people in all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and the District of Columbia.

⁹ Any estimate of the clearing price for the next auction is subject to a reasonable range of uncertainty. This good faith estimate, and those throughout this Complaint, are predicated on the separate analyses conducted by the IMM and the Commonwealth’s expert, Kris Aksomit, both of which are described in more detail below.

¹⁰ <https://www.pjm.com/about-pjm>.

B. Purpose and Function of PJM's Capacity Market

PJM secures future power supply resources through its capacity market, called the reliability Pricing Model (“RPM”).^{11,12} PJM’s Open Access Transmission Tariff¹³ (“Tariff”) Attachment DD implements the current reformed RPM.¹⁴ PJM relies upon a competitive auction mechanism, securing capacity commitments under the RPM through a Base Residual Auction (“BRA” or “Auction”), which is designed to be held three years before a “Delivery Year.”¹⁵ When operating on that intended schedule, PJM also conducts three subsequent Incremental Auctions.¹⁶

The PJM capacity market has two driving purposes.

The first purpose is to signal whether the market is long or short—with low capacity prices driving uneconomic units to retire and high prices encouraging new entry. Celebrating the first RPM auction in 2007, PJM hailed its ability to “send pricing signals that will attract investment in new capacity resources where they are most needed.”¹⁷ Unlike the “prompt” capacity auctions conducted by other RTOs shortly before the delivery year, the RPM’s

¹¹ Attachment 1, Exhibit A at Section 4.1.

¹² Although this Complaint adopts the colloquial terminology of referring to the RPM as a “market,” the term “model” is more apt given the significant weight of PJM’s design choices in controlling auction outcomes. See Monitoring Analytics, Analysis of the 2025/2026 RPM Base Residual Auction Part D (Dec. 6, 2024), at 7, available at

https://www.monitoringanalytics.com/reports/Reports/2024/IMM_Analysis_of_the_20252026_RPM_Base_Residual_Auction_Part_D_20241206.pdf (“The BRA prices do not solely reflect supply and demand fundamentals but also reflect, in significant part, PJM decisions about the definition of supply and demand.”).

¹³ <https://www.pjm.com/directory/merged-tariffs/oatt.pdf>.

¹⁴ The first daily capacity market, created in 1999, was replaced by the current design based on the recognition that the energy market resulted in a shortfall in net revenues compared to that necessary to attract and retain adequate resources for the reliable operation of the energy market. Quarterly State of the Market Report for PJM: January through June 2024, at p. 309, available at

https://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2024/2024q2-som-pjm-sec5.pdf.

¹⁵ *PJM Interconnection, L.L.C.*, 142 FERC ¶ 61079, 2013 WL 392398 (Jan. 31, 2013), citing *PJM Interconnection, L.L.C.*, 117 FERC ¶ 61,331 (2006), order on reh’g, 119 FERC ¶ 61,318 (2007), reh’g denied, 121 FERC ¶ 61,173 (2007), aff’d Pub. Serv. Elec. & Gas Co. v. FERC, 324 Fed. App. 1 (D.C. Cir. 2009).

¹⁶ A Delivery Year is a twelve-month period beginning on June 1 and ending on May 31. See Tariff Attachment DD, §§ 2.5 and 2.34.

¹⁷ PJM, “PJM Completes First Reliability Pricing Model Auction,” (Apr. 17, 2007), <https://www.pjm.com/-/media/DotCom/Images/ctc-display/modules/timeline/2007-first-annual-pdf.ashx>.

“forward” construct is conducted three years in advance to allow the auction’s clearing price to better serve as a signal.¹⁸ Three years is the expected build time of a generic power plant.¹⁹ Therefore, as designed, that signal should incent timely new entry of generation assets as needed in a given delivery year.

The second purpose is to provide “missing money” to capacity resources in order to support resource adequacy and ensure sufficient capacity.²⁰ This “missing money” enables facilities to remain online to provide capacity even if they could not economically do so if reliant on energy revenues alone. In this way, the RPM is designed to serve the interests of ratepayers and generators by replacing the need for highly variable energy market scarcity pricing with stable capacity revenues.

To perform both functions, PJM relies upon Net CONE to establish the RPM auction price. Net CONE is a barometer of the estimated support needed to bring a new unit of a reference resource (that PJM selects) into the market. Net CONE is calculated as the annualized Gross CONE of the reference resource, less the expected net revenue from the energy and ancillary services market. Gross CONE, by contrast, is the entire estimated annual cost of constructing and operating a new capacity resource.²¹

¹⁸ Prompt auctions can also provide a signaling function, but to do so they must be deployed intentionally and necessarily have entirely different design parameters. For instance, unlike the current ad hoc-prompt situation in PJM, ISO-NE is in the midst of deliberate multi-year transition from forward to prompt auctions. *See ISO-NE, Capacity Auction Reforms Key Project, available at <https://www.iso-ne.com/committees/key-projects/capacity-auction-reforms-key-project>.*

¹⁹ *See David Kearns, et al., Technology Readiness and Costs of CCS Global CCS Institute at 30, available at <https://www.globalccsinstitute.com/wp-content/uploads/2021/03/Technology-Readiness-and-Costs-for-CCS-2021-1.pdf>.*

²⁰ Attachment 1, Exhibit A at Section 4.1. *See also* Murty P. Bhavaraju et al., *PJM Reliability Pricing Model - A Summary and Dynamic Analysis*, IEEE XPLORE (June 2007), *available at* <https://ieeexplore.ieee.org/document/4275491> (“[S]ince the peaking generation needed to meet the adequacy criterion will not receive enough revenue from the energy market to justify investments, other revenue streams are needed to ensure that they cover their fixed costs. . . . [this] is referred to as ‘Missing Money.’”).

²¹ Attachment 1, Exhibit A at Section 4.2.

C. Changes to PJM's Reliability Pricing Model

PJM has regularly refined the RPM, introducing new features and improvements over time. Two design features are principally responsible for the harm to consumers that this Complaint seeks to avert.

1. PJM's Variable Resource Requirement Curve Maximum Price Calculation

First, from the inception of the RPM in 2007, PJM's Capacity Demand Curve, known as the VRR curve, relied upon Net CONE to set the price and quantity of capacity to be procured in each auction.²² PJM initially used a single reference point—1.5 times Net CONE—to define the maximum price point of the curve, and hence the maximum price of the auction.

In 2011, the Brattle Group, in its Second Quadrennial Review, recommended introducing an alternate reference point to define the top of the curve due to inaccuracies that had been repeatedly observed in the estimation of Energy and Ancillary Services (“E&AS” or “EAS”) revenues.²³ Gross CONE was proposed to serve this function, and since that time the higher of either Gross CONE or 1.5 times Net CONE have determined the maximum auction price.

²² Attachment 1, Exhibit A at Section 4.3. Under the auction clearing requirements of the RPM, PJM develops a VRR curve related to capacity market demand. The VRR curve is based on the cost of new entry of a reference unit and is designed to provide incentives to invest in capacity. The VRR curve is a downward sloping demand curve based on the Net CONE price and quantity. The steeper, or more vertical, the demand curve, the more price volatility and quantity certainty can be expected. For the 2015/2016, 2016/2017, and 2017/2018 Delivery Years, the VRR curve had a maximum price (Point A on the VRR curve) equal to 1.5 times the Net CONE, determined annually, or Gross CONE, net of the three-year average energy and ancillary service revenues. However, for the Delivery Years of 2018/2019 through 2025/2026, the VRR curve had a maximum price (called “Point A”) of the greater of Gross CONE or 1.5 times Net CONE for all unforced capacity MW between 0 and 99 percent of the reliability requirement.

²³ The Brattle Group, Second Performance Assessment of PJM's Reliability Pricing Model (Aug. 26, 2011), at 99-100, available at https://www.brattle.com/wp-content/uploads/2017/10/6232_second_performance_assessment_of_pjms_reliability_pricing_model_pfeifenberger_et_al_aug_26_2011-3.pdf (recommending the use of Gross CONE because “the resulting difference between points *a* and *b* would, for the most part, also likely be large enough to exceed the range of likely discrepancies differences between *administratively-determined* Net CONE values (*i.e.*, based on administratively-determined CONE and administratively-determined historical E&AS margins) and true Net CONE values . . .” (emphasis in original)).

In 2019, the IMM challenged the use of Gross CONE, arguing that its use as a potential maximum price could one day result in an artificial rise in prices.²⁴ In response, PJM repeated the arguments originally made by Brattle in 2011 that a backstop was necessary as reliance on Net CONE alone risked providing insufficient capacity prices during periods of high E&AS revenue. In essence, high energy market revenues could depress Net CONE, potentially masking the need for a high price signaling the market to build new capacity.

The Commission was persuaded that reliance on Net CONE alone would be insufficient to prevent such an “extreme scenario” where high E&AS revenue masked the need for entry of new capacity.²⁵ The Commission reasoned that because PJM would pay Gross CONE only in situations where supply fell below the Installed Reserve Margin, the use of Gross CONE as a backstop was just and reasonable to avoid a scenario where the Installed Reserve Margin was not met but capacity prices nonetheless remained artificially low due to reliance solely on a multiple of Net CONE.²⁶

2. Modifications to VRR curve for 2026/2027 Delivery Year

Second, the forthcoming 2026/2027 capacity auction will utilize the highest ever multiple of Net CONE as the co-determinant, alongside Gross CONE, of the price cap: 1.75 times Net CONE (rather than 1.5 times Net CONE).²⁷

The Brattle Group proposed this increase to Net CONE in the Fifth Quadrennial Review of PJM’s VRR curve.²⁸ The change was proposed due to apparent concerns that prior auctions

²⁴ *PJM Interconnection, L.L.C.*, order on reh'g, 173 FERC ¶ 61,123 (Nov. 3, 2020) at ¶ 123, citing IMM Rehearing Request at 11-12, 23-25, available at https://elibrary.ferc.gov/eLibrary/filelist?accession_number=20200619-5214.

²⁵ *PJM Interconnection, L.L.C.*, 171 FERC ¶ 61,153 (May 21, 2020), at 329-30.

²⁶ *PJM Interconnection, L.L.C.*, 171 FERC ¶ 61,153 (May 21, 2020), at 329-30.

²⁷ <https://pjm.com/directory/merged-tariffs/oatt.pdf>.

²⁸ Fifth Review of PJM’s Variable Resource Requirement Curve for Planning Years Beginning 2026/2027 (April 19, 2022), available at <https://www.brattle.com/wp-content/uploads/2022/05/Fifth-Review-of-PJMs-Variable-Resource-Requirement-Curve.pdf>.

had “consistently procured capacity volumes beyond the Reliability Requirement” and recognizing that “[t]he PJM Board has identified the need for ‘appropriate levels of capacity procurement’ as a focus area for this Quadrennial Review.”²⁹

In the context of these concerns, PJM argued to the Commission that using a 1.75 multiple alongside the shift to a Combined Cycle unit as the reference resource would “produce[] a steeper VRR curve that more strongly controls RPM quantity clearing outcomes, increasing certainty that sufficient quantity will be procured while guarding against over procurement. Sharper control over quantity outcomes may be advantageous in the future if there is increased uncertainty over new entrants’ true net costs of new entry, driven by uncertainties in Gross CONE and/or E&AS revenues.”³⁰ As PJM explained further, “one of the overriding considerations in this periodic review is to address procurement level concerns, both variability and quantity. Increasing the multiplier [to 1.75] could help fulfill this objective, as . . . a steeper curve reduces variability in capacity procurement levels . . .”³¹ The adoption of 1.75 times Net CONE was principally predicated on these concerns regarding over procurement and the need to provide more market certainty.

D. Other Recent Changes in PJM’s Capacity Market

Commonwealth of Pennsylvania witness Kris Aksomitis has described several other recent changes in the PJM capacity market. These changes include:

²⁹ Fifth Review of PJM’s Variable Resource Requirement Curve for Planning Years Beginning 2026/2027 at 2 (April 19, 2022), available at <https://www.brattle.com/wp-content/uploads/2022/05/Fifth-Review-of-PJMs-Variable-Resource-Requirement-Curve.pdf>.

³⁰ <https://www.pjm.com/-/media/committees-groups/committees/mrc/2022/20220824/item-02---3-pjm-position-on-2022-quadrennial-review-recommendations.ashx>.

³¹ *PJM Interconnection, L.L.C.*, Docket No. ER22-2984-000, Periodic Review of Variable Resource Requirement Curve Shape and Key Parameters (Sept. 30, 2022), at 19.

- A change in PJM’s accreditation of resource reliability from average Effective Load Carrying Capability (“ELCC”) to marginal ELCC beginning with the 2025/2026 BRA;³²
- Revisions to load forecasting and modeling, as well as changes in the BRA parameters due to a change in the measurement of UCAP and concern over extreme weather events;³³
- A change in the reference resource from combustion turbine (“CT”) to combined cycle gas turbine (“CCGT”);³⁴ and
- The establishment of the Capacity Performance program to help promote reliability during peak conditions in the 2016/2017 delivery period;³⁵
- Changes to E&AS Offset methodology by using forward electricity and gas prices applied to historical hourly shapes.³⁶

E. PJM’s December 2024 Section 205 Filings

The results of PJM’s capacity auction for the 2025/2026 Delivery Year revealed major issues with PJM’s model. That auction saw the clearing price increase almost tenfold from the previous auction: for most of the PJM region, the capacity price for the 2025/2026 delivery year increased from \$28.92/MW-day in the previous auction to \$269.92/MW-day,³⁷ totaling \$14.7 billion in costs to consumers.³⁸

³² Attachment 1, Exhibit A at Section 4.4.3. For certain resources, the change was from Equivalent Forced Outage Rate Demand to marginal ELCC.

³³ Attachment 1, Exhibit A at Section 4.4.4.

³⁴ Attachment 1, Exhibit A at Section 4.4.5.

³⁵ Attachment 1, Exhibit A at Section 4.4.2.

³⁶ Attachment 1, Exhibit A at Section 4.4.6.

³⁷ PJM 2025/2026 Base Residual Auction Report (July 30, 2024) at 3, available at <https://www.pjm.com/-/media/DotCom/markets-ops/rpm/rpm-auction-info/2025-2026/2025-2026-base-residual-auction-report.ashx>.

³⁸ The total cost to load for the 2025/2026 BRA was \$14.7 billion, which includes the cost of EE. PJM 2025/2026 Base Residual Auction Report (July 30, 2024) at 3, available at <https://www.pjm.com/-/media/DotCom/markets-ops/rpm/rpm-auction-info/2025-2026/2025-2026-base-residual-auction-report.ashx>.

In response to the July auction and the serious concerns it raised about the capacity market's design, PJM made two Section 205 filings with the Commission in December 2024 at Docket Nos. ER25-682-000 and ER25-785-000 offering proposed changes to its RPM.³⁹

PJM's filings acknowledge the changing market realities and recognize that "when high prices are misaligned with the objectives of the VRR Curve design, PJM must reevaluate the RPM to better reflect actual market fundamentals."⁴⁰ PJM's filings also note that "[t]he PJM capacity market has had to absorb a number of significant external events, including unprecedented rapid load growth,"⁴¹ a "bottleneck" in PJM's interconnection queue that constrains new entry,⁴² and a "compressed auction schedule [that] has exacerbated the impact of the rapid external changes and created far more volatility than what might have occurred had the markets been able to run on their intended pace of one annual Base Residual Auction three years in advance of the Delivery Year."⁴³ Further, PJM's experts warn that the current RPM construct risks responding to these factors by delivering "multiple years of high prices that are beyond what is needed to attract new entry in the long run, but that may yet be produced in the interim period before barriers to entry can be addressed . . ."⁴⁴ In sum, PJM's Section 205 filings

³⁹ PJM is not alone in recognizing that current market conditions demand changes to the RPM model. Following the last auction, the IMM released an analysis recommending that the maximum price on the VRR curve be set at 1.5 times Net CONE rather than the greater of Gross CONE and 1.75 times Net CONE. Monitoring Analytics, Analysis of the 2025/2026 RPM Base Residual Auction Part C (Nov. 6, 2024), at 9, available at https://www.monitoringanalytics.com/reports/reports/2024/IMM_Analysis_of_the_20252026_RPM_Base_Residual_Auction_Part_C_20241106.pdf. OPSI also sent a letter to PJM urging PJM to lower the maximum price in its capacity construct. OPSI Letter Regarding Proposed Capacity Market Adjustments (dated Nov. 21, 2024), <https://www.pjm.com/-/media/about-pjm/who-we-are/public-disclosures/2024/20241121-opsi-letter-re-proposed-capacity-market-adjustments.ashx>. That letter argued that the maximum price is excessive under the current capacity construct given that interconnection queue delays limit the cap's ability to ensure reliability. OPSI proposed that, in the near term, PJM could address the situation by using a fraction of Gross CONE, a multiplier of Net CONE, a fixed adder to Net CONE, or a combination of these metrics to set Point A on the VRR Curve.

⁴⁰ *PJM Interconnection, L.L.C.*, Revisions to Reliability Pricing Model, Docket No. ER25-682-000 (Dec. 9, 2024), at 5.

⁴¹ *Id.* at 35.

⁴² Graf/Marzewski Affidavit at ¶ 41(c).

⁴³ *PJM Interconnection, L.L.C.*, Revisions to Reliability Pricing Model, Docket No. ER25-682-000 (Dec. 9, 2024), at 36.

⁴⁴ Newell Affidavit at ¶ 18.

recognize that anticipated record prices under the current RPM design will be structurally unable to elicit the intended supply response due to interconnection queue delays and the compressed auction schedule: “Until barriers can be addressed, high prices. . . cannot fully activate a response.”⁴⁵

In response, PJM has proposed multiple changes to the RPM, including reverting to the prior Combustion Turbine reference technology, which will have a downward impact on the maximum auction price.^{46, 47} While the reference technology changes that PJM is now proposing to reverse were correlated with the move to 1.75 times Net CONE in the last quadrennial review, PJM’s Section 205 filings do not propose any changes to the cap, arguing “interventions that suppress the price would increase investor perceptions of regulatory risk . . .”⁴⁸ PJM does not identify any principle distinguishing the risk to investor confidence from modifications to Net CONE versus the similarly price suppressive proposals contained in PJM’s Section 205 filings.

III. DISCUSSION

The price cap for PJM’s capacity auction must be changed before the auction for the 2026/2027 Delivery Year. The assumptions that were used in 2022 in setting the demand curve, and the price cap (Point A on that curve) in particular, have been undercut by changing market conditions.⁴⁹ In light of those changes, PJM’s proposed BRA design will leave consumers paying

⁴⁵ Newell Affidavit at ¶ 18.

⁴⁶ PJM has also responded by activating the stakeholder process on several reforms proposed by a letter from five governors, including Governor Shapiro, which has renewed discussions around a seasonal or sub-seasonal capacity market construct and improvements to the ELCC accreditation that serve to undercount peak capacity of certain resources. See Mark Takahashi, PJM Board Letter (Dec. 9, 2024) at 6, available at <https://www.pjm.com/-/media/DotCom/about-pjm/who-we-are/public-disclosures/2024/20241209-board-letter-outlining-action-on-capacity-market-adjustments-rri-and-sis.pdf>; see also <https://www.pjm.com/-/media/DotCom/about-pjm/who-we-are/public-disclosures/2024/20241025-governors-letter-regarding-capacity-auctions.ashx>.

⁴⁷ The Commonwealth agrees that these are appropriate proposals. The Commonwealth also supports PJM’s three related proposals: (1) Reliability Resource Initiative, (2) Capacity Interconnection Rights, and (3) Surplus Interconnection Service. *Id.* Each of these proposals will help to increase capacity supply without requiring consumers to pay needlessly high RPM costs.

⁴⁸ Newell Affidavit at ¶ 20.

⁴⁹ Attachment 1, Exhibit A at 1.

up to \$20.4 billion in added costs over the next two years without receiving commensurate benefits in the form of new or retained generating capacity and increased reliability. That is unjust and unreasonable.

As described below and at more length in the Declaration of Kris Aksomititis (Attachment 1) and in his related Report (Exhibit A to Attachment 1), this unjust and unreasonable outcome can be corrected before, and without further postponing, the next auction. Time is short before the forthcoming auction, but scheduling concerns alone must not serve to maintain the status quo given the unprecedented magnitude of potential costs to consumers.⁵⁰ The Commonwealth's recommendations are intended to be pragmatic, predicated on returning to proven RPM rules that can be implemented in the very near term.⁵¹

A. Unforeseen Market Changes Make PJM's RPM Unjust and Unreasonable

Two significant changes in the marketplace since 2022 have undermined fundamental assumptions that informed the design of PJM's RPM and, as a result, make the RPM unjust and unreasonable.

1. Changes to Capacity Marketplace Expectations

Dramatic increases in load growth forecasts and the impact of the revised methodology in setting the target capacity requirement have completely changed the market dynamics relative to when the demand curve parameters were set in 2022.⁵² In PJM's footprint and beyond, energy markets have entered a period of dramatic change unforeseen even two years ago.⁵³

Electrification and rapidly growing interest in generative AI and associated data centers have

⁵⁰ Attachment 1, Exhibit A at Section 3.2.

⁵¹ Attachment 1, Exhibit A at Section 3.2.

⁵² Attachment 1, Exhibit A at 1.

⁵³ Although some of the factors described here are being experienced across the country, each of the four major capacity markets in the United States is a bespoke creation and the interaction of load growth and other factors with the design of PJM's RPM does not necessarily produce easily translatable lessons for other capacity markets.

upended a 30-year trend of relatively flat load forecasts,⁵⁴ replacing it with demand that is projected to skyrocket from 23 GW to 128 GW of growth in the next five years.⁵⁵ Peak load for 2027 is now forecast about 8,000 MW higher than was expected in 2022. The installed reserve margin requirement has been increased by about 3 percentage points due to the revised reliability forecasting methodology. Witness Aksomititis states that the large excess reserve margin in PJM has been unexpectedly reversed by these factors in the last two to three years.⁵⁶

Unsurprisingly, even PJM experts told this Commission that, “the supply and demand balance that PJM has experienced over the last decade has fundamentally changed.”⁵⁷ The shift can be seen in the rapidly evolving year-over-year forecast for winter peak load in the MAAC LDA serving much of Pennsylvania (expected to be further revised upwards in PJM’s forthcoming 2025 load forecast⁵⁸):⁵⁹

⁵⁴ NERC, 2024 Long-Term Reliability Assessment (Dec. 2024) at 31, *available at* https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_Long%20Term%20Reliability%20Assessment_2024.pdf.

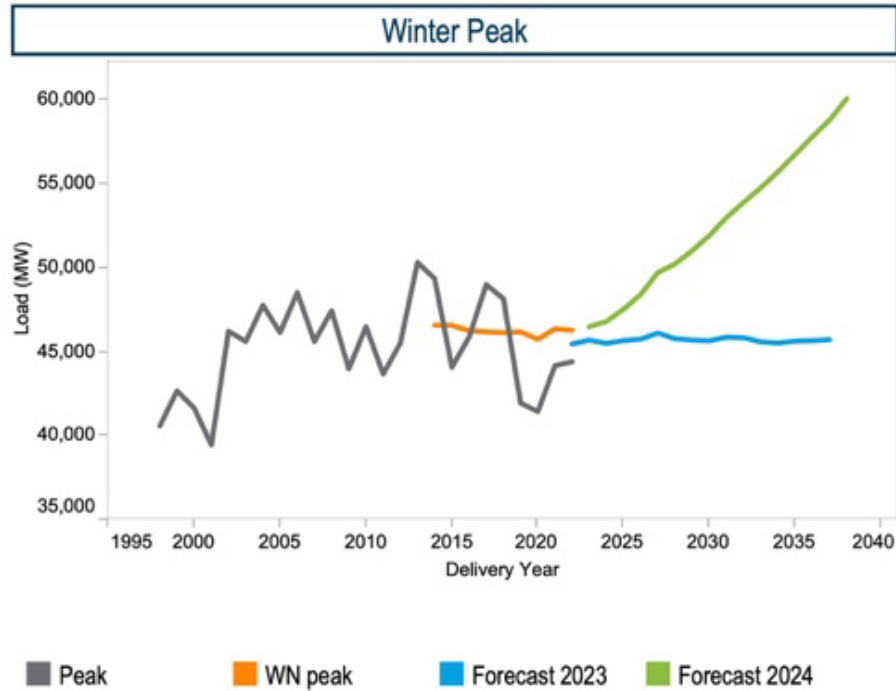
⁵⁵ John D. Wilson, *et al.*, Strategic Industries Surging, Driving US Power Demand, Clean Grid Initiative, at 3 (Dec. 2024), *available at* <https://gridstrategiesllc.com/wp-content/uploads/National-Load-Growth-Report-2024.pdf>.

⁵⁶ Attachment 1, Exhibit A at 1.

⁵⁷ Graf/Marzewski Affidavit at ¶ 48.

⁵⁸ See Molly Mooney, *2025 Preliminary PJM Load Forecast*, at 40 (Dec. 9, 2024), <https://www.pjm.com/-/media/DotCom/committees-groups/subcommittees/las/2024/20241209/20241209-item-03---2025-preliminary-pjm-load-forecast.ashx>.

⁵⁹ PJM, Load Forecast Report (Jan. 2024) at 4, *available at* <https://www.pjm.com/-/media/DotCom/library/reports-notices/load-forecast/2024-load-report.ashx>.



The steep VRR curve adopted by the Fifth Quadrennial Review is a very poor match for the market conditions that now exist. That curve introduces high volatility—this design “exchanges price risk for volumetric risk” as witness Aksomititis describes it.⁶⁰ That volatility further drowns out any vestigial price signal in a constrained entry environment. It requires potential entrants to gamble that a handful of additional megawatts will not appear and tank the price.

This was never the intended outcome of these VRR curve adjustments. The steep curve recommended by the Fifth Quadrennial Review was intended to limit over procurement and provide more granular control in a supply elastic, generation rich, environment with flat load. Today, with tight supply and capacity sellers unable to respond to the BRA clearing price no matter how high it climbs, that steep curve unintentionally serves to raise prices beyond rational

⁶⁰ Attachment 1, Exhibit A at Section 5.2.2.

levels and introduces volatility that undercuts the RPM's central purposes of reliability and predictability.⁶¹

In other words, a highly volatile VRR curve, extremely inelastic supply, and growing load growth make it impossible to ascribe the wisdom of a healthy marketplace to any resulting price, high or low. If supply were to dip slightly and prices hit the cap, it would send a dramatically different price signal from an equally plausible scenario where a small influx of supply craters prices—with the underlying reality essentially identical. Generators and consumers would both benefit from a more stable curve that can provide consistent pricing.

PJM's own expert, and one of the architects of the Fifth Quadrennial Review, recognizes the need to change the current cost formula: "If supply-side barriers and other challenges persist, the result could be to produce more concentrated compensation than the curve was designed for, at a greater cost to consumers, and with extreme sensitivity of prices to small changes in supply."⁶² In short, unexpected changes to PJM's marketplace have undone the assumptions underpinning the Fifth Quadrennial Review and sent prices through the roof without a concomitant benefit, making the resulting auction design unjust and unreasonable in this new environment.

2. New Entry is Restricted

Second, the RPM is incapable of accomplishing its designed objectives. The capacity auction is designed: (1) to send a price signal to the market; and (2) to provide the "missing money" to existing generators. In particular, increasing the top of the VRR curve to the greater of Gross CONE or 1.75 times Net CONE necessarily assumed that market participants can respond with efficient entry or exit to the price signal that results from a given auction.

⁶¹ Attachment 1, Exhibit A at Sections 3 and 5.2.2.

⁶² Newell Affidavit at ¶ 5.

Yet it is currently physically impossible for new resources to respond to high BRA signals and enter PJM’s marketplace. Right now, the PJM interconnection queue is utterly jammed—an all-time record 3,300 projects were awaiting interconnection earlier this year, by far the most queued projects of any RTO in the nation.⁶³ As it works to address this serious backlog, PJM has declined to allow new projects to join the queue since 2022,⁶⁴ so resources not already in the queue are unlikely to enter service before the end of the decade. Even PJM’s proposed “fast track” Reliability Resource Initiative (“RRI”)—which Pennsylvania generally supports—is not projected to allow new resources to come online before the 2029/2030 delivery year.⁶⁵ These obstacles mean most new projects are unable to even get in line to join the PJM grid for the foreseeable future, and none can realistically expect to be delivering power within eleven months.⁶⁶

Making matters worse, PJM’s capacity auctions have become increasingly delayed in recent years.⁶⁷ PJM’s RPM is designed to be a forward auction that procures capacity three years in advance of the covered delivery year. But compounding delays since 2019 have resulted in increasingly condensed timelines between when capacity auctions are being held and the auction’s covered delivery year. PJM held the 2022/2023 delivery year BRA thirteen months in advance, the 2023/2024 BRA twelve months in advance, the 2024/2025 BRA eighteen months in

⁶³ Lawrence Berkeley National Laboratory, *Queued Up: 2024 Edition*, (Apr. 2024) at 9, *available at* https://emp.lbl.gov/sites/default/files/2024-04/Queued%20Up%202024%20Edition_1.pdf.

⁶⁴ *Id.* at 7.

⁶⁵ See Affidavit of Donald Bielak at 10, Docket No. ER25-712-000, Tariff Revisions for Reliability Resource Initiative (Dec. 13, 2024), *available at* <https://www.pjm.com/pjmfiles/directory/etariff/FercDockets/8547/20241213-er25-712-000.pdf>.

⁶⁶ PJM’s expert Samuel Newell implicitly concedes that any resource seeking to enter the 2026/2027 BRA would have needed to begin construction in 2023. Newell Affidavit at ¶ 11 (“the most recent forecast for 2026 is 157.2 GW, which is 4.5 GW higher than forecast in 2023 at the time a new generator would have had to start construction.” (citations omitted and emphasis added)). This impossibility refers to newly constructed units, not adding marginal capacity through other paradigms such as surplus interconnection service, which the Commonwealth supports.

⁶⁷ Attachment 1, Exhibit A at Section 4.4.1.

advance, the 2025/2026 BRA eleven months in advance, and recently delayed the 2026/2027 BRA to July 2025, eleven months in advance of the delivery date.⁶⁸ This trend has curtailed the market's ability to respond to auction signals irrespective of price.⁶⁹

If the market cannot function as an effective signal, it serves only the second purpose of providing existing units the “missing money” to remain operational. Under these circumstances, witness Aksomitis concludes that PJM's current cap is far higher than necessary to achieve that purpose.⁷⁰ If the upcoming auction clears at or near the current cap, there is a meaningful risk that that extraordinary cost comes with very little reliability benefit. In the 2025/2026 BRA, had prices hit the RTO-wide cap, the maximum response would have been an extra 514 MW of Unforced Capacity (“UCAP”), given that that was all remaining uncleared capacity available in the auction. Witness Aksomitis estimates that this equates to an implied Value of Lost Load (“VOLL”) of a minimum of \$11.6 million per MWh, which is orders of magnitude above recent VOLL estimates from MISO and ERCOT of \$35,000 per MWh.⁷¹ The lack of new entry means it will not be possible to summon a reliability improvement commensurate with such extraordinary cost.

PJM may theorize that extremely high prices could draw additional resources into the capacity market outside of new entrants. Witness Aksomitis examined this possibility and found that any such dormant resources do not require such high prices to enter. He notes that the

⁶⁸ Attachment 1, Exhibit A at Section 4.4.1.

⁶⁹ As noted above, *see supra* n.15, other RTOs hold intentionally prompt auctions which can offer some signaling function. However, the parameters of a forward auction, including the expected demand curve, differ dramatically from those in a prompt auction and it is not appropriate to design a forward auction and simply back into a de facto prompt schedule, expecting the same results.

⁷⁰ Attachment 1, Exhibit A at 1.

⁷¹ “MISO Update to PJM Reserve Certainty Task Force,” Nov. 2024, available at <https://www.pjm.com/-/media/DotCom/committees-groups/task-forces/rcstf/2024/20241113/20241113-item-04---miso-shortage-pricing-update-to-pjm-rcstf.pdf>. MISO reports a range of VOLL from \$10,000/MWh to \$35,000/MWh (pages 16 and 20). PUCT Review of Value of Lost Load in the ERCOT Market, September 2024, Value of Lost Load Study for the ERCOT Region, suggest an ERCOT wide VOLL of \$35,000.

inability to interconnect new projects leaves three potential pools of resources that could opt to respond to a higher auction price signal: (1) mothballed units that could return to service; (2) projects that have exited the interconnection queue but not yet entered service; and (3) demand response resources.⁷² None of these three sources of additional capacity require scarcity level pricing to enter the marketplace, and the BRA's current volatility risks may actually prevent their entry.

First, as witness Aksomitis has demonstrated, for mothballed units that are part of a larger portfolio, the steeply vertical VRR curve based on Gross CONE perversely disincentivizes reactivation due to lower fleet-wide profits were the unit to return to service.⁷³ Witness Aksomitis concludes, "[a] small portfolio and and/or relatively low costs for the reactivating unit are the only realistic way that the price cap would incent returning capacity."⁷⁴

Second, PJM's tranche-based queue backlog processing means that the majority of imminent projects (in Transition Cycle #1 ("TC1")) will not receive an Interconnection Agreement before mid-2025.⁷⁵ This makes them "exceedingly unlikely to participate in the 2026/2027 BRA given reasonable construction timelines and the high likelihood of the resource not being available by June 2026."⁷⁶

Third, demand response resources ("DR") are unconstrained by many of the market rules and physical limitations of conventional resources. While they should be expected to respond to higher market signals, there is no empirical basis to suggest markedly increased participation will occur at extremely high multiples of Net CONE or at Gross CONE versus at the historically high

⁷² Attachment 1, Exhibit A at Sections 5.3-3.1.

⁷³ Attachment 1, Exhibit A at Section 5.3.1.

⁷⁴ Attachment 1, Exhibit A at Section 5.3.1.

⁷⁵ Attachment 1, Exhibit A at Section 5.3.

⁷⁶ Attachment 1, Exhibit A at Section 5.3.

prices that the market is already delivering. Because neither Net or Gross CONE pertain to the cost structure of DR, it is impossible to argue that either figure is the necessary amount needed to secure sufficient DR response. Instead, common sense dictates that an elevated price, such as the record set in the 2025/2026 BRA, and the potential for continued prices above historic norms will entice DR to enter the marketplace—in that scenario, the uncertainty produced by the steep VRR curve may be the greatest barrier to reliable participation by DR in forthcoming auctions.

Finally, the VRR price cap exists because market participants generally agree that it would not be just and reasonable for consumers to pay astronomical sums to obtain a handful of additional megawatts beyond a given point. Specifically for the 2025/2026 BRA, witness Aksomititis has demonstrated that a price increase from 1.0 times Net CONE at \$224/MW-Day to Gross CONE at \$695/MW-Day would have elicited only about 770 MW of additional total capacity, at most.⁷⁷ Under these conditions, “the implied cost of achieving incremental reliability would far exceed reasonable estimates of the VOLL.”⁷⁸ This means that reducing the price cap as the Commonwealth requests for the two forthcoming auctions stands to save customers \$20.4 billion dollars while reducing available capacity by only 100 MW each year.⁷⁹ Customers would pay approximately \$100 million for each additional megawatt of capacity above a 1.5 times Net CONE price cap.

⁷⁷ Attachment 1, Exhibit A at Section 5.2.3.

⁷⁸ Attachment 1, Exhibit A at Section 5.2.4.

⁷⁹ These estimates are derived from the IMM’s Scenario 32 in Part C (137,370 UCAP cleared) and Scenario 52 in Part D (137,270 UCAP cleared) as the closest suitable analogues for the estimated outcome of the 2025/2026 auction under the auction rules as proposed by PJM in its 205 filings or those rules with the addition of the Commonwealth’s requested relief. Monitoring Analytics, Analysis of the 2025/2026 RPM Base Residual Auction Part D (Nov. 6, 2024), at 20, *available at* https://www.monitoringanalytics.com/reports/reports/2024/IMM_Analysis_of_the_20252026_RPM_Base_Residual_Auction_Part_C_20241106.pdf; Monitoring Analytics, Analysis of the 2025/2026 RPM Base Residual Auction Part D (Dec. 6, 2024), at 27, *available at* https://www.monitoringanalytics.com/reports/Reports/2024/IMM_Analysis_of_the_20252026_RPM_Base_Residual_Auction_Part_D_20241206.pdf.

In sum, increasing prices in the forthcoming auction cannot reasonably be expected to deliver sizable increases in capacity at any price, and requiring customers to pay scarcity pricing for *de minimis* variations in supply would serve neither the purpose of the RPM nor the public interest. In short, the current RPM auction rules are not just and reasonable under these market conditions.

B. PJM Should Be Directed to Remove the Gross CONE Linkage

Under the conditions described above, where the RPM is not serving as an effective market signal, PJM's use of Gross CONE is an arbitrarily high alternative price cap as by definition it provides far more than the "missing money."⁸⁰ PJM should be directed to replace its reliance on Gross CONE with 1.5 times the RTO-wide Net CONE, mirroring the RTO-wide Net CONE-based RPM penalty structure that PJM has proposed.⁸¹

Gross CONE cannot be justified in the absence of potential entry because it sets the price cap at a level far above realistic capacity costs.⁸² Witness Aksomititis found that setting the price cap at Gross CONE would likely increase capacity prices for the 2026/2027 BRA by as much as 50% relative to prices under a Net CONE-based price cap, with no reasonable expectation of an

⁸⁰ Attachment 1, Exhibit A at 1. As noted above, although Gross CONE was introduced as a backstop alternative price cap, it will likely set the market in the two forthcoming auctions as the Gross CONE of CT or CC reference units is expected to exceed multiples of Net CONE.

⁸¹ See *PJM Interconnection, L.L.C.*, Revisions to Reliability Pricing Model, Docket No. ER25-682-000 (Dec. 9, 2024), at 71. The logic for using RTO Net CONE as a backstop mirrors PJM's arguments for its use in the penalty rate. Namely, it is likely to avert the collapse of the VRR curve in LDAs where Net CONE falls to \$0 in the next two auctions, replacing the need for Gross CONE in such circumstances. As PJM recently described to this Commission: "High EAS revenues can result in low or even zero-based capacity prices. However, high net EAS revenues have not been equally felt across the RTO. The RTO Net CONE is comparatively less likely to experience \$0 or near-\$0 Net CONE values. In short, a uniform Non-Performance Charge Rate based on the RTO Net CONE supports PJM's efforts to maintain reliability during potential capacity emergencies." *Id.*

⁸² Attachment 1, Exhibit A at 2, Sections 3.2.2 and 6.2. See also Monitoring Analytics, Analysis of the 2025/2026 RPM Base Residual Auction Part D (Dec. 6, 2024), at 8, available at https://www.monitoringanalytics.com/reports/Reports/2024/IMM_Analysis_of_the_20252026_RPM_Base_Residual_Auction_Part_D_20241206.pdf ("The use of Net CONE was based on the logic of the capacity market, to ensure that between the energy and capacity markets the cost of entry was covered. . . . Net CONE was the equilibrating factor between the capacity market and energy market. The use of Gross CONE is inconsistent with that basic capacity market logic.").

incremental market response sufficient to justify this cost.⁸³ This would represent an unjustified wealth transfer as the incremental capacity and reliability benefit are shown to be minimal and come at cost orders of magnitude greater than any reasonable estimate of the VOLL.

Circumstances have meaningfully changed since this Commission last considered the use of Gross CONE as the maximum BRA price.⁸⁴ In 2020, this Commission concluded that Gross CONE was a necessary backstop for Net CONE because of the risk of an “extreme scenario” where high E&AS revenues reduced Net CONE below reasonable levels and effectively masked the need for new capacity in times of resource scarcity.⁸⁵

That scenario did not materialize in the 2025/2026 auction, and current market conditions preclude any realistic probability of it occurring in the forthcoming two auctions (given PJM’s proposed reliance on a CT reference resource); instead, Net CONE-based capacity prices are expected to remain elevated, or even at record highs, for the foreseeable future. This removes the feasibility of the “extreme scenario” that the Commission feared occurring before the next Quadrennial Review. Indeed, record load growth is making it plainly evident that new capacity is needed in the marketplace and the capacity market is responding as designed with a strong build signal. Under these conditions, Net CONE is functioning as intended and recently produced an all-time high RTO-wide capacity price in response to increasing supply demand imbalance in July 2024.

In 2020, the Commission also noted that allowing Gross CONE would be just and reasonable as a price cap because it would only bind the auction price if supply were below the Installed Reserve Margin.⁸⁶ This logic is flawed—a price cap of any amount can be justified if

⁸³ Attachment 1, Exhibit A at 2, Sections 3.2.2 and 6.2.

⁸⁴ *PJM Interconnection, L.L.C.*, 171 FERC ¶ 61,153 (May 21, 2020).

⁸⁵ *PJM Interconnection, L.L.C.*, 171 FERC ¶ 61,153 (May 21, 2020), at ¶ 329-30.

⁸⁶ *PJM Interconnection, L.L.C.*, 171 FERC ¶ 61,153 (May 21, 2020), at ¶ 329.

the very act of reaching that cap makes it just. This is the central problem with Gross CONE. As a measure of total cost (an amount which will definitionally always be more than the necessary capacity payment) it is unmoored to any specific rationale and in essence is merely a convenient large number. While Gross CONE is used elsewhere as such a generic round number, it has no rigorous basis as the proper maximum amount for consumers to pay in the event of scarcity.⁸⁷

But even accepting the premise that extreme prices should be permitted when needed to entice the entry of additional supply, the Commission's logic in 2020 was predicated on the inherent assumption that Gross CONE would be capable of incenting such supply to enter and discipline the market. When falling below the Installed Reserve Margin cannot be corrected by an immediate price spike, as the Commission assumed in the supply-rich environment at the time, Gross CONE loses any theoretical justification. And as PJM has admitted to this Commission, under the current constrained entry conditions and market parameters, even highly elevated prices "cannot fully activate response" in the marketplace.⁸⁸

Today's capacity market is simultaneously confronting growing load and diminishing supply due to retirements, ELCC adjustments, and other changes. These are serious challenges, but they simply cannot be fixed by consumers paying Gross CONE.

⁸⁷ Brattle's original recommendation of Gross CONE in 2011 included observations that utilizing 1.5 times Gross CONE, or even 2.0 times Gross CONE as the maximum auction price, would even further reduce the risk of misestimating Net CONE. The Brattle Group, Second Performance Assessment of PJM's Reliability Pricing Model (Aug. 26, 2011) at 99-100, n.118, *available at* https://www.brattle.com/wp-content/uploads/2017/10/6232_second_performance_assessment_of_pjms_reliability_pricing_model_pfeifenberger_et_al_aug_26_2011-3.pdf. This is limitless logic. A similar lack of principled gating function undermines the attendant argument that Gross CONE may be necessary to ensure the market can provide true Net CONE over time. That is because Gross CONE itself might be insufficient under unusual market conditions. To avert these concerns, a floor above \$0 on the VRR curve could be considered to complement a cap at 1.5 times Net CONE, providing more predictable market outcomes. But the time for introducing such novel concepts is during the quadrennial review process, not when today's constrained entry conditions block resources that wish to enter the market from doing so, irrespective of BRA clearing price.

⁸⁸ Newell Affidavit at ¶ 18.

Nor would paying Gross CONE (or 1.75 times Net CONE) in the next two forthcoming auctions actually achieve meaningful improvements in grid reliability. The Commonwealth supports and encourages every rational measure to ensure the reliability of our electrical grid, including the use of a static backstop to avert a Net CONE-based VRR curve from collapsing due to high energy revenues. But PJM's existing reliability metrics, including the calculations related to the 1-in-10 reliability requirement, are predicated on the possibility of a higher price stimulating sufficient new capacity to relieve structural shortfalls in the market and thus tangibly improving reliability. Those expectations cannot be met in the current market at any price. Costs are rising across many areas of society, and to the extent that rising prices may require higher price caps in future auction cycles, those increases will be taken into account at the recalculation of Gross CONE in the Sixth Quadrennial Review, making that the proper forum for forward-looking concerns about price increases.⁸⁹ Further, the literal inability to construct any new resources in response to a price signal of any amount within the next two years due allays any concerns about rising prices impacting the feasibility of building said new resources.

Numerous shortcomings with PJM's methodology for calculating the Installed Reserve Margin,⁹⁰ Net CONE on a UCAP basis,⁹¹ and ELCC⁹² also all suggest that the scarcity pricing implied by reaching a Gross CONE cap would not reflect empirical capacity supply available in the marketplace. Additionally, PJM's use of either a CC or CT unit as the reference resource, and therefore the economic basis of Gross CONE, ignores that vanishingly little of either resource is being constructed today and the cost structure of the reference resource may have an increasingly

⁸⁹ Attachment 1, Exhibit A at 51-52, Section 6.2.

⁹⁰ Attachment 1, Exhibit A at 41-45, Section 5.4.

⁹¹ Attachment 1, Exhibit A at 46-51, Section 5.5.

⁹² Monitoring Analytics, Analysis of the 2025/2026 RPM Base Residual Auction Part A (Sept. 20, 2024), at 6, available at

https://www.monitoringanalytics.com/reports/Reports/2024/IMM_Analysis_of_the_20252026_RPM_Base_Residual_Auction_Part_A_20240920.pdf.

attenuated correlation to the actual cost needed to bring the resources that are actually waiting (and waiting) in the queue into the marketplace. Thus, warnings concerning reliability that are predicated on a cascade of implicit and explicit assumptions are insufficient to justify charging what is by definition an excessive amount that itself cannot provide any degree of certainty that reliability will be greater, only certainty that cost will increase. That outcome cannot be in the public interest.

Therefore, replacing Gross CONE with an alternative formula directly rooted in Net CONE will satisfy the need for a backstop to address concerns about E&AS revenues masking the need for new capacity, but will eliminate the risk of unjust outcomes.⁹³

C. PJM Should Be Directed to Reduce the Price Cap by Lowering the Net CONE Multiplier Until the Next Quadrennial Review

Additionally, PJM should be directed to reduce the price cap by lowering its multiplier to 1.5 times Net CONE until a new demand curve is established by the ongoing Sixth Quadrennial Review.⁹⁴

Currently, the forthcoming auction will use the increased 1.75 times Net CONE as one of two possible definitions of the price cap. As witness Aksomititis observes, this figure was predicated on the potential for new entry and is not reasonable given the current compressed auction schedule and prolonged queue delays that interfere with that underlying assumption.⁹⁵ The steep slope and narrow width of the demand curve that results from the current cap

⁹³ Attachment 1, Exhibit A at 2, Section 5.2.4. Other potential backstop options exist as well, including OPSI's November 21, 2024 proposals and an original alternative considered by Brattle in 2011 of relying on 0.5 times Gross CONE to approximate 1.5 times Net CONE. The Brattle Group, Second Performance Assessment of PJM's Reliability Pricing Model (Aug. 26, 2011) at 99, *available at* https://www.brattle.com/wp-content/uploads/2017/10/6232_second_performance_assessment_of_pjms_reliability_pricing_model_pfeifenberger_et_al_aug_26_2011-3.pdf.

⁹⁴ Recognizing that analysis for that Review is already underway, the Commonwealth suggests that a one-year delay be considered, which would maintain the originally planned schedule for the Sixth Quadrennial Review.

⁹⁵ Attachment 1, Exhibit A at Section 6.1.

definition were intended to prevent over procurement in an expected supply rich market and are poorly suited to respond to the interconnection delays, compressed auctions, and explosive load growth that have all arisen since 2022. These curve parameters currently risk producing unjustifiably high prices.

PJM's expert, Dr. Newell, agrees that the proper curve shape for these market conditions is a "flatter curve [that] reduce[s] prices and price volatility in conditions of supply-demand shocks and non-forward auctions with less supply-side elasticity."⁹⁶ PJM's proposed return to a CT reference resource will tend to flatten the curve, but cannot assure that the RPM will not price near or at the cap. If the auction does clear near the cap, using the current definition rather than the Commonwealth's definition will cost consumers more than \$20 billion over two years without providing tangible reliability or capacity benefits.

PJM recognizes that the assumptions underlying the Fifth Quadrennial Review have been undone by real world events.⁹⁷ As a result, its filings argue that the recommendations of the Fifth Quadrennial Review—in particular the change to the reference resource—should logically be reversed. However, it refuses to address the increase to Net CONE (from 1.5 times to 1.75 times Net CONE) that was adopted by this Commission as a concomitant result of the Fifth Quadrennial Review's analysis. The flawed assumptions undermining the switch in reference resource make the use of 1.75 times Net CONE equally untenable.

Before 2022, auctions had "consistently procured capacity volumes beyond the Reliability Requirement."⁹⁸ So, in 2022, the Commission approved the proposal to increase to

⁹⁶ Newell Affidavit at ¶ 18.

⁹⁷ See Newell Affidavit at ¶ 10 (describing an "unusual combination" of events that together are "beyond what the curve was designed for in the 2022 Quadrennial Review which incorporated smaller shocks, greater entry possibilities, and greater supply elasticity in three-year forward auctions . . .").

⁹⁸ Fifth Review of PJM's Variable Resource Requirement Curve for Planning Years Beginning 2026/2027 at 2 (April 19, 2022), available at <https://www.brattle.com/wp-content/uploads/2022/05/Fifth-Review-of-PJMs-Variable-Resource-Requirement-Curve.pdf>.

1.75 times Net CONE based on the analysis of the Fifth Quadrennial Review that found the overall result of the proposed VRR curve would “reduce[] average excess capacity procurement by approximately 805 MW relative to the current VRR curve”⁹⁹ Further justification for the increase came from concerns of artificial under procurement given the variability of E&AS revenues and the difficulty of assessing true Net CONE, as described above pertaining to Gross CONE.

Today, each of these issues has diminished or disappeared. First, rather than over procurement, the capacity market faces the prospect of a tight supply environment for at least the next several auctions. Second, PJM has taken a positive step in addressing historical issues with uncertainty over E&AS revenues by switching to a forward-looking model in the 2026-2027 auction that should improve the accuracy of Net CONE estimation. While this does not eliminate uncertainty with regards to E&AS revenue estimation, it directly addresses the concerns of artificial under procurement that the switch to 1.75 times Net CONE were partly intended to prevent. Third, as PJM’s experts have argued to the Commission, the proposed return to a Combustion Turbine (“CT”) unit as the reference resource further eases the range of uncertainty that might otherwise require a larger margin of error in estimating Net CONE “because CTs are far less reliant on EAS revenues, [so] the Net CONE of CT resources remain relatively stable in spite of the regulatory and policy uncertainties. . . .”¹⁰⁰

⁹⁹ Fifth Review of PJM’s Variable Resource Requirement Curve for Planning Years Beginning 2026/2027 at 2 (April 19, 2022), *available at* <https://www.brattle.com/wp-content/uploads/2022/05/Fifth-Review-of-PJMs-Variable-Resource-Requirement-Curve.pdf>; *see also* *PJM Interconnection, L.L.C.*, 182 FERC ¶ 61,073, Order Accepting Proposed Tariff Revisions (Feb. 14, 2023), at ¶ 158. At the time, PJM minimized the likelihood of Net CONE-based under procurement scenarios by expressly emphasizing to the Commission that the Net CONE multiplier was unlikely to be determinative of the final auction price regardless due to the expected primacy of Gross CONE. *Id.* at 146, fn. 331.

¹⁰⁰ Graf/Marzewski Affidavit at ¶ 72.

Under these conditions, and given that the RPM is unable to serve as an effective market signal, PJM's use of 1.75 times Net CONE as one potential determinant of the price cap is arbitrarily high.¹⁰¹ PJM should be directed to return to the prior multiplier of 1.5 times Net CONE that has existed in every previous BRA auction and that is familiar and predictable for market participants.¹⁰²

Indeed, 1.5 times Net CONE is a conservative, reliability-centric price cap. True Net CONE itself is sufficient (and theoretically exactly correct) to supply the “missing money” when that is the sole effective outcome of the RPM. However, witness Aksomitis emphasizes that “Net CONE is an administrative estimate” that is subject to reasonable uncertainty.¹⁰³ Empirical observation indicates that PJM may have historically overestimated Net CONE, as “capacity additions have occurred even when prices were below the Net CONE, effectively revealing a lower market derived Net CONE.”¹⁰⁴ Yet in the unlikely scenario that Net CONE were underestimated, capping the auction at 1.0 times Net CONE could lead to a failure to properly compensate reference units. These concerns are mitigated to some degree by PJM's proposal to revert to a CT reference unit in the forthcoming auction as doing so will tend to increase Net CONE.¹⁰⁵ However, given the reasonable range of estimates that exist for true Net CONE, the Commonwealth agrees that a maximum price above administrative Net CONE is a sensible

¹⁰¹ Attachment 1, Exhibit A at 1.

¹⁰² Additionally, as a purely pragmatic matter, given the growing uncertainty around both supply and demand in the capacity markets, the forthcoming auction represents a particularly inopportune time to increase the Net CONE multiplier to an all-time high.

¹⁰³ Attachment 1, Exhibit A at Section 6.2.

¹⁰⁴ Attachment 1, Exhibit A at Section 5.3. The use of a reference resource—whether CC or CT—that is generally more expensive to build and operate than the majority of resources currently seeking to join the PJM grid also suggests that Net CONE may be a conservative figure for attracting new entry in this market environment.

¹⁰⁵ Newell Affidavit at ¶ 18.

precautionary measure to avoid underestimating the true “missing money” required to keep needed capacity online.¹⁰⁶

While PJM has proposed changing the reference resource, thereby indirectly modestly lowering the price cap, it has declined to directly address the cap because doing so would supposedly “frustrate RPM’s goal of providing a degree of long-term stability.”¹⁰⁷ This conclusion defies PJM’s own logic in urging the Commission to roll back the change of reference resource: both changes (higher cap and newer reference resource) were recommended by the Fifth Quadrennial Review, predicated on the same assumptions and expressly pitched to this Commission as a correlated change, with 1.75 times Net CONE being the appropriate multiplier for a CC reference resource in order to have the same effect as 1.5 times Net CONE for a CT resource.¹⁰⁸ PJM has submitted that these assumptions no longer match the real world and that the reference resource must be reversed as a result. That conclusion applies with equal force to reversing the correlated increase to 1.75 times Net CONE. In fact, given the uncertainty driven by record load growth, a reversion to the traditional multiplier (1.5 times Net CONE) that was employed in every other BRA strengthens rather than undermines the stability of the capacity market.

¹⁰⁶ Attachment 1, Exhibit A at Section 6.2.

¹⁰⁷ See *PJM Interconnection, L.L.C.*, Revisions to Reliability Pricing Model, Docket No. ER25-682-000 at 45 (Dec. 9, 2024) (quotation omitted); see also Protest of the PJM Power Providers Group, Sierra Club, et al. v. PJM Interconnection, L.L.C., EL24-148-000 (Oct. 24, 2024), at 6 (“Frequent alteration of market rules and drastic changes in price signals erode investor confidence and hinder access to needed capital by increasing perceived risk.”).

¹⁰⁸ See *PJM Interconnection, L.L.C.*, Docket No. ER22-2984-000, Periodic Review of Variable Resource Requirement Curve Shape and Key Parameters (Sept. 30, 2022) at 19 (“[T]he relationship between gross CONE and 1.75 times Net CONE for a CC Reference Resource is similar to the relationship between gross CONE and 1.5 Net CONE for the CT Reference Resource.”).

Further, there have already been habitual changes—referred to by one member of this Commission as “endless Rube Goldberg tinkering”¹⁰⁹—attempting to stabilize PJM’s RPM model since its introduction in 2007. These include the most recent proposals contained in PJM’s December 2024 Section 205 filings. The Commonwealth agrees that long-term stability is an important attribute of any capacity market model and strongly supports reaching a sustainable, durable capacity model as soon as possible. However, the volatility introduced by the Fifth Quadrennial Review’s VRR curve is a source of instability in uncertain times. All market participants would benefit from a more predictable VRR curve in times of rapidly changing load growth. Again, PJM makes these same arguments in favor of changing the reference resource.¹¹⁰

While PJM has candidly, and reasonably, warned that its estimate of Net CONE is subject to high degrees of uncertainty (given regulatory and policy changes and E&AS variation),¹¹¹ and conceded that its chosen VRR curve introduces excessive volatility,¹¹² it persists with the illogical conclusion that the market must have access to disproportionate levels of compensation to permit functional outcomes. This cannot be so. No rational observer could ascribe percipience to a market where 770 MW of capacity (less than 0.5% of total UCAP) represents the full range of expected clearing volumes from price caps of 1.0 Net CONE to Gross CONE.¹¹³ With an entirely inelastic supply curve, the reality is that a market that winds up with a handful of additional megawatts pushing prices down to 1.0 Net CONE is effectively the exact same real

¹⁰⁹ See *PJM Interconnection, L.L.C.*, 182 FERC ¶ 61,073 (Feb. 14, 2023), (Christie, concurring at ¶ 2) (describing tinkering “with the minute details of the capacity market construct. . . has gone on for years and never reaches a point of stability, yet stability of market design is essential to attract the necessary capital investment in capacity resources.”).

¹¹⁰ Newell Affidavit at ¶ 18 (“The benefit of flatter curve is reduced prices and price volatility in conditions of supply-demand shocks and non-forward auctions with less supply-side elasticity.”).

¹¹¹ Graf/Marzewski Affidavit at ¶¶ 71-72.

¹¹² *PJM Interconnection, L.L.C.*, Revisions to Reliability Pricing Model, Docket No. ER25-682-000 (Dec. 9, 2024), at 63.

¹¹³ Attachment 1, Exhibit A at Section 5.2.3.

world market as one where a minute influx pushes prices to Gross CONE. The market cannot meaningfully distinguish these outcomes. Nor does any magic assurance of reliability arise between those two scenarios.¹¹⁴

Therefore, the public interest simply cannot tolerate up to \$20.4 billion in unreasonably high rates dictated by a steep demand curve that was designed for an entirely different environment. To prevent an unjustly high auction price and to reflect current market conditions, PJM should be directed to return the price cap to 1.5 times Net CONE until a new demand curve is established by the ongoing Sixth Quadrennial Review.¹¹⁵

* * * * *

In sum, the capacity price cap should be set at the greater of 1.5 times Net CONE or 1.5 times the RTO Net CONE in constrained LDAs. If Net CONE is higher in an LDA, that LDA would use the LDA specific Net CONE, otherwise 1.5 times RTO-wide Net CONE would be the maximum price. This change is necessary to avert the risk of an up to \$20.4 billion over payment born by consumers across the PJM region.

IV. RULE 206 REQUIREMENTS

To the extent this information has not already been addressed above, the Commonwealth provides the following as required by Rule 206 of the Commission's Rules of Practice and Procedure.

¹¹⁴ While PJM's Section 205 filings, if adopted, would begin to flatten the VRR curve by changing the reference resource, the possibility of an extremely volatile outcome remains so long as the 1.75 Net CONE multiplier and Gross CONE, both of which were intended to combat scenarios that have not come to pass, remain the bedrock of the VRR curve.

¹¹⁵ Multiple means could be used to lower the price cap, as outlined in OPSI's November 21, 2024 letter. *See* OPSI Letter Regarding Proposed Capacity Market Adjustments (Nov. 21, 2024), <https://www.pjm.com/-/media/about-pjm/who-we-are/public-disclosures/2024/20241121-opsi-letter-re-proposed-capacity-market-adjustments.ashx>. However, for the reasons described below, reducing the multiple of Net CONE and eliminating the use of Gross CONE is the most direct method and remains directly tied to historical practice.

A. Good faith estimate of financial impact or harm (Rules 206(b)(3) and (4))

As documented above, PJM's current method for calculating the maximum price on the VRR curve is unjust and unreasonable.

Witness Aksomitis estimates the capacity price for the upcoming July 2025 auction for the 2026/2027 Delivery Year will fall between \$360/MW-Day and \$500/MW-Day, or about 50% higher than actual 2025/2026 BRA results. This unjust and unreasonable rule will likely lead to excessive costs, inefficiencies and reduced reliability that will likely increase monthly utility bills for consumers in the Commonwealth as well as for the Commonwealth itself. Without prompt reforms that would apply to the next auction, that auction will impose additional unjust and unreasonable costs on consumers, including the Commonwealth. Witness Aksomitis calculates that the excessive price cap alone will increase capacity charges to PJM ratepayers in the 2026/2027 BRA by at least \$5.82 billion above the fundamentals, based on 2025/2026 BRA results (for a total capacity cost of \$20.5 billion in PJM's footprint in the 2026/2027 BRA) without accompanying benefits to consumers.

Witness Aksomitis' calculations are markedly conservative compared to the projections of other stakeholders. In a complaint filed on November 18, 2024 at Docket No. EL25-18-000 by a group of state consumer advocates (the "Joint Consumer Advocates"), the advocates project a new offer cap of \$696/MW-day for the entire PJM region.¹¹⁶ If that occurs, capacity charges to PJM ratepayers in PJM's footprint will total \$37 billion in the 2026/2027 BRA,¹¹⁷ which equates to an additional \$22.3 billion compared to actual 2025/2026 BRA results.

¹¹⁶ Joint Consumer Advocate Complaint at 2, 49, 52.

¹¹⁷ Joint Consumer Advocate Complaint at 49, 52.

B. Practical, operations, or other nonfinancial impacts (Rule 206(b)(5))

The Commonwealth believes that PJM’s current method for calculating the maximum price on the VRR curve creates excessive costs and inefficiencies to the detriment of ratepayers.

C. Other pending matters (Rule 206(b)(6))

Aspects of this Complaint are related to issues raised in other matters in which PJM’s capacity market rules are being challenged.

Specifically, a complaint filed by the Sierra Club, Natural Resources Defense Council, Public Citizen, Sustainable FERC Project, and Union of Concerned Scientists on September 27, 2024, at Docket No. EL24-148-000 is related to the availability of capacity from power plants operating under Reliability Must Run (“RMR”) arrangements.¹¹⁸ The Sierra Club complaint makes specific reference to the Brandon Shores and Wagner units that are located in the Baltimore Gas & Electric (“BGE”) LDA. Whether specific RMR units in the BGE LDA, namely the Brandon Shores and Wagner units, should offer into the capacity market is at issue in ER24-1787 and ER24-1790. Comments in the Sierra Club complaint, Docket No. EL24-148-000, have raised other aspects of the RPM market design.¹¹⁹ Market design issues have also been raised in recent letters submitted to the PJM Board of Managers by the OPSI (in the OPSI Letter¹²⁰ of September 27, 2024) and P3 (in the “P3 Letter”¹²¹ of October 2, 2024).

Additionally, a complaint was filed on November 18, 2024 at Docket No. EL25-18 by the state consumer advocates for Illinois, Maryland, New Jersey, Ohio and the District of Columbia (the “Joint Consumer Advocates”) which alleges that PJM’s capacity market rules are unjust and

¹¹⁸ The Commonwealth intervened in the Sierra Club *et al.* proceeding on Oct. 17, 2024.

¹¹⁹ Comments of the Organization of PJM States, Inc., filed Oct. 8, 2024.

¹²⁰ September 27, 2024 letter from OPSI to the PJM Board (“OPSI Letter”) at 3, available at <https://opsi.us/wp-content/uploads/2024/09/OPSI-BRA-RESPONSE-LETTER-2024.09.27.pdf>.

¹²¹ P3 Letter Regarding the OPSI Letter Addressing Results of the 2025/2026 Base Residual Auction, October 2, 2024, available at <https://www.pjm.com/-/media/about-pjm/who-we-are/public-disclosures/2024/20241002-p3-letter-re-opsi-letter-addressing-results-of-25-26-bra.ashx>.

unreasonable because they fail to mitigate market power and result in the imposition of excessive capacity charges upon consumers.

While these complaints raise related issues, neither the Sierra Club complaint nor the Joint Consumer Advocates complaint specifically addresses PJM's method for calculating the maximum price on the VRR curve.

Further, PJM has made two recent Section 205 filings. On December 9, 2024, PJM made a Section 205 filing with FERC at Docket No. ER25-682-000 to make certain proposed changes to its RPM. On December 20, 2024, PJM made an additional Section 205 filing at Docket No. ER25-785-000 proposing to extend the capacity must-offer requirement to all generation capacity resources.¹²² The proposed changes would affect the price cap described in these filings but do not include direct changes to the price cap formula maximum discussed herein.

The Commonwealth is aware of and actively engaged in ongoing discussions in the PJM stakeholder processes that could result in reforms to the current BRA rules. At the present time, however, the Commonwealth has no reason to believe that the stakeholder process will be able to propose or effectuate reforms that could be implemented before the upcoming auction for the 2026/2027 Delivery Year.

D. Specific relief or remedy request (Rule 206(b)(7))

The Complaint sets forth in detail the specific relief requested.

E. Documents supporting the Complaint (Rule 206(b)(8))

The Declaration of Kris Aksomititis is included as Attachment 1 to this Complaint. A detailed Report prepared by Mr. Aksomititis supporting this Complaint, as well as Mr. Aksomititis'

¹²² The Commonwealth also notes the filing of a third pertinent Section 205 at Docket No. ER25-712-000 on December 13, 2024.

CV, are included as Exhibits A and B to the Declaration, respectively. The Declaration and Report identify the materials relied upon by Mr. Aksomitis.

F. Alternative Dispute Resolution (Rule 206(b)(9))

The Commonwealth has not used the Commission's Enforcement Hotline or Dispute Resolution Services and do not believe at this time that alternative dispute resolution would resolve the issues underlying this Complaint. The Commonwealth has no reason to expect that alternative dispute resolution would yield the requested relief.

G. Form of Notice (Rule 206(b)(10))

A form of notice of this Complaint suitable for publication in the Federal Register is appended.

H. Fast Track Processing (Rule 206(b)(11))

The Commonwealth desires the relief be granted so that reforms can be implemented before the upcoming auctions for the 2026/2027 Delivery Year. To do this, the Commonwealth respectfully requests that this Complaint be addressed at the same time as PJM's Section 205 Filing of December 9, 2024.¹²³ In the event that the Commission should issue a deficiency letter for this Complaint or the PJM Section 205 Filing of December 9, 2024, the Commonwealth further respectfully requests that the Commission order a brief additional delay to the 2026/2027 capacity auction until December 2025 to ensure that ratepayer bills are not increased by double digits solely due to the commands of the calendar.

¹²³ *PJM Interconnection, L.L.C.*, Revisions to Reliability Pricing Model, Docket No. ER25-682-000 (Dec. 9, 2024).

I. Communications (Rule 203(b))

Pursuant to Rule 203(b) of the Commission's Rules of Practice and Procedure, 18 C.F.R.

§ 385.203(b), the Commonwealth specifies that communications in this matter are to be addressed to the following:

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Jacob B. Boyer, Esq.
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V. CONCLUSION

Managing the largest electrical grid in the nation is no easy task, particularly given the rapidly changing supply and demand dynamics across the PJM region. PJM and its dedicated staff work hard to address these important problems.

Still, it is difficult to escape the conclusion that PJM's capacity market is currently failing. This is not one isolated failure: respected analysts have ranked PJM's interconnection queue process the worst in the nation.¹²⁴ PJM has also habitually failed to run its capacity auctions on time – earning the distinction of being the only grid operator in the nation with a

¹²⁴ John D. Wilson, et al., *Generator Interconnection Scorecard Ranking Interconnection Outcomes and Processes of the Seven U.S. Regional Transmission System Operators*, Advanced Energy United (Feb. 2024), at 5, available at [https://advancedenergyunited.org/hubfs/2024%20Advanced%20Energy%20United%20Generator%20Interconnection%20Scorecard%20\(1\).pdf](https://advancedenergyunited.org/hubfs/2024%20Advanced%20Energy%20United%20Generator%20Interconnection%20Scorecard%20(1).pdf).

forward auction design that is effectively being held as a prompt auction. It has unsuccessfully tried repeatedly since 2007 to address deficiencies with its capacity market construct in what has been referred to as a game of whack-a-mole.¹²⁵ Now, PJM offers its latest series of fixes and corrections in its Section 205 filings and has argued that other, even very similar, proposals could interfere with the free function of the market or harm reliability.¹²⁶

This Commission is the only formal check on PJM. It must look skeptically at any claims by PJM that a lower price cap would impair the marketplace or impact reliability in the next two auctions. As noted above, the RPM cannot be considered a true open market, but a market construct where PJM's own design choices, as the IMM has wisely observed, matter most of all.¹²⁷ More importantly, no one cares more about ensuring the reliability and stability of the grid than the Commonwealth. Pennsylvania has supported PJM since its founding in 1927 with the principal objective of ensuring reliability remaining paramount.

The proposals contained in this Complaint are rooted in a strong desire to improve PJM's capacity market and to ensure it provides all market participants needed stability in the long term. The current course is unsustainable. Excessively high auction prices that do not, and cannot, produce substantial supply increases in the real world threaten not only millions of

¹²⁵ Delia Patterson & Harvey Reiter, *FERC Chasing the Uncatchable: Trying to Fix Mandatory Capacity Markets is Like Trying to Win at Whack-a-Mole*, STINSON, LLP (2016), available at <https://www.lexology.com/library/detail.aspx?g=1017dff1-42c8-4b8f-ada1-6ce816a20fec>.

¹²⁶ See Mark Takahashi, Letter to Advocates (Sept. 19, 2024) at 3-4, available at <https://www.pjm.com/-/media/DotCom/about-pjm/who-we-are/public-disclosures/2024/20240919-pjm-board-response-consumer-advocates-letter-re-urgent-reforms-pjm-capacity-market-re-reliability-must-run-units.ashx> (suggesting that including RMR units would “distort the price signal and fail to incent the new build needed” and “could have unintended market consequences . . .”); Mark Takahashi, PJM Board Letter (Dec. 9, 2024) at 6, available at <https://www.pjm.com/-/media/DotCom/about-pjm/who-we-are/public-disclosures/2024/20241209-board-letter-outlining-action-on-capacity-market-adjustments-rri-and-sis.pdf> (suggesting that critiques of PJM's proposals might indirectly contribute to “allow[ing] the grid to fail . . .”).

¹²⁷ Monitoring Analytics, Analysis of the 2025/2026 RPM Base Residual Auction Part D (Dec. 6, 2024), at 7, available at https://www.monitoringanalytics.com/reports/Reports/2024/IMM_Analysis_of_the_20252026_RPM_Base_Residual_Auction_Part_D_20241206.pdf.

consumers across Pennsylvania but the continued viability of PJM's capacity market. Averting that outcome is essential, just, and reasonable.

For these reasons, Governor Josh Shapiro and the Commonwealth of Pennsylvania respectfully request that the Commission find that the existing capacity auction price caps are unjust and unreasonable, and direct PJM to implement the reforms identified herein. Using a price cap as it currently exists, or solely as modified in PJM's Section 205 filings, in the upcoming auctions for the 2026/2027 BRA will result in unjust and unreasonable rates.

Respectfully submitted,

/s/ Jacob B. Boyer

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Dated: December 30, 2024

*Counsel for Governor Josh Shapiro and
the Commonwealth of Pennsylvania*

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Commonwealth of Pennsylvania	:	
Complainant,	:	
	:	
v.	:	Docket No. EL25-____-000
	:	
PJM Interconnection, L.L.C.	:	
Respondent.	:	

NOTICE OF COMPLAINT

(December 30, 2024)

Take notice that on December 27, 2024 pursuant to sections 206 and 306 of the Federal Power Act, 16 U.S.C. 824e, 825e and Rule 206 of the Federal Energy Regulatory Commission’s (Commission) Rules of Practice and Procedure, 18 CFR 385.206, the Commonwealth of Pennsylvania (Complainant) filed a Complaint against PJM Interconnection, L.L.C. (PJM or Respondent). Complainant asserts that PJM’s capacity market rules and unjust and unreasonable because: (1) capacity requirements are overstated; (2) the cost of capacity, as defined by Net CONE or Gross CONE in unforced capacity (“UCAP”) terms, is over-stated; (3) the capacity market price cap is arbitrarily high and does not recognize the current inability of new supply to discipline market prices; and (4) the market power mitigation rules are insufficient to ensure competitive outcomes given the lack of entry and tight market conditions.

The Complainant certifies that copies of the Complaint were served on the contacts for PJM as listed on the Commission’s list of Corporate Officials.

Any person desiring to intervene or to protest this filing must file in accordance with Rules 211 and 214 of the Commission’s Rules of Practice and Procedure (18 CFR 385.211 and 385.214). Protests will be considered by the Commission in determining the appropriate action to be taken, but will not serve to make protestants parties to the proceeding. Any person wishing to become a party must file a notice of intervention or motion to intervene, as appropriate. The Respondent’s answer and all interventions, or protests must be filed on or before the comment date. The Respondent’s answer, motions to intervene, and protests must be served on the Complainants.

The Commission encourages electronic submission of protests and interventions in lieu of paper using the “eFiling” link at <http://www.ferc.gov>. Persons unable to file electronically should submit an original and 5 copies of the protest or intervention to the

Federal Energy Regulatory Commission, 888 First Street, NE, Washington, DC 20426.

This filing is accessible on-line at <http://www.ferc.gov>, using the “eLibrary” link and is available for review in the Commission’s Public Reference Room in Washington, DC. There is an “eSubscription” link on the web site that enables subscribers to receive email notification when a document is added to a subscribed docket(s). For assistance with any FERC Online service, please email FERCOnlineSupport@ferc.gov, or call (866) 208-3676 (toll free). For TTY, call (202) 502-8659.

Comment Date: 5:00 pm Eastern Time on [January 20, 2025].

Debbie-Anne A. Reese,
Acting Secretary.

Certificate of Service

I hereby certify that I have on this date caused a copy of the foregoing document to be served upon PJM Interconnection, LLC, at the following addresses obtained from the Commission's list of corporate officials designated to receive services pursuant to 18 C.F.R. § 385.2010(k):

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Dated: December 30, 2024

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*Counsel for Governor Josh Shapiro and
the Commonwealth of Pennsylvania*

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

Governor Josh Shapiro and the	:	
Commonwealth of Pennsylvania	:	
	:	
Complainants,	:	
	:	
v.	:	Docket No. EL25-_____
	:	
PJM Interconnection, L.L.C.	:	
	:	
Respondent.	:	

DECLARATION OF KRIS AKSOMITIS

I. INTRODUCTION

1. My name is Kris Aksomitis. I am Director, Commercial Power Development and Strategy, for Power Advisory LLC (“Power Advisory”). My business address is 22 Devers Street, Concord, Massachusetts, 01742. Power Advisory is an electricity sector management consulting firm specializing in electricity market analysis, power procurement, policy development, regulatory and litigation support, market design, and clean energy project feasibility assessment.

2. I am responsible for Power Advisory’s US wholesale market forecast products, including capacity price forecasts for a variety of markets including PJM.

3. Additional description of my background is provided in Section 2 of my Report attached to this Declaration as Exhibit A, and a copy of my CV is provided as Exhibit B to this Declaration.

II. SUMMARY

4. I was retained by Eckert Seamans Cherin & Mellott, LLC on behalf of Governor Josh Shapiro and the Commonwealth of Pennsylvania to provide expert evidence regarding recent outcomes and concerns with the PJM capacity market. In particular, Power Advisory was asked to comment on whether the market is currently functioning as intended and whether prices represent a competitive outcome. To the extent Power Advisory identified concerns, actionable recommendations were requested. I prepared a report that provides an overview and historical context for the PJM capacity market, reviews and discusses issues with the current capacity market, and makes recommendations.

5. A copy of my Report, entitled “PJM Capacity Auction Evaluation,” is provided as Exhibit A to this Declaration. The Report provides a complete discussion of my analysis, findings and recommendations, and is incorporated herein by reference.

6. My declaration is organized as follows: First, I provide an overview and historical context for the PJM capacity market. Second, I review and discuss issues with the current capacity market. Third, I make recommendations that I urge PJM and FERC to consider prior to the 2026/2027 Base Residual Auction.

7. The documents I reviewed in preparing this declaration are described in my Report.

A. Summary of Findings

8. My primary finding is that the market signal for new capacity is not creating an investment response due to delays in the interconnection queue exacerbated by the currently compressed auction timelines. This gives rise to uncompetitive outcomes that result in a transfer

of wealth from load customers to capacity sellers, without any realistic expectation of improved reliability from elevated price levels.

9. The 2026/27 Base Residual Auction (BRA) auction is poised to deliver arbitrarily high price results. The expected market conditions and assumptions that were used in 2022 in setting the demand curve, and the price cap in particular, have been undercut by changing market conditions and will not apply for at least the next two auctions.

10. PJM's price cap of the greater of 1.75 times Net CONE or Gross CONE serves to further increase prices. I find that the increase to the price cap and the potential linkage to Gross CONE can not be justified with restricted market entry. My assessment is that an increase in the price cap will likely inflate capacity costs to PJM customers by billions of dollars with little benefit. For example, I estimate in Section 5.4.2 that a higher price cap in line with the expected 2026/27 BRA price cap assuming a CT reference unit is adopted, would have increased prices in the 2025/26 BRA by nearly \$100/MW-Day and resulted in consumers paying an implied nearly \$6 million per MWh of improved reliability, at a minimum. In the absence of market entry, a higher price cap primarily results in wealth transfer.

11. The price cap's linkage to Gross CONE is not justified. As the cost of entry declines, as defined by Net CONE, the price cap is held at an arbitrarily high level. In fact, an initial concern with the 2026/2027 BRA is that Net CONE was \$0/MW-Day in many areas for combined cycle gas turbine (CCGT) generation, which was expected to be the reference technology. This indicates that energy prices alone supported entry for the reference technology and new capacity was still unable to respond.

12. PJM itself appears to recognize the issue of limited entry. As outlined in its recent Reliability Resource Initiative (RRI) proposal filing, only 514 MW of unforced capacity (UCAP)

was offered and did not clear in the 2025/26 Base Residual Auction (BRA), and only 230 MW of UCAP has been placed into service this year. Very little new capacity, particularly in terms of UCAP, is expected to be available for the 2026/27 BRA based on publicly available data outlined in Section 5.1.1. PJM states accelerating capacity through its RRI proposal is the only way to bring capacity online before 2028. In my opinion, an online date of June 2028 in time for the 2028/29 BRA will be a challenging timeline even for projects accelerated by the RRI.

13. It is important to note that the price expectations for the 2026/27 BRA are informed primarily by the 2025/26 BRA results released in August 2024. The 2025/26 market outcome was unexpected and attracted very little new capacity despite record prices. The PJM market design choices have been made with an expectation that there will be sufficient lead time for new entry to participate in the BRA, i.e., PJM's market is predicated on a three-year forward design. The current compressed auction timeline further limits market response beyond the interconnection queue delays. Together this means the previous design choices are not appropriate for the 2026/27 BRA.

14. PJM has recently proposed several changes to the 2026/27 BRA. The changes proposed are including RMR resources in the capacity supply curve, using a dual fuel combustion turbine (CT) as the reference technology, removing reactive service revenue from the net Energy and Ancillary Service (E&AS) offset, and creating a uniform RTO wide performance penalty based on Net CONE. PJM has also indicated a potential for the must offer capacity exemption for certain resources to be eliminated in time for the 2026/27 BRA. These changes, if approved, would serve to mitigate some of the concerns raised in this report with the current market design choices, but several issues remain that serve to inflate capacity prices

beyond both the cost of capacity, as estimated by Net CONE, and beyond the price justified by the actual supply and demand conditions.

15. In addition to the lack of a feasible market response to high prices, PJM's approach to defining the current capacity need, cost of new entry and demand curve parameters inflate current capacity prices and result in a wealth transfer that does not reflect true supply/demand fundamentals. Specifically, PJM introduced an over-stated capacity demand shock to the market through its adoption of new modeling techniques at a time of strong load growth, compressed auction schedules and stalled interconnection queues.

16. The undue impact to customers of over-stating capacity requirements is usually a volumetric concern; the capacity price is similar in equilibrium, but the volume is excessive. In a market without feasible competitive entry, over-stating capacity requirements can dramatically elevate prices as seen in the 2025/26 BRA. The historical experience in the PJM market is that entry was able to discipline prices, and capacity market parameters were not as critical to ensuring market outcomes were just and reasonable. Given the near-term inability of entry to mitigate prices to levels that support new generation, the specific capacity market parameters and calibrations must be examined.

17. PJM's revised approach to defining the need for capacity, which is based on effective load carrying capability (ELCC) as outlined in its business practices and presentations, relies on historical generation performance data from June 2012 through May 2023. The Polar Vortex, that occurred in January 2014 is the single largest factor in setting the capacity reserve margin requirement with this approach as that event highlighted the risk of concurrent forced outages across the generation fleet. This event also triggered a wide range of efforts to mitigate future reliability risks, including the Capacity Performance framework with performance

penalties. PJM has noted on various occasions that the changes implemented have improved generator performance under adverse conditions, but the methodology used in setting the reserve margin requirement does not incorporate any expectation of improvement from the Capacity Performance framework. This overstates the required reserve margin and raises prices as a result.

18. A related issue is that PJM systematically understates the expected performance of the default capacity resource used to set the UCAP adjusted CONE. PJM's approach to setting class level ELCC relies on the historical performance of all assets in a technology class from 2012 through 2023, as noted. This understates expected new unit performance both because much of the historical record exists in the absence of the Performance framework, but also because old units with poor performance are part of the same class as new units. This raises the demand curve by increasing Net CONE on a UCAP basis, again increasing prices beyond the justifiable level. It also fails to properly reward new build resources for their improved reliability because a new build is part of the same asset class with the same ELCC as older, unreliable units.

B. Summary of Recommendations

19. My recommendations represent an estimate of attempting to drive outcomes that are just and reasonable under current circumstances. Any lack of time to perfectly implement changes should not be an argument for the status quo given the magnitude of impacts to consumers. The recommendations are intended as pragmatic and implementable for the near term. The reliability impacts of any of the recommended changes are minimal, if not zero because the same or very nearly the same amount of total capacity would be expected to clear the market with the changes in place.

20. First, I recommend that a price cap reduction should be in place for the next two auctions until the next quadrennial review is able to evaluate whether there is the possibility of sufficient capacity entry in the market to support competitive outcomes in the 2028/29 delivery

year. In effect, this price cap reduction will remedy the rapidly changing market conditions that have undermined the assumptions under which the 2022 quadrennial review was conducted. A price cap will preclude the undue wealth transfer in the absence potential competition. The current price cap level is informed by potential entry and is not reasonable with the current lack of potential entry.

21. Second, given that Net CONE is an administrative estimate incorporating future conditions and therefore subject to error, 1.5 times Net CONE is a reasonable upper boundary on the potential cost of capacity. A lower price cap is expected to have very little impact on clearing volumes in the market. Gross CONE cannot be justified in the absence of potential entry because it arbitrarily sets the price cap at a level unrelated to realistic capacity costs.

22. The RTO Net CONE should set the minimum price cap for all LDAs. If Net CONE is higher in a constrained LDA, 1.5 times Net CONE would use the LDA-specific Net CONE. Gross CONE should not be considered in the price cap formulation. This addresses the concern that a constrained LDA has very low Net CONE and an arbitrarily low price cap as a result.

III. PJM CAPACITY MARKET OVERVIEW AND HISTORICAL CONTEXT

23. PJM secures future power supply resources through the PJM capacity market, called the Reliability Pricing Model (RPM). This market is designed to ensure long-term reliability by procuring generation resources to meet expected electricity demand plus a reserve margin to ensure reliability three years in the future.¹ The capacity market pays generators for the generating capacity they make available. PJM conducts an annual RPM Base Residual Auction (BRA) and three Incremental Auctions. The Base Residual Auction is conducted for the

¹ “Capacity Market (RPM).” <https://learn.pjm.com/three-priorities/buying-and-selling-energy/capacity-markets.aspx>.

procurement of resource commitments to meet PJM's unforced capacity obligation for the Delivery Year and allocates the cost of those commitments to Load Serving Entities (LSEs) through the Locational Reliability Charge.² First, Second, and Third Incremental Auctions are conducted by PJM to allow for replacement resource procurement and increases or decreases in resource commitments due to changes in reliability requirements.³

24. In addition to the signalling function described above, a capacity market is intended to supply the “missing money” to capacity resources in order to support resource adequacy and ensure sufficient capacity. Capacity markets are utilized to supplement energy markets under the rationale that an energy-only market does not deliver sufficient revenues concurrently with resource adequacy. When there is sufficient capacity to meet reliability targets, energy prices do not support the capacity, or there is “missing money,” and the market is not sustainable.

25. Operators hold capacity market auctions to ensure there will be adequate capacity to meet future electricity demand, which is equal to the peak demand in the future, or the Delivery Year, plus a reliability margin. Eligible participants include new and existing power supply resources, generator upgrades, DR, and energy efficiency⁴ and transmission upgrades. Capacity market participants commit to providing electricity supply or reducing electric demand in the Delivery Year.

26. Capacity markets are characterized by an administratively determined need for capacity, a price schedule known as a demand curve, and definition of the capacity supply.

² “RPM Base Residual Auction FAQs,” October 10, 2016. <https://www.pjm.com/-/media/DotCom/markets-ops/rpm/rpm-auction-info/rpm-base-residual-auction-faqs.ashx>, page 1.

³ “RPM Incremental Auction FAQs,” January 19, 2019. <https://www.pjm.com/-/media/DotCom/markets-ops/rpm/rpm-auction-info/rpm-incremental-auction-faqs.ashx>, page 1.

⁴ PJM will no longer include energy efficiency in the capacity market as it is fully captured through demand curve reductions.

27. The Net CONE is an explicit response to the missing money issue and is a key variable for capacity markets. Net CONE is calculated as the annualized Gross CONE of the reference resource, less the expected net revenue from the energy and ancillary services market. Gross CONE is the estimated annual cost of a new capacity resource, which is essentially determined from an engineering and financial study of a generic investment in the default capacity resource. In PJM, the capacity market delivers 0.75 Net CONE at Point B on the capacity demand curve. For 2025/26, this was defined as 1.5% more UCAP than the resource requirement.⁵

28. The PJM Capacity Demand Curve, also referred to as the variable resource requirement (VRR), is a downward sloping demand curve based on the Net CONE price and quantity. Effective with the 2018/2019 Delivery Year, the VRR Curve is plotted by combining a horizontal line from the y-axis to Point A, a straight line connecting Points A and Point B, and a straight line connecting Point B and Point C, as outlined in Table 1. The price associated with Point C is \$0/MW-day.⁶ The steeper, or more vertical, the demand curve, the more price volatility can be expected. NYISO, in comparison to PJM, has a notably flatter demand curve and resultingly produces the greatest price stability and widest range of quantity realized.⁷

29. PJM has instituted several design changes to its capacity market rules in recent years, which have had a profound impact on prices. These changes include a shortened forward market procurement in advance of the effective date for pricing, the implementation of the

⁵ “2025/2026 Base Residual Auction Report,” July 30, 2024. <https://www.pjm.com/-/media/DotCom/markets-ops/rpm/rpm-auction-info/2025-2026/2025-2026-base-residual-auction-report.pdf>,

⁶ “PJM Manual 18: PJM Capacity Market,” November 15, 2023. <https://www.pjm.com/-/media/DotCom/documents/manuals/ml18.pdf>, pages 34-37.

⁷ “Third Triennial Review of PJM’s Variable Resource Requirement Curve,” May 15, 2014. https://www.brattle.com/wp-content/uploads/2017/10/7510_third_triennial_review_of_pjms_variable_resource_requirement_curve-4.pdf, pages ix, 3, and 4.

Capacity Performance program, the implementation of a marginal ELCC for all resources, revisions to forecasts and reliability modeling, an increase to the price cap, changes to E&AS calculations, and proposed changes to the marginal Net CONE.

30. Until recently, PJM operated under an RPM model that procured capacity three years in advance of the delivery year. The three-year advance was initially delayed in 2019, and the delay has impacted each subsequent BRA, resulting in condensed timelines. PJM held the 2022/2023 delivery year BRA thirteen months in advance, the 2023/2024 BRA twelve months in advance, the 2024/2025 BRA eighteen months in advance, the 2025/2026 BRA eleven months in advance, and recently delayed the 2026/2027 BRA to June 2025, twelve months in advance of the delivery date.

31. In their recent Quadrennial Review, PJM increased the capacity market price cap from 1.5 times the Net CONE to the greater of the Gross CONE and 1.75 times the Net CONE, allowing for a potentially higher price cap. Through this, PJM intends to address potential market condition changes that result in an underestimate of Net CONE and under-procurement of capacity, as well encouraging entry of new resources when conditions are tight.

32. In the Quadrennial Review, PJM also elected to change the reference resource from CT to CCGT. This change is intended to reflect the idea that CCGT will most likely be used to meet future capacity shortfalls. This has implications for market price signals and price volatility. Due to the higher E&AS revenues, the Net CONE value fell to \$0/MWh in some LDAs for the 2026/2027 initial parameters, which would have resulted in a capacity performance penalty rate of \$0. The reduced Net CONE values also produce a notably steeper VRR curve due to the use of Gross CONE in the price cap formula, potentially resulting in capacity market price volatility.

33. Additional discussion of PJM's capacity market and relevant historical context is provided in Section 4 of my Report provided as Exhibit A.

IV. FINDINGS

34. PJM's 2025/26 Base Residual Auction (BRA) settled at arbitrarily high prices. The same outcome will repeat in the next BRA, and likely several that follow, absent changes. There are several key reasons for this, including that:

(a) The capacity market price cap is arbitrarily high and does not recognize the current inability of new supply to enter the market under current conditions or to discipline market prices. Interconnection queue delays and the reduced time between a BRA and its delivery year preclude entry. The cap can be redefined in recognition of the current restricted-entry conditions without compromising reliability. Increased load growth and the supply and demand shock introduced with the changes in the reserve requirement study methodology and marginal ELCC capacity accreditation further evidence that the assumptions used in setting demand curve parameters are no longer valid.

(b) Design flaws in the market have caused, and will cause, the auction to clear at an unreasonably high price, which only accentuates the importance of redefining the cap. Those design flaws include: (1) capacity requirements are over-stated and (2) the cost of capacity, as defined by Net CONE or Gross CONE in UCAP terms, is overstated.

A. Expected Fundamental Market Conditions for the 2026/2027 BRA

35. The PJM market is generally expected to reflect less surplus capacity from a market fundamental perspective in the 2026/27 BRA.⁸ PJM's proposed changes and the potential change to categorical exemptions will better align fundamentals with market outcomes, but the market is expected be structurally tighter. This section provides a starting point to an assessment of the estimated impact of the price cap increase and linkage to Gross CONE.

36. With the current parameters in the PJM auction, absent material amounts of capacity that did not indicate participation when the initial IRM was calculated, the market price for capacity is estimated to fall between \$360/MW-Day and \$500/MW-Day, or about 50% higher than actual 2025/26 BRA results. Note that the results are all expected to be above 1.5 times Net CONE (the range is 1.6 to 2.2 Net CONE) absent changes to the market parameters and/or unexpected incremental capacity entering the auction.

37. If the price cap is set at 1.5 times Net CONE with the same calculations above, the range of results is about \$265/MW-Day to \$330/MW-Day.

38. Refer to Section 5.1 of my Report for additional discussion on the expected market conditions for the 2026/2027 BRA.

B. Price Cap Increase Is Not Justified

39. The price cap increase is not justified because it does not recognize that new entry is not feasible and is unlikely to incentivize incremental capacity that has exited through deactivation notice to return to the market. It does result in large wealth transfers with little expected value.

40. The 2026/2027 price cap will increase from the greater of Gross CONE and 1.5 Net CONE to the greater of Gross CONE and 1.75 Net CONE. This change is in conjunction

⁸ In physical terms of total installed capacity relative to peak load. Capacity in the auction may increase due to adding RMR and categorically exempt capacity.

with a change in E&AS offset methodology – forward pricing versus historical lookback – that will be first applied in the 2026/27 BRA. The price cap is further increased with the potential use of CCGT as the default resource due to the reliance on Gross CONE if it exceeds Net CONE.

41. The primary issue that has changed is that excess entry and over-supply risk as a result of a flat demand curve is no longer a risk. The interconnection queue delays have effectively negated the ability of new supply to enter the market, and auction schedules have been compressed. A further change is that load growth expectations have increased dramatically since the curve was constructed, and PJM has now indicated that even the entirety of the existing interconnection queue may be required to meet load growth and retirements by 2030.⁹

42. The underlying assumptions were reasonable at the time given the outlook in 2022 and the VRR curve that PJM proposed in response is suitable to address concerns of over procurement and Net CONE uncertainty. However, material shifts in market dynamics in the last two years have seen these assumptions disproven and indeed the opposite has occurred. The primary market concerns are now managing extremely high load growth at a time of restricted entry from new capacity.

43. There is little potential benefit in raising the price cap in the absence of potential new resources. The price cap should not interfere with the proper function of the market, but nor should it risk transfer of wealth with little or no associated benefit. I further note that the steeper slope of the revised demand curve and previously approved use of CCGT Gross CONE further increases the wealth transfer. Additionally, linking the price cap to Gross CONE rather than a multiple of Net CONE dramatically increases prices with identical supply assumptions.

⁹ “PJM Board Letter to Stakeholders.” December 9, 2024. <https://www.pjm.com/-/media/DotCom/about-pjm/who-we-are/public-disclosures/2024/20241209-board-letter-outlining-action-on-capacity-market-adjustments-rri-and-sis.pdf>, page 3.

44. Refer to Section 5.2 of my Report for additional discussion establishing that the price cap increase is not justified.

C. New Capacity Precluded

45. Historically, new entry has played a critical role in disciplining the market. This feature is particularly valuable in the forward capacity auction design. Historical data demonstrates that capacity additions have occurred even when prices were below the Net CONE, effectively revealing a lower market derived Net CONE. In general, there has been more new supply offered than cleared in the auction, indicating that new capacity serves as a proxy price cap when the market is functioning as intended.

46. In the current market, however, the incentive to return to the market across a range of portfolio sizes and cost structures is mixed at best. The impact of the higher price cap is certainly total higher revenues but the relative incentive to return or not return to the market is not driven by the price cap. In other words, raising the price cap and linking it to Gross CONE is not an effective incentive to return capacity to the market and as a result largely results in wealth transfer with limited expectation of incremental reliability.

47. An increase in the price cap is extremely unlikely to incent new capacity due to compressed auction timelines and the lack of UCAP exiting the queue in the near-term. The increase in the price cap is unlikely to reverse deactivation decisions because the steepness of the demand curve impacts existing portfolios. There is little if any capacity likely to return from a mothball outage in the short term. In summary, there is little evidence or reasonable expectation that a price cap of \$550/MW-Day will increase available supply.

48. Refer to Section 5.3 of my Report detailing how new capacity is effectively precluded in the current market.

D. Reliability Requirement is Overstated by PJM Methodology

49. PJM implemented its Marginal ELCC accreditation process for capacity and establishing the reliability requirement for the market RRS. The methodology is reasonable and provides an intuitive result that the primary driver of a shortfall in available supply relative to demand is a function of extreme weather that increases load and simultaneously creates correlated outages amongst the generation fleet. For example, extreme cold weather both increases load and raises forced outage rates at thermal generators.

50. In my estimation, the change in methodology to the ELCC approach now used is reasonable and consistent with the capacity accreditation approach. However, the actual implementation of the revised approach overstates the reserve requirement because it completely ignores improvements in system performance associated with changes to the market framework and operational practices. This methodology is inappropriate because it fails to recognize a clear trend break in the generator availability data. The concern is strengthened by the fact that the break was an expected outcome of an intervention initiated by PJM that PJM recognizes as having benefit.

51. The lack of winter capacity ratings in the model is a secondary concern. The IMM noted in its evaluation of the 2025/26 BRA that the reliability requirement would be lower if winter capacity ratings were used for thermal units.¹⁰

52. In summary, PJM's approach in its revised RRS approach over-states the required capacity reserve margin by ignoring fleet performance improvements that PJM itself has implemented and supported as effective. PJM has also taken conservative assumptions with

¹⁰ Analysis of the 2025/2026 RPM Base Residual Auction Part A," September 20, 2024.
https://www.monitoringanalytics.com/reports/Reports/2024/IMM_Analysis_of_the_20252026_RPM_Base_Residual_Auction_Part_A_20240920.pdf, page 6.

respect to the winter capacity of thermal resources. This serve to inflate capacity and volumes because the demand curve is right-shifted.

53. Refer to Section 5.4 of my Report for additional discussion on how the reliability requirement is overstated.

E. Net CONE Is Overstated on UCAP Basis

54. PJM inaccurately measures capacity performance and uses a flawed accreditation process, particularly with respect to new capacity, by using class average performance and ignoring the impact of increased winter capacity. These issues undervalue the reliability of new capacity and decrease its expected UCAP. The aggregate impact of these choices inflates Net CONE values through inaccurate UCAP calculations for new assets.

55. An issue with the current methodology is that generator performance is generally expected to improve due to PJM's Capacity Performance program. The Capacity Performance program incentivized generators to invest in resiliency measures, therefore, PJM should expect that existing unit performance has improved. However, PJM accredits capacity based on forced outage, planned outage, and resource performance data that stretches back to 2012, six years before the capacity performance program was fully implemented.¹¹ PJM either does not believe that the penalties incent availability at critical times or understates the resilience improvements from thermal generation units as a result of the program. If the latter is the case, then the program increases capacity costs without serving a purpose. If it does provide incremental reliability benefits, these improvements should be captured in resource accreditation.

56. Additionally, the resource accreditation design, by tying new entrants to class ELCCs from all resources in the class, undervalues new resource performance. PJM's approach

¹¹ "ELCC Education," February 16, 2024. <https://www.pjm.com/-/media/DotCom/committees-groups/committees/pc/2024/20240216-special/elcc-education.pdf>, page 4.

is problematic because it does not drive reliability improvements in practice. The same class-based forced outage, de-rate, and planned outage is applied to new thermal resources, regardless of their actual expected performance based on observable characteristics. Since new resources are accredited based on class, there is a muted or limited incentive to invest in greater than class average availability. Even if developers invest in reliability, the class-based accreditation diminishes the true value of entrants and overstates Net CONE as a result.

57. Undervaluing new thermal resources lowers their UCAP relative to their ICAP and effectively makes the default entrant more expensive than reality on a UCAP basis. Revising the accreditation of resources to more accurately reflect within class reliability based on observable characteristics, including vintage, will increase the veracity of the investment signal and reduce Net CONE as a result.

58. As noted by the IMM, Net CONE UCAP should be calculated including winter capability. This is very feasible as a new unit would be able to obtain CIRs that include winter capability. There is no realistic concern that winter deliverability is a barrier to using winter ratings for the reference technology entrant.

59. Refer to Section 5.5 of my Report for additional discussion establishing that Net CONE is overstated on a UCAP basis.

V. RECOMMENDATIONS

60. My Report makes two immediate recommendations that are focused on addressing the core concern of excessive wealth transfer before the next quadrennial review. This means that first, the price cap should be temporarily reduced and second, it must be tied to a

lower multiple of Net CONE and de-linked from Gross CONE. These recommendations are detailed in Section 6 of the Report.

A. Reduce the Market Price Cap

61. I recommend that the price cap should be reduced until a new demand curve is established by the ongoing PJM Quadrennial Review. The current price cap level is informed by potential for new entry and is not reasonable with the current auction schedule and prolonged queue delays that interfere with that underlying assumption. The slope and narrow width of the demand curve do not reflect lack of entry due to interconnection delays, compressed auctions and the underlying uncertainty of load growth that has arisen since 2022. The current demand curve parameters are driving unjustified high prices, but in the future the narrow curve could create risk for entrants responding to a load growth forecast that materializes slightly below expectations.

62. The potential risk of undue wealth transfer from a high price cap in the absence of competitive entry is very high and there is little estimated reliability benefit. With the currently expected parameters for the 2026/27 BRA (a price cap at the greater of Gross CONE and 1.75 Net CONE), the market price for capacity is estimated to fall between \$360/MW-Day and \$500/MW-Day, or about 50% higher than actual 2025/26 BRA results. Note that the results are all expected to be above 1.5 Net CONE (the range is 1.6 to 2.2 Net CONE) absent changes to the market parameters and/or unexpected incremental capacity entering the auction.

63. Rationalizing extremely high prices as a necessary response to current supply demand fundamentals ignores there is very little potential new supply available to respond and the steep demand curve does not incent a response canceling deactivations due to the price impact of incremental capacity clearing the auction. Projects in the transmission queue are very

unlikely to be able to be online for the 2026/27 BRA, and the mothballed generation seems unlikely to be available as well.

B. Reduce the Net CONE Multiplier and Drop the Gross CONE Linkage

64. Net CONE represents the best available estimate of competitive outcomes over the long-term and could be used directly as a price cap with the current market conditions. PJM has suggested a Capacity Performance penalty rate of 1.0 times Net CONE to reflect an estimate of the cost of replacement capacity in the event of non-performance during an emergency.¹² Given that Net CONE is an administrative estimate incorporating future conditions and therefore subject to error, 1.5 times Net CONE is a reasonable upper boundary on the potential cost of capacity. A lower price cap is expected to have very little impact on clearing volumes in the market. Gross CONE cannot be justified in the absence of potential entry because it arbitrarily sets the price cap at a level unrelated to realistic capacity costs.

65. To accompany this 1.5 times Net CONE ceiling, the RTO Net CONE should set the minimum price cap for all LDAs. If Net CONE is higher in a constrained LDA, 1.5 Net CONE would use the LDA specific Net CONE. Gross CONE should not be considered in the price cap formulation. This addresses the concern that a constrained LDA has very low Net CONE and an arbitrarily low price cap as a result.

¹² “Consultation with Members Regarding Future 205 Filing on Capacity Market,” November 21, 2024. <https://www.pjm.com/-/media/DotCom/committees-groups/committees/mc/2024/20241121/20241121-item-03a---1---member-consultation-regarding-future-205-filing-on-capacity-market---presentation.ashx>, page 22. PJM Board Letter to Stakeholders,” December 9, 2024. <https://www.pjm.com/-/media/DotCom/about-pjm/who-we-are/public-disclosures/2024/20241209-board-letter-outlining-action-on-capacity-market-adjustments-rri-and-sis.pdf>, page 4.

VI. CONCLUSION

This concludes my declaration. I declare under penalty of perjury that the foregoing is true and correct. Executed on December 30, 2024.

Dated: December 30, 2024

/s/ *Kris Aksomitis*

Kris Aksomitis
Director, Commercial Power Development and Strategy
Power Advisory LLC



Exhibit A

PJM Capacity Auction Evaluation





PJM Capacity Auction Evaluation

Prepared for: The Commonwealth of Pennsylvania

December 23, 2024

Submitted by:

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EXECUTIVE SUMMARY

The 2026/27 Base Residual Auction (BRA) auction is poised to deliver arbitrarily high price results. The expected market conditions and assumptions that were used in 2022 in setting the demand curve, and the price cap in particular, have been undercut by changing market conditions and will not apply for at least the next two auctions.

First, dramatic increases in load growth forecasts and the impact of the revised methodology in setting the target capacity requirement have completely changed the market dynamics relative to when the demand curve parameters were set in 2022. Peak load for 2027 is now forecast about 8,000 MW higher than what expected in 2022. The installed reserve margin requirement has been increased by about 3 percentage points by the revised reliability forecasting methodology. The large excess reserve margin in PJM has been unexpectedly reversed by these factors in the last two to three years, and the impact of interconnection queue delays and compressed auction schedules is now an important consideration.

A critical function of a forward capacity auction, such as PJM's BRA, is that the auction's clearing price sends a signal to market participants to invest in generation resources needed to ensure reliability. PJM sets a cap on the clearing price of a given auction to keep prices from exceeding competitive levels. The price cap is currently set at the greater of 1.75 times the Net Cost of New Entry (CONE) or, alternatively, Gross CONE. Defining the cap in this way assumes that market participants can respond to the price signal that results from a given auction. That, however, is currently not true because delays in the interconnection queue and the currently compressed auction schedule severely restrict potential entry, even in response to high prices. Therefore, a key assumption that justified a price cap that far exceeds Net CONE (the possibility of incentivizing additional entry) is no longer present.¹

The high price cap is also very unlikely to reduce currently approved deactivations by enough to justify the cost to consumers. As shown in Section 5.3.1, under many circumstances the increase in the price cap may actually create a relatively weaker signal for capacity to defer its deactivation due to the steepness of the capacity demand curve.

Under these circumstances, PJM's current cap is arbitrarily high. A market that clears at or near the cap creates the potential risk of undue wealth transfer with very little estimated reliability benefit. I estimate from the 2025/26 BRA results that the price increase from setting the price cap at the \$550/MW-day level expected in the 2026/27 BRA would have increased capacity costs by about \$5.8 billion dollars relative to the actual results. At most an extra 514 MW of Unforced Capacity (UCAP) would have cleared given this was all the uncleared capacity available in the auction. I estimate this equates to an implied Value of Lost Load (VOLL) of about \$11.6 million per MWh at a minimum, which is orders of magnitude above recent VOLL estimates from MISO and ERCOT of \$35,000.² The lack of a likely or demonstrable reliability improvement commensurate with the cost that will occur with near certainty is not justifiable.

Given the conditions noted, the price cap should be lowered until the next PJM Quadrennial Review provides an opportunity to establish a demand curve that reflects the current situation. Redefining the

¹ See Section 5.3.

² "MISO Update to PJM Reserve Certainty Task Force", November 2024, [20241113-item-04---miso-shortage-pricing-update-to-pjm-rcstf.pdf](#). MISO reports a range of VOLL from \$10,000/MWh to \$35,000/MWh (pages 16 and 20). PUCT Review of Value of Lost Load in the ERCOT Market, September 2024, [Value of Lost Load Study for the ERCOT Region](#), suggest an ERCOT wide VOLL of \$35,000.

cap to account for the current reality—that there is limited prospect for new entry—would protect consumers from market power and administratively created capacity demand shocks at a time that there is no feasibility of an effective market response in the form of entry from high UCAP resources.

During the current restricted entry situation, the price cap should be defined relative to expected competitive outcomes. Net CONE represents the best available estimate of competitive outcomes over the long-term and could be used directly as a price cap. PJM is proposing to use Net CONE as the performance penalty level because it represents a reasonable estimate of the value of replacement capacity. Given that Net CONE is an administrative estimate and subject to error, 1.5 times Net CONE is a reasonable upper boundary on the potential cost of capacity that does not interfere with proper market function but protects consumers against undue costs. Gross CONE cannot be justified in the absence of potential entry because it arbitrarily sets the price cap at a level unrelated to realistic capacity costs. My analysis finds that setting the price cap at Gross CONE is likely to increase capacity prices for the 2026/27 BRA by as much as 50% relative to prices under a lower price cap, with no reasonable expectation of an incremental market response sufficient to justify the cost. This represents an unjustified wealth transfer as the incremental capacity and reliability benefit are shown to be minimal and come at cost orders of magnitude greater than any reasonable estimate of the VOLL.

In summary on the price cap, circumstances have meaningfully changed since the cap was last approved in ways that warrant lowering the cap now. Reducing the price cap should not interfere with proper market function but should eliminate the risk of undue outcomes. The capacity price cap should be set at 1.5 times Net CONE, and 1.5 times the RTO Net CONE should set the minimum price cap for all LDAs. If Net CONE is higher in a constrained Locational Deliverability Area (LDA), that LDA would use the LDA specific Net CONE. Gross CONE should not be considered in the price cap formulation.

Second, current market realities have revealed several design flaws in PJM's market parameters that will inflate prices above reasonable levels for the upcoming 2026/27 BRA, and likely several of the auctions that follow. PJM has recently proposed changes that resolve some flaws, but there are remaining issues. While these flaws exist independent of the price cap, the design flaws magnify the importance of redefining the market cap during restricted-entry conditions because these flaws magnify the impact of the excessive price cap.

While some may argue that excessively high prices are necessary to avert reliability concerns, my analysis has identified two weaknesses with PJM's methodology for determining reliability needs that each suggest the need for such excessive pricing solely for reliability is unwarranted. These weaknesses are:

Capacity Requirements are Over-Stated

PJM implemented its Marginal ELCC process for accrediting capacity resources and establishing the overall reliability requirement for the market. The Reserve Requirement Study (RRS) relies on generator performance data from 2012 through 2023 with no adjustments, even though various market changes such as the Capacity Performance construct were implemented after the 2014 Polar Vortex with the express purpose of improving generator performance during such events. The generator performance data, as examined in Sections 5.2 and 5.2.1, illustrates a clear performance improvement consistent with PJM's expectations in 2014 from market changes adopted in response to the Polar Vortex.³

³ The PJM Capacity Performance Framework introduced penalties and created incentives for improved weatherization, firm natural gas supply contracts and improved maintenance, as stated by PJM. See [PJM Tightens Capacity Market Rules to Improve Reliability](#) as an example.

PJM should re-estimate the reliability requirement with data from 2018 through 2023 and use this value in the capacity auction. This will more accurately reflect the true requirement for capacity with current performance expectations recognizing structural changes to market rules and practices. Winter capacity ratings for thermal resources should be broadly utilized in the model on a risk adjusted basis to reflect that some amount of winter capacity is deliverable. PJM should develop a reasonable assessment of the adjustment ratio. Ignoring this capacity entirely due to imperfect information is not a balanced approach.

Cost of Entry is Over-Stated

The CONE for the reference technology is initially estimated in installed capacity (ICAP) terms. There is no issue identified with the engineering and financial estimates of the CONE in ICAP terms. In UCAP terms, the CONE is over-stated because it treats the new entrant reference technology as part of a class of technology. The evidence illustrates this undervalues new generation capacity because some portion of the existing fleet has relatively poor performance that is not representative of expected performance from a new unit. This issue is compounded because increased winter capacity is ignored because UCAP is based on summer capacity ratings.

PJM should estimate the UCAP of the reference technology with a representative sample of existing units that reasonably reflects expected performance from a new dual fuel CT. The estimate should be further adjusted to fully reflect winter capacity ratings because an entrant would not have the same deliverability risk as existing units, *i.e.*, Capacity Interconnection Rights (CIRs) should not be a limiting factor for an entrant.

1. INTRODUCTION AND OVERVIEW OF REPORT

Through my role as a Director at Power Advisory LLC ("Power Advisory"), I was retained by the Commonwealth of Pennsylvania to provide expert evidence regarding the outcomes from the 2025/26 BRA and related concerns with future auctions such as the upcoming 2026/27 BRA. I was asked to examine and comment on whether the market is currently functioning as intended. To the extent I identified concerns, actionable recommendations were requested.

I identified several concerns with the current structure and function of the market. In particular, numerous capacity market rules and parameters are creating price signals in excess of what one would expect given supply and demand. Further, market prices are not able to be disciplined by new entry due to the combination of interconnection queue backlog and the compressed capacity auction schedule.

Section 2 of this report begins with a high-level description of my relevant experience in market design, market evaluation and market analysis.

Section 3 provides a summary of findings and recommendations.

Section 4 provides an overview of the PJM capacity market for context. It also provides a brief summary of recent changes to the PJM capacity market and its historical performance.

Section 5 examines issues with elements of the capacity market that serve to reduce the current supply of capacity in the market and over-state the cost of new capacity. These factors increase capacity prices above levels consistent with market fundamentals. Evidence that the price cap proposed for the 2026/27 BRA will elevate price expectations is illustrated. Further, current issues with interconnection delays, the compressed auction schedule, and the resulting inability of the market to respond to capacity market prices preclude the typical competitive response.

Section 6 provides recommendations and rationale for changes to current parameters.

2. AUTHOR BACKGROUND

Kris Aksomititis is currently the Director of Commercial Power Development and Strategy at Power Advisory LLC (Power Advisory). Power Advisory is an energy sector management consulting firm focused on the North American electricity markets with expertise in wholesale market design, price forecasting electricity planning for distribution and bulk systems, market risk assessment, governance, structure and organization of wholesale and retail electricity markets.

Mr. Aksomititis has worked in various market design, regulatory, analytical, forecasting and commercial roles over the last 25 years. At Power Advisory, Mr. Aksomititis is responsible for overseeing wholesale market forecasts and analysis for the US Based team, which produces forecasts for NYISO, ISO-NE, PJM and occasionally other markets as requested by clients. He provides regular updates to clients on energy, capacity, ancillary services, transmission and policy changes in US markets with a focus on PJM, MISO, ERCOT and SPP. He has worked on projects for US Federal and State agencies, system operators as well as Provincial Governments in Canada, on projects evaluating long term electricity price expectations, evolving market dynamics and risks. He has submitted a range of expert evidence on behalf of clients to the Alberta Utilities Commission and defended that evidence in written and oral hearings. He has spoken at various conferences on price forecasting and market design topics, including capacity market design.

Mr. Aksomititis rejoined Power Advisory from Liberty Power (also known as Algonquin Power and Utilities) in 2023. While at Liberty Power, he was the Senior Director of Market Strategy, reporting to the Senior Vice-President of Business Development. In this role he evaluated renewable energy projects across North America and evaluated the strategic fit of assets, technologies, contracts or geographies within the overall long-term corporate portfolio. He was responsible for setting long-term revenue assumptions, market risk evaluation and assisted with providing market context for siting, project design and contracting choices. He worked on a range of early to late-stage development projects in PJM, NYISO, MISO, ERCOT, CAISO, SPP and AESO, as well as operating projects in PJM, ERCOT, CAISO, and MISO. He was the internal market expert in numerous commercial processes including project acquisition and asset sell-downs.

From mid 2017 through 2019, Mr. Aksomititis represented a group of cogeneration owners in the Alberta capacity design process, from initial conceptual design through to Utilities Commission hearing on the final market rules. In this role, he organized and represented eight of the largest industrial energy consumers in Alberta into a single group for the consultation with a combined generation portfolio of about 4,000 MW, or roughly 30% of the total installed generation in the market at that time. He developed numerous submissions on all aspects of the market design during the consultation, and provided presentations to the AESO and its working groups during the 3-year course of the design consultation. He served as Industry Chair for the AESO on the Market Mechanics Design Stream Working Group during the initial consultation phase in 2017 and 2018. He submitted evidence on behalf of the group to the Alberta Utilities Commission hearing to approve the capacity market design and testified during the hearing. He was a member of the AESO's working group established outside the market design process to implement tariff elements to charge capacity costs to end use customers.

In a prior role at the AESO, he worked in the Market Design group as a Program Manager. He was responsible for developing and evolving market rules related to intertie operation, ancillary services and wind integration. He authored numerous AESO Discussion and Recommendation Papers on market design issues such as altering the energy market price cap, altering the function of the ancillary services market, developing new ancillary services to support wind integration and developing new products to enable increased flows over the intertie. He worked with internal and external stakeholder to create efficient and effective markets, as well as managed the implementation of market changes with internal groups such as system controllers and IT implementation.

Mr. Aksomitis has also served as the Manager of Market Analysis at TransAlta, an electricity generation company with assets at that time in Alberta, Washington, California, Ontario, Wyoming and Australia. He was responsible for all long-term corporate price forecasting, as well as analytical support for business development, commercial and regulatory functions.

Mr. Aksomitis worked at the Alberta Utilities Commission and a Senior Market Analyst when the Commission was initially given oversight of ISO market rules. He acted as the internal electricity market expert. In this role he was responsible for supporting Commissioners and legal staff in the evaluation of the expected market impacts from ISO rules.

Mr. Aksomitis holds an MA in Economics from the University of Calgary, with a focus on competition theory. His thesis research focused on measuring market power in the Alberta electricity market during the initial market period from 1996 to 2000 when it was only partially de-regulated.

3. SUMMARY OF FINDINGS AND RECOMMENDATIONS

A foundational premise of a forward capacity auction, such as PJM's, is that the auction's clearing price functions as a market signal for new capacity that in turn produces investment in generation resources needed to ensure reliability. That premise holds true, however, only if market participants are in fact able to react to an auction's clearing price. Under ordinary circumstances, in which new capacity can be connected to PJM's network and capacity auctions are being held sufficiently in advance of their associated delivery year, this is a reasonable assumption. Currently, however, it is not. Due to delays in PJM's interconnection queue and the compressed capacity timelines between when PJM is holding its capacity auctions and the delivery years for which the auctions are being held, capacity sellers cannot respond to the clearing price no matter how high it climbs and the capacity auction is incapable of serving one of its essential purposes. Indeed, despite the historically high clearing price of the 2025/26 BRA there was extremely limited entry. Further, these factors are playing out at a time when both load growth has surpassed PJM's forecasts and further design flaws have come to light. As a result, absent addressing market flaws, the 2026/27 BRA will likely clear at historically high prices, and still, there will be very little entry. This makes lower the cap critical.

3.1 Summary of Findings

The primary finding is that the market signal for new capacity in PJM is not creating an investment response due to delays in the interconnection queue exacerbated by the currently compressed capacity auction timelines. This gives rise to uncompetitive outcomes that result in a transfer of wealth from load customers to capacity sellers, without any realistic expectation of improved reliability, *i.e.*, additions of capacity, from the elevated price levels.

PJM's price cap of the greater of 1.75 times Net CONE or Gross CONE serves to further increase prices. I find that the increase to the price cap and the potential linkage to Gross CONE can not be justified with restricted market entry. My assessment is that an increase in the price cap will likely inflate capacity costs to PJM customers by billions of dollars with little benefit. For example, I estimate in Section 5.4.2 that a higher price cap in line with the expected 2026/27 BRA price cap would have increased prices in the 2025/26 BRA by nearly \$100/MW-Day and resulted in consumers paying an implied nearly \$6 million per MWh of improved reliability, at a minimum. In the absence of market entry, a higher price cap primarily results in wealth transfer.

The price cap's linkage to Gross CONE is not justified. As the cost of entry declines, as defined by Net CONE, the price cap is held at an arbitrarily high level. In fact, an initial concern with the 2026/2027 BRA is that Net CONE was \$0/MW-Day in many areas for combined cycle gas turbine (CCGT) generation, which was expected to be the reference technology. This indicates that energy prices alone supported entry for the reference technology and new capacity was still unable to respond. In this instance, the capacity price needs to be high enough to avoid undue retirement from existing resources that have different cost structures than the reference technology, but Gross CONE for a new unit is a much higher price than required for this purpose.

PJM itself appears to recognize the issue of limited entry. As outlined in its recent Reliability Resource Initiative (RRI) proposal filing,⁴ only 514 MW of unforced capacity (UCAP) was offered and did not clear in

⁴ "Tariff Revisions for Reliability Resource Initiative," December 12, 2024, [20241213-er25-712-000.pdf](#), pages 14-15.

the 2025/26 Base Residual Auction (BRA), and only 230 MW of UCAP has been placed into service this year.⁵ Very little new capacity, particularly in terms of UCAP, is expected to be available for the 2026/27 BRA based on publicly available data outlined in Section 5.1.1. PJM states accelerating capacity through its RRI proposal is the only way to bring capacity online before 2028.⁶ In my opinion, an online date of June 2028 in time for the 2028/29 BRA will be a challenging timeline even for projects accelerated by the RRI.

It is important to note that the price expectations for the 2026/27 BRA are informed primarily by the 2025/26 BRA results released in August 2024. The 2025/26 market outcome was unexpected and attracted very little new capacity despite record prices. The PJM market design choices have been made with an expectation that there will be sufficient lead time for new entry to participate in the BRA, *i.e.*, PJM's market is predicated on a three-year forward design. The current compressed auction timeline further limits market response beyond the interconnection queue delays. Together this means the previous design choices are not appropriate for the 2026/27 BRA.

PJM has recently proposed several changes to the 2026/27 BRA. The changes proposed are including RMR resources in the capacity supply curve, using a dual fuel combustion turbine (CT) as the reference technology, removing reactive service revenue from the net Energy and Ancillary Service (E&AS) offset, and creating a uniform RTO wide performance penalty based on Net CONE.⁷ PJM has also indicated a potential for the must offer capacity exemption for certain resources to be eliminated in time for the 2026/27 BRA.⁸ These changes, if approved, would serve to mitigate some of the concerns raised in this report with the current market design choices, but several issues remain that serve to inflate capacity prices beyond both the cost of capacity, as estimated by Net CONE, and beyond the price justified by the actual supply and demand conditions.

In addition to the lack of a feasible market response to high prices, PJM's approach to defining the current capacity need, cost of new entry and demand curve parameters inflate current capacity prices and result in a wealth transfer that does not reflect true supply/demand fundamentals.⁹ Specifically, PJM introduced an over-stated capacity demand shock to the market through its adoption of new modeling techniques at a time of strong load growth, compressed auction schedules and stalled interconnection queues.

The undue impact to customers of over-stating capacity requirements is usually a volumetric concern; the capacity price is similar in equilibrium, but the volume is excessive. In a market without feasible competitive entry, over-stating capacity requirements can dramatically elevate prices as seen in the 2025/26 BRA. The historical experience in the PJM market is that entry was able to discipline prices, and capacity market parameters were not as critical to ensuring market outcomes were just and reasonable.

⁵ Ibid, pages 13-14

⁶ "Tariff Revisions for Reliability Resource Initiative," December 12, 2024, [20241213-er25-712-000.pdf, page 9.](#)

⁷ "PJM Board Letter to Stakeholders." December 9, 2024. <https://www.pjm.com/-/media/DotCom/about-pjm/who-we-are/public-disclosures/2024/20241209-board-letter-outlining-action-on-capacity-market-adjustments-rri-and-sis.pdf>, page 4.

⁸ "Consultation with Members: Capacity Markets Must Offer and Market Seller Offer Cap Changes," December 13, 2024. <https://www.pjm.com/-/media/DotCom/committees-groups/committees/mc/2024/20241213-special/item-01---1-consultation-with-members-capacity-market-must-offer-and-market-seller-offer-cap-changes---presentation.pdf>, page 5.

⁹ See IMM Reports: for example, [Monitoring Analytics - Reports - 2024](#)

Given the near-term inability of entry to mitigate prices to levels that support new generation, the specific capacity market parameters and calibrations must be examined.

PJM's revised approach to defining the need for capacity, which is based on effective load carrying capability (ELCC) as outlined in its business practices and presentations, relies on historical generation performance data from June 2012 through May 2023. The Polar Vortex, that occurred in January 2014 is the single largest factor in setting the capacity reserve margin requirement with this approach as that event highlighted the risk of concurrent forced outages across the generation fleet. This event also triggered a wide range of efforts to mitigate future reliability risks, including the Capacity Performance framework with performance penalties. PJM has noted on various occasions that the changes implemented have improved generator performance under adverse conditions, but the methodology used in setting the reserve margin requirement does not incorporate any expectation of improvement from the Capacity Performance framework. This overstates the required reserve margin and raises prices as a result.

A related issue is that PJM systematically understates the expected performance of the default capacity resource used to set the UCAP adjusted CONE. PJM's approach to setting class level ELCC relies on the historical performance of all assets in a technology class from 2012 through 2023, as noted. This understates expected new unit performance both because much of the historical record exists in the absence of the Performance framework, but also because old units with poor performance are part of the same class as new units. This raises the demand curve by increasing Net CONE on a UCAP basis, again increasing prices beyond the justifiable level. It also fails to properly reward new build resources for their improved reliability because a new build is part of the same asset class with the same ELCC as older, unreliable units.

3.2 Summary of Recommendations

The recommendations presented address the identified cost issues so that they align with current market conditions. A lack of time to implement changes should not be an argument for the status quo given the magnitude of impacts to consumers without any concomitant reliability benefit. The recommendations are intended as pragmatic and implementable for the near term. While the impacts of these recommendations are expected to lower prices in the 2026/27 BRA, the adverse reliability impacts of any of the recommended changes are minimal, if not zero because the same or very nearly the same amount of total capacity would be expected to clear the market with the changes in place. Both recommendations address the capacity price cap.

3.2.1 *Reduce the Price Cap*

A price cap reduction should be in place for the next two auctions until the next quadrennial review is able to evaluate whether there is the possibility of sufficient capacity entry in the market to support competitive outcomes in the 2028/29 delivery year. In effect, this price cap reduction will remedy the rapidly changing market conditions that have undermined the assumptions under which the 2022 quadrennial review was conducted. A price cap will preclude the undue wealth transfer in the absence potential competition. The current price cap level is informed by potential entry and is not reasonable with the current lack of potential entry.

As shown in Section 5.5, very little new capacity will be available from the interconnection queue for the 2026/27 BRA. Due to the inelasticity of the capacity demand curve, there is little if any incentive for capacity that has been given deactivation approval to cancel that deactivation. It is unlikely that any mothballed capacity will return to service for the 2026/27 BRA. As such, any reliability concerns associated with a lower price cap are unfounded. Entry decisions will be made in the context of the demand curve parameters developed under the ongoing quadrennial review.

The potential risk of undue wealth transfer from a high price cap in the absence of competitive entry is very high and there is little estimated reliability benefit. As outlined in Section 5.1.3, with the currently expected parameters for the 2026/27 BRA (a price cap at the greater of Gross CONE and 1.75 Net CONE), the market price for capacity is estimated to fall between \$360/MW-Day and \$500/MW-Day, or about 50% higher than actual 2025/26 BRA results. Note that the results are all expected to be above 1.5 Net CONE (the range is 1.6 to 2.2 Net CONE) absent changes to the market parameters and/or unexpected incremental capacity entering the auction.

3.2.2 Lower the Net CONE Multiplier and Drop Gross CONE Linkage

Net CONE represents the best available estimate of competitive outcomes over the long-term and could be used directly as a price cap with the current market conditions. PJM has suggested a Capacity Performance penalty rate of 1.0 times Net CONE to reflect an estimate of the cost of replacement capacity in the event of non-performance during an emergency.¹⁰ Given that Net CONE is an administrative estimate incorporating future conditions and therefore subject to error, 1.5 times Net CONE is a reasonable upper boundary on the potential cost of capacity. As shown in Section 5.4.1, a lower price cap is expected to have very little impact on clearing volumes in the market. Gross CONE cannot be justified in the absence of potential entry because it arbitrarily sets the price cap at a level unrelated to realistic capacity costs.

The RTO Net CONE should set the minimum price cap for all LDAs. If Net CONE is higher in a constrained LDA, 1.5 Net CONE would use the LDA specific Net CONE. Gross CONE should not be considered in the price cap formulation. This addresses the concern that a constrained LDA has very low Net CONE and an arbitrarily low price cap as a result.

¹⁰ "Consultation with Members Regarding Future 205 Filing on Capacity Market," November 21, 2024. <https://www.pjm.com/-/media/DotCom/committees-groups/committees/mc/2024/20241121/20241121-item-03a---1---member-consultation-regarding-future-205-filing-on-capacity-market---presentation.ashx>, page 22.

4. PJM CAPACITY MARKET OVERVIEW AND HISTORICAL CONTEXT

4.1 Purpose and Function of a Capacity Market

PJM secures future power supply resources through the PJM capacity market, called the Reliability Pricing Model (RPM). This market is designed to ensure long-term reliability by procuring generation resources to meet expected electricity demand plus a reserve margin to ensure reliability three years in the future.¹¹ The capacity market pays generators for the generating capacity they make available. PJM conducts an annual RPM Base Residual Auction (BRA) and three Incremental Auctions. The Base Residual Auction is conducted for the procurement of resource commitments to meet PJM's unforced capacity obligation for the Delivery Year and allocates the cost of those commitments to Load Serving Entities (LSEs) through the Locational Reliability Charge.¹² First, Second, and Third Incremental Auctions are conducted by PJM to allow for replacement resource procurement and increases or decreases in resource commitments due to changes in reliability requirements.¹³

In addition to the signalling function described above, a capacity market is intended to supply the 'missing money' to capacity resources in order to support resource adequacy and ensure sufficient capacity. Capacity markets are utilized to supplement energy markets under the rationale that an energy-only market does not deliver sufficient revenues concurrently with resource adequacy. When there is sufficient capacity to meet reliability targets, energy prices do not support the capacity, or there is "missing money", and the market is not sustainable.

Operators hold capacity market auctions to ensure there will be adequate capacity to meet future electricity demand, which is equal to the peak demand in the future, or the Delivery Year, plus a reliability margin. Eligible participants include new and existing power supply resources, generator upgrades, DR, and energy efficiency¹⁴ and transmission upgrades. Capacity market participants commit to providing electricity supply or reducing electric demand in the Delivery Year.

4.2 Key Elements of PJM Capacity Market

Capacity markets are characterized by an administratively determined need for capacity, a price schedule known as a demand curve, and definition of the capacity supply.

The Net CONE is an explicit response to the missing money issue and is a key variable for capacity markets. Net CONE is calculated as the annualized Gross CONE of the reference resource, less the expected net revenue from the energy and ancillary services market. Gross CONE is the estimated annual cost of a new capacity resource, which is essentially determined from an engineering and financial study of a generic investment in the default capacity resource. In PJM, the capacity market delivers 0.75 Net CONE at Point

¹¹ "Capacity Market (RPM)." <https://learn.pjm.com/three-priorities/buying-and-selling-energy/capacity-markets.aspx>.

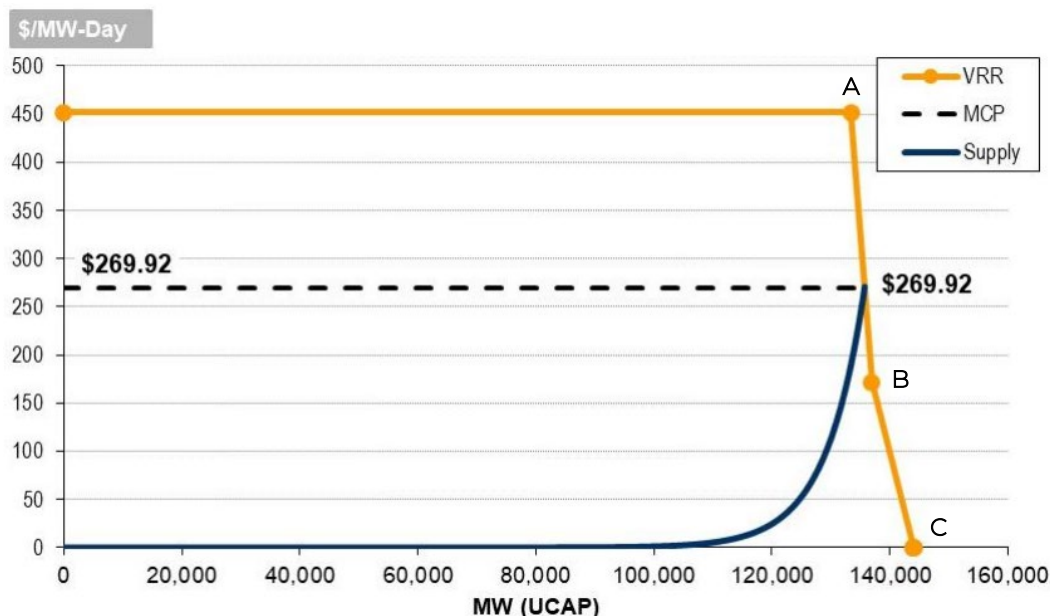
¹² "RPM Base Residual Auction FAQs," October 10, 2016. <https://www.pjm.com/-/media/DotCom/markets-ops/rpm/rpm-auction-info/rpm-base-residual-auction-faqs.ashx>, page 1.

¹³ "RPM Incremental Auction FAQs," January 19, 2019. <https://www.pjm.com/-/media/DotCom/markets-ops/rpm/rpm-auction-info/rpm-incremental-auction-faqs.ashx>, page 1.

¹⁴ PJM will no longer include energy efficiency in the capacity market as it is fully captured through demand curve reductions.

B on the capacity demand curve. For 2025/26, this was defined as 1.5% more UCAP than the resource requirement.¹⁵

Figure 1: 2025/2026 BRA RTO Supply Curve¹⁶



In most ISO markets, the capacity market demand curve is generally sloped, as the inherent volatility of a vertical demand curve is suboptimal for both generators and loads, with a capacity price of near zero if there is a surplus beyond the identified demand and an extremely high price if there is a capacity shortfall. A sloped demand curve results in lower price volatility at the expense of clearing more or less than target capacity in the auction. A sloped demand curve also provides value for capacity that exceeds the identified target. For example, the capacity price does not immediately fall to near-zero when the market is slightly over-supplied. The marginal reliability impact (MRI) demand curve is often used as the theoretical basis for the shape as it reflects the declining marginal value of excess capacity.

Defining capacity is an issue the industry is challenged by, and many markets are working on developing an approach to create a consistent product. The goal of the capacity market demand curve is that 1 MW of accredited capacity (UCAP in PJM) from any given resource has the same impact on supply adequacy as 1 MW of accredited capacity from a different type of resource, such that accredited capacity should be substitutable across technologies. Marginal ELCC is the emerging consensus approach to defining capacity, as it attempts to simulate and measure the capacity value of each resource type within the market at a given point in time. Marginal ELCC can be volatile for certain resource types, operating as a function of market penetration. There are also many assumptions that impact the measurement of the Marginal ELCC that are often challenging to discern such as the frequency of extreme events, operation of storage, correlation of outages and demand side response to emergency conditions. This generally results in an increase in the demand for capacity to reflect emerging adequacy risks. For example, PJM

¹⁵ "2025/2026 Base Residual Auction Report," July 30, 2024. <https://www.pjm.com/-/media/DotCom/markets-ops/rpm/rpm-auction-info/2025-2026/2025-2026-base-residual-auction-report.pdf>,

¹⁶ 2025/2026 BRA Supply Curves, September 13, 2024. <https://www.pjm.com/-/media/markets-ops/rpm/rpm-auction-info/2025-2026/2025-2026-bra-supply-curves.ashx>, page 2.

increased its target reserve margin for the 2025/26 BRA relative to prior auctions and has again indicated an increase for the 2026/27 BRA.¹⁷

Another key component of the capacity market is the choice of the default resource that sets the Net CONE (and Gross CONE). This typically is also not a straightforward choice and impacts the capacity market outcome. PJM's approved tariff uses a combined cycle gas turbine (CCGT) unit to set the CONE but has indicated a desire to move back to using a combustion turbine (CT). The choice between a dual fuel or gas only model is a consideration in many markets. NYISO has proposed 2-hour battery storage as the lowest cost resource.

4.3 PJM Capacity Demand Curve

The PJM Capacity Demand Curve, also referred to as the variable resource requirement (VRR), is a downward sloping demand curve based on the Net CONE price and quantity. Effective with the 2018/2019 Delivery Year, the VRR Curve is plotted by combining a horizontal line from the y-axis to Point A, a straight line connecting Points A and Point B, and a straight line connecting Point B and Point C, as outlined in Table 1. The price associated with Point C is \$0/MW-day.¹⁸ The steeper, or more vertical, the demand curve, the more price volatility can be expected. NYISO, in comparison to PJM, has a notably flatter demand curve and resultingly produces the greatest price stability and widest range of quantity realized.¹⁹

¹⁷ "Planning parameters for the 26/27 BRA." September 11, 2024 <https://www.pjm.com/-/media/DotCom/committees-groups/committees/mic/2024/20240911/20240911-item-09--2627-planning-parameters.ashx>, page 4.

¹⁸ "PJM Manual 18: PJM Capacity Market," November 15, 2023. <https://www.pjm.com/-/media/DotCom/documents/manuals/m18.pdf>, pages 34-37.

¹⁹ "Third Triennial Review of PJM's Variable Resource Requirement Curve," May 15, 2014. https://www.brattle.com/wp-content/uploads/2017/10/7510_third_triennial_review_of_pjms_variable_resource_requirement_curve-4.pdf, pages ix, 3, and 4.

Table 1:: VRR Curve Parameters

2025/ 2026	Point A	Point B	Point C
X-axis	Region Reliability Requirement * 98.98%	Region Reliability Requirement * 101.6%	Region Reliability Requirement * 106.6%
Y-axis	Greater of Gross CONE or 1.5 * net CONE - E&AS Offset / (1 - EFORD)	0.75 * net CONE - E&AS Offset / (1 - EFORD)	0
2026/2027	Point A	Point B	Point C
X-axis	Region Reliability Requirement * 99%	Region Reliability Requirement * 101.5%	Region Reliability Requirement * 104.5%
Y-axis	Greater of Gross CONE or 1.75 * net CONE - E&AS Offset / (1 - UCAP)	0.75 * net CONE - E&AS Offset / (1 - UCAP)	0

4.4 Recent Changes in PJM Capacity Market

PJM has instituted several design changes to its capacity market rules in recent years, which have had a profound impact on prices. These changes include a shortened forward market procurement in advance of the effective date for pricing, the implementation of the Capacity Performance program, the implementation of a marginal ELCC for all resources, revisions to forecasts and reliability modeling, an increase to the price cap, changes to E&AS calculations, and proposed changes to the marginal Net CONE.

4.4.1 Delays in Forward Auctions

Until recently, PJM operated under an RPM model that procured capacity three years in advance of the delivery year. The three-year advance was initially delayed in 2019, and the delay has impacted each subsequent BRA, resulting in condensed timelines. PJM held the 2022/2023 delivery year BRA thirteen months in advance, the 2023/2024 BRA twelve months in advance, the 2024/2025 BRA eighteen months in advance, the 2025/2026 BRA eleven months in advance, and recently delayed the 2026/2027 BRA to June 2025, twelve months in advance of the delivery date.

4.4.2 Capacity Performance Program

PJM established the Capacity Performance program to help promote reliability during peak conditions beginning in the 2016/2017 delivery period, though it was not fully implemented until 2020/2021. The “pay-for-performance” program applies penalties to generators that do not meet power supply expectations during a grid emergency and awards those funds to generators that exceed performance during those

same periods. The Capacity Performance program incentivizes the development of resources with high reliability, resulting in higher capacity costs but lower energy costs during extreme weather events, since more generation is available to meet demand. A 2018 PJM report suggest that the program achieved its intended results, noting that there was mild weather during the study period.²⁰

PJM determined the current Non-Performance Charge rate such that a resource that fails to perform during any Performance Assessment Interval²¹ (PAI) in a given delivery year pays the expected full cost of replacement capacity. The Commission approved PJM's use of Net CONE in the Non-Performance Charge Rate as a reasonable estimate of the cost of providing replacement capacity. The Non-Performance Charge is evaluated on a 5-minute basis, based on an estimated 30 hours of emergency actions (i.e., 12 x 30 or 360 PAI intervals) in a given delivery year, resulting in an estimated Non-Performance Charge at Net CONE/360 during the delivery year.²²

By promoting high-reliability resources, the Capacity Performance program has the effect of disincentivizing renewable resources from entering the capacity market. The intermittent nature of renewable energy generation subjects operators bidding in capacity markets to availability risks.²³ Since penalties are a function of Net CONE, the risk is correlated with the capacity price. As a result, operators may not bid renewable resources into the capacity market or factor higher risk premiums into their bids, leading to higher clearing prices. Wind, solar and battery storage resources currently have an exemption from the must offer requirement in the capacity market.

PJM reports that 1,600 MW were held out of the 2025/2026 BRA, 1,100 MW of which were wind, solar, battery, and hybrid.²⁴ This misalignment of installed system capacity and cleared capacity resources due to exempt resources could potentially increase in magnitude as renewables and storage account for 96% of the interconnection queue as of December 2024, and a proportion of these new resources may choose to avoid capacity obligations if the current rules are maintained.²⁵

4.4.3 *Marginal ELCC*

PJM changed its accreditation of resource reliability from average ELCC to marginal ELCC beginning with the 2025/26 BRA. While average ELCC assesses the reliability contribution of an entire class of resources, marginal ELCC measures a resource's incremental reliability contribution against the existing portfolio.

²⁰"Strengthening Reliability: An Analysis of Capacity Performance," June 20, 2018. <https://www.pjm.com/-/media/DotCom/library/reports-notices/capacity-performance/20180620-capacity-performance-analysis.pdf>, page 21.

²¹ A 5 minute interval triggered by operator emergency declarations such as an Emergency Load Response Event.

²²ER24-99-000, Order Accepting Tariff Revisions Subject to Condition, January 30, 2024 <https://pjm.com/directory/etariff/FercOrders/7145/20240130-er24-99-000.pdf>, page 6.

²³"Addressing capacity performance risk for variable energy resources," October 2019. https://media.crai.com/sites/default/files/publications/Energy-Insights-Capacity-performance-risk_0.pdf, page 1.

²⁴ "Consultation with Members: Capacity Markets Must Offer and Market Seller Offer Cap Changes," December 13, 2024. <https://www.pjm.com/-/media/DotCom/committees-groups/committees/mc/2024/20241213-special/item-01---1-consultation-with-members-capacity-market-must-offer-and-market-seller-offer-cap-changes---presentation.pdf>, page 10.

²⁵ *Id.*, page 12.

This value is then applied to the whole class of resources. Marginal ELCC uses a probabilistic model to determine the likelihood that a resource is available when needed.

The design change significantly reduced the ELCC of solar, storage, and DR, while thermal resources were less affected.²⁶

Table 2:: ELCC Values 2024/2025 and 2025/2026 BRA

Resource Type	2024/2025 Average ELCC ²⁷	2025/2026 Marginal ELCC ²⁸
Onshore Wind	21%	35%
Offshore Wind	47%	60%
Solar Fixed Panel	21%	9%
Solar Tracking Panel	47%	14%
4-hr Storage	92%	59%
6-hr Storage	100%	67%
8-hr Storage	100%	68%
10-hr Storage	100%	78%
Hydro Intermittent	36%	37%
Landfill Gas Intermittent	61%	54%
Demand Resource	100%	76%
Nuclear	95%	95%

²⁶ Natural gas generation accreditation was materially reduced as well.

²⁷ "ELCC Class Ratings for 2024/2025," 2023. <https://www.pjm.com/-/media/DotCom/planning/res-adeq/elcc/elcc-class-ratings-for-2024-2025.pdf>.

"PJM Capacity Special Report," August 2024. <https://www.calpinesolutions.com/pdf/Supplemental%20Report%20PJM%2025-26%20Capacity%20Results%20-%208.20.2024%20Update.pdf>.

²⁸ "Installed Reserve Margin(IRM), Forecast Pool Requirement (FPR), Effective Load Carrying Capability (ELCC) for the 2026/2027 BRA." [20240724-item-05---irm-fpr-and-elcc-for-26-27-bra---presentation.ashx](https://www.pjm.com/-/media/DotCom/planning/res-adeq/elcc/elcc-class-ratings-for-2024-2025.pdf), page 6.

Gas Combined Cycle	96%	79%
Gas Combustion Turbine	94%	62%, 79% ²⁹
Coal	85%	84%

4.4.4 Revisions to Reliability and Modelling

Capacity market designs seek to ensure that there is marginally greater supply than demand. Too much supply indicates that high-fixed cost resources should retire, and too little supply is a reliability concern. After years of peak load decline or stagnation,³⁰ load increased in the 2025/2026 delivery year; the forecasted peak demand increased by 3,243 MW or 2.2% over the 2024/2025 delivery year.³¹ Comparatively, forecasted peak demand only increase by 0.6% the previous delivery year remains well below peak PJM loads seen in 10 to 15 years ago.³² The significant increase in forecasted load has altered the equilibrium of supply and demand.

PJM continues to revise its load forecast upward, with the preliminary 2025 peak demand forecast materially higher than the 2024 forecast. Figure 4 highlights the most recent increase to the load forecast in Section 5.1.2.

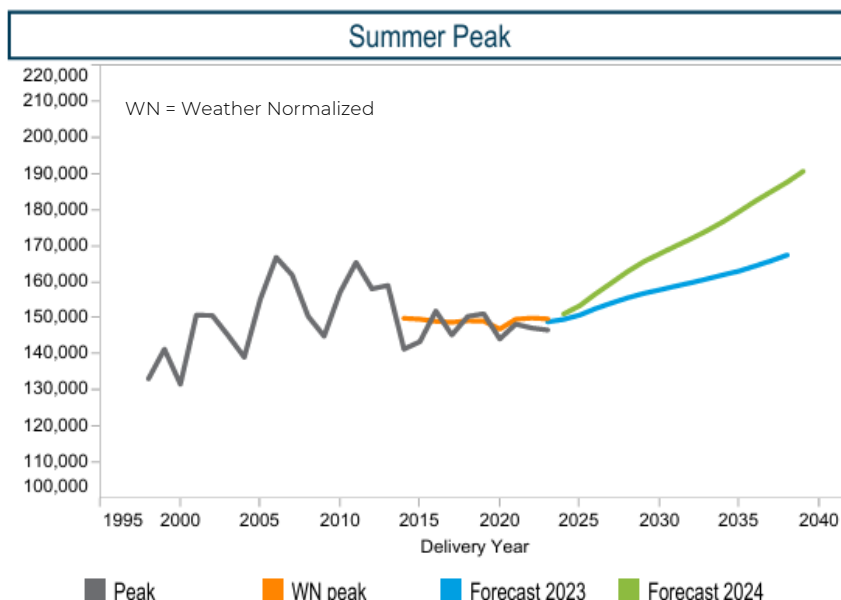
²⁹ CT Class split by Gas CT and Gas CT Dual Fuel for 2025/26

³⁰ [2024-load-report.ashx](https://www.pjm.com/-/media/markets-ops/rpm/rpm-auction-info/2025-2026/2025-2026-planning-period-parameters-for-base-residual-auction-pdf.ashx)

³¹ "2025/2026 RPM Base Residual Auction Planning Period Parameters." <https://www.pjm.com/-/media/markets-ops/rpm/rpm-auction-info/2025-2026/2025-2026-planning-period-parameters-for-base-residual-auction-pdf.ashx>, page 1.

³² "2024/2025 RPM Base Residual Auction Planning Period Parameters." <https://www.pjm.com/-/media/DotCom/markets-ops/rpm/rpm-auction-info/2024-2025/2024-2025-planning-period-parameters-for-base-residual-auction-pdf.pdf>, page 1.

Figure 2: PJM Peak Load Historical Values and Forecast



PJM also altered BRA parameters due to a change concern over extreme weather events. Beginning in the 2025/2026 delivery year, PJM altered its reliability modeling to reflect that outage risks for some plants are correlated. For example, during a winter storm, if a plant suffers an outage or de-rate, there is a higher likelihood that other generators will experience similar challenges. Such an effect was observed in the 2014 Polar Vortex and 2022 Winter Storm Elliot. The impact of this change was an increase in the reliability requirement as defined by the installed reserve margin (IRM) from 14.7% to 17.8% from 2024/25 to 2025/26 BRA. A secondary impact was a decrease in the amount of UCAP available from 164,108 MW to 144,450 MW.³³ The decline in UCAP is a function of the altered definition of capacity, not a reduction in required resources. The significant change in the IRM followed adjustments of less than one percent from the 2023/2024 delivery year to the 2024/2025 delivery year.³⁴

³³ "2025/2026 RPM Base Residual Auction Planning Period Parameters." <https://www.pjm.com/-/media/markets-ops/rpm/rpm-auction-info/2025-2026/2025-2026-planning-period-parameters-for-base-residual-auction-pdf.ashx>, page 1.

³⁴ "2024/2025 RPM Base Residual Auction Planning Period Parameters." <https://www.pjm.com/-/media/DotCom/markets-ops/rpm/rpm-auction-info/2024-2025/2024-2025-planning-period-parameters-for-base-residual-auction-pdf.pdf>, page 2.

Table 3: BRA Auction Parameters

	2020/2021 ³⁵	2021/2022 ³⁶	2022/2023 ³⁷	2023/2024 ³⁸	2024/2025 ³⁹	2025/2026 ⁴⁰
Forecasted Peak Load (MW)	153,915	152,647	150,229	149,680	150,640	153,883
Target IRM	16.6%	15.80%	14.50%	14.80%	14.70%	17.80%
UCAP (MW)	167,644	166,355	163,269	163,166	164,108	144,450

4.4.5 Changes to Net CONE and Price Cap

In their recent Quadrennial Review, PJM increased the capacity market price cap from 1.5 times the Net CONE to the greater of the Gross CONE and 1.75 times the Net CONE, allowing for a potentially higher price cap.⁴¹ Through this, PJM intends to address potential market condition changes that result in an underestimate of Net CONE and under-procurement of capacity, as well encouraging entry of new resources when conditions are tight.

In the Quadrennial Review, PJM also elected to change the reference resource from CT to CCGT. This change is intended to reflect the idea that CCGT will most likely be used to meet future capacity shortfalls. This has implications for market price signals and price volatility. Due to the higher E&AS revenues, the Net CONE value fell to \$0/MWh in some LDAs for the 2026/2027 initial parameters, which would have resulted in a capacity performance penalty rate of \$0. The reduced Net CONE values also produce a notably steeper

³⁵ "2020-2021 RPM Base Residual Auction Planning Parameters." <https://www.pjm.com/-/media/DotCom/markets-ops/rpm/rpm-auction-info/2020-2021-bra-planning-period-parameters.xlsx>

³⁶ "2022/2023 RPM Base Residual Auction Planning Period Parameters" <https://www.pjm.com/-/media/DotCom/markets-ops/rpm/rpm-auction-info/2022-2023/2022-2023-planning-period-parameters-for-base-residual-auction-pdf.pdf>, page 2.

³⁷ *Id.*

³⁸ "2024/2025 RPM Base Residual Auction Planning Period Parameters." <https://www.pjm.com/-/media/DotCom/markets-ops/rpm/rpm-auction-info/2024-2025/2024-2025-planning-period-parameters-for-base-residual-auction-pdf.pdf>, page 2.

³⁹ *Id.*

⁴⁰ "2025/2026 RPM Base Residual Auction Planning Period Parameters." <https://www.pjm.com/-/media/markets-ops/rpm/rpm-auction-info/2025-2026/2025-2026-planning-period-parameters-for-base-residual-auction-pdf.ashx>, page 2.

⁴¹ "PJM Recommendations – Quadrennial Review." <https://www.pjm.com/-/media/committees-groups/committees/mrc/2022/20220824/item-02---3-pjm-position-on-2022-quadrennial-review-recommendations.ashx>, page 2.

VRR curve due to the use of Gross CONE in the price cap formula, potentially resulting in capacity market price volatility.

4.4.6 *Changes to E&AS Offset*

PJM initially calculated E&AS revenues based on historical electricity and natural gas prices over a three-year period. PJM changed its methodology in 2020, using forward electricity and gas prices applied to historical hourly shapes. Although initially supportive, FERC ordered PJM to return to its original E&AS calculation method since the methodology had been implemented with Reserve Pricing Reforms that the Commission rejected.⁴² PJM subsequently refined its methodology for the 2026/2027 BRA, where it will calculate the E&AS Offset using forward prices shaped by historical data from one of the three calendar years preceding the auction.⁴³

Deriving an accurate value for Net CONE requires the E&AS value to reflect expected market revenues, which are best determined through forward markets. Forward markets are a better indicator of market conditions since they more accurately account for anticipated changes to resource mix, demand, supply, weather, and exogenous factors. The discrepancy between historical and forward approaches is expected to become more pronounced as the resource mix continues to evolve and demand forecasts continue to rise. PJM's design change to forward prices reflects a more accurate methodology, one that ISO-NE also adopted beginning in the 2025/2026 delivery year.⁴⁴

4.5 PJM Historical Market Performance

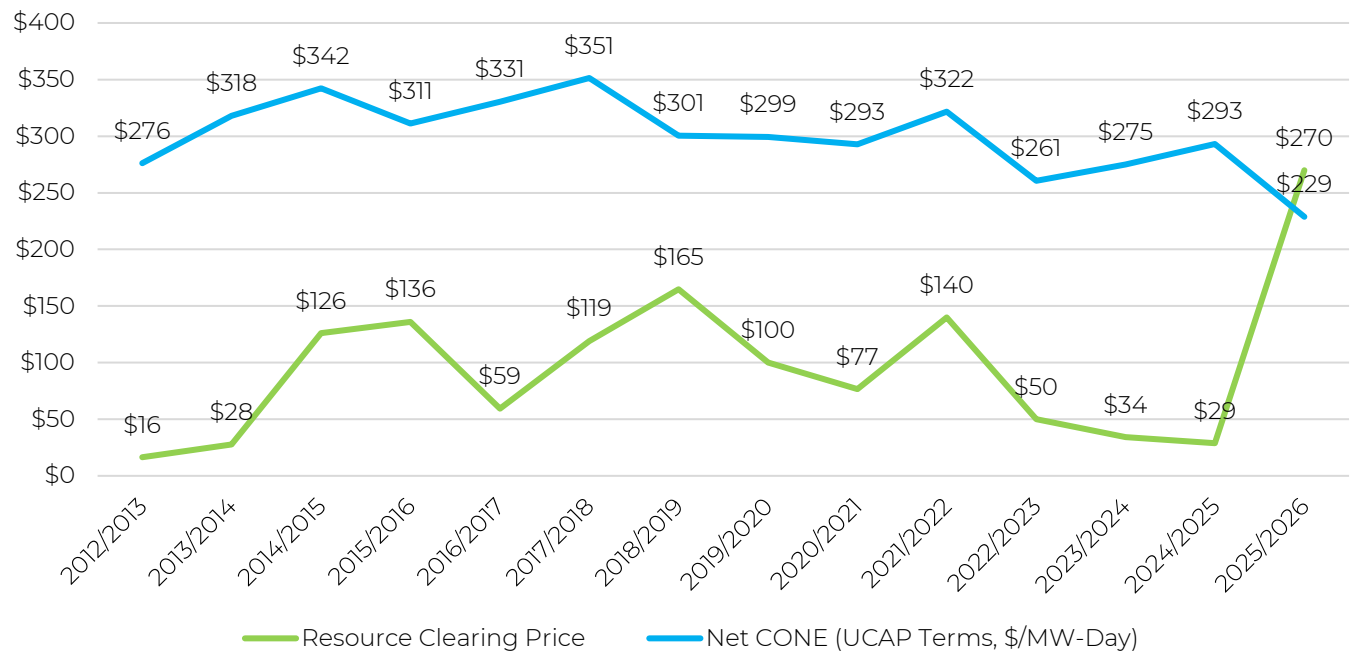
The PJM capacity market typically settles at a level below 0.5 times Net CONE at the RTO level, as shown in Figure 3. 2025/26 and 2018/19 are the only years historically above 0.5 Net CONE, and 2025/26 is the only BRA that has ever settled above Net CONE. Net CONE has been relatively stable in the \$300/MW-Day range throughout the historical record, and 2025/26 marks the low point in Net CONE and the high point in market clearing price.

⁴² "PJM CONE 2026/2027 Report," April 21, 2022. <https://www.brattle.com/wp-content/uploads/2022/05/PJM-CONE-2026-27-Report.pdf>, page 51

⁴³ PJM Manual 18: PJM Capacity Market, November 15, 2023. <https://www.pjm.com/-/media/DotCom/documents/manuals/m18.pdf>

⁴⁴ "Cost of New Entry and Offer Review Trigger Prices," September 8, 2020. https://www.iso-ne.com/static-assets/documents/2020/09/a6_a_i_iso_presentation_offests_and_esi.pptx

Figure 3: Base Auction RTO Resource Clearing Price and Net CONE⁴⁵



⁴⁵ Data comes from PJM Base Residual Auction Planning Period Parameters and IMM Analysis of Base Residual Auctions, including and <https://www.pjm.com/-/media/DotCom/markets-ops/rpm/rpm-auction-info/2019-2020-rpm-bra-planning-parameters-report.ashx>

5. FINDINGS

PJM's 2025/26 Base Residual Auction (BRA) settled at arbitrarily high prices. The same outcome will repeat in the next BRA, and likely several that follow, absent changes. This is true for several key reasons described in this section. They include that:

- The capacity market price cap is arbitrarily high and does not recognize the current inability of new supply to enter the market under current conditions or to discipline market prices. Interconnection queue delays and the reduced time between a BRA and its delivery year preclude entry. The cap can be redefined in recognition of the current restricted-entry conditions without compromising reliability. Increased load growth and the supply and demand shock introduced with the changes in the reserve requirement study methodology and marginal ELCC capacity accreditation further evidence that the assumptions used in setting demand curve parameters are no longer valid.
- Design flaws in the market have caused, and will cause, the auction to clear at an unreasonably high price, which only accentuates the importance of redefining the cap. Those design flaws include: (1) capacity requirements are over-stated and (2) the cost of capacity, as defined by Net CONE or Gross CONE in UCAP terms, is over-stated.

5.1 Expected Fundamental Market Conditions for 2026/27 BRA

The PJM market is generally expected to reflect less surplus capacity from a market fundamental perspective in the 2026/27 BRA.⁴⁶ PJM's proposed changes and the potential change to categorical exemptions will better align fundamentals with market outcomes, but the market is expected be structurally tighter. This section provides a starting point to an assessment of the estimated impact of the price cap increase and linkage to Gross CONE.

5.1.1 *System Capacity is Expected to be Relatively Unchanged from 2025/2026 to 2026/2027 BRAs*

For the 2026/27 BRA, the numbers for the auction were initially published in July, based on information available at that time. Note that the 2026/27 BRA was scheduled for December 2024, so the information was likely very accurate relative to auction expectations in July 2024.⁴⁷ For comparison, the 2025/26 material is available that shows very little change in the year over year resource mix.⁴⁸ The key variables from the reports are shown in Table 4.

⁴⁶ In physical terms of total installed capacity relative to peak load. Capacity in the auction may increase due to adding RMR and categorically exempt capacity.

⁴⁷ "Installed Reserve Margin (IRM), Forecast Pool Requirement (FPR), and Effective Load Carrying Capability (ELCC) for 2026/2027 BRA," July 24, 2024. <https://www.pjm.com/-/media/DotCom/committees-groups/committees/mrc/2024/20240724/20240724-item-05---irm-fpr-and-elcc-for-26-27-bra---presentation.ashx>, page 10.

⁴⁸ "Installed Reserve Margin (IRM), Forecast Pool Requirement (FPR), and Effective Load Carrying Capability (ELCC) for 2025/2026 BRA," March 20, 2024. <https://www.pjm.com/-/media/DotCom/committees-groups/committees/mrc/2024/20240320/20240320-item-05---irm-fpr-and-elcc-for-25-26-bra---presentation.ashx>, page 15.

Table 4: BRA Auction Assumptions

	2025/26	2026/27
ICAP	191,693	192,547
Solved Load	160,624	160,351
System UCAP	152,765	152,067
IRM	17.80%	18.60%

The key aspect of the analysis highlighted in the links is that the peak load that can be served with existing ICAP, known as the solved load. For the 2025/26 BRA, this value was 160,624 MW and for the 2026/27 BRA it was estimated at 160,351 MW in July of 2024.⁴⁹ In other words, the best available information is that the expected resource mix across the two auctions is expected to be able to meet roughly the exact same peak load, i.e. total UCAP on the system is expected to be essentially unchanged despite an increase in ICAP on the system of about 850 MW (191,693 MW in 2025/26 and 192,547 MW in 2026/27). In both cases, the solved load refers to the peak load that can be served while meeting the 0.1 LOLE reliability criteria.

The primary uncertainty we are aware of is the amount of the RMR capacity that will truly be available from Brandon Shores and Wagner. Based on current information, somewhere between 226 MW of UCAP up to almost 1,600 MW of UCAP will be placed into the capacity auction under the PJM proposal.⁵⁰

5.1.2 Strong Load Growth

Peak load for 2026/27 BRA now appears to be forecast at about 159,900 MW. This is derived from a combination of the prior 2026/27 peak load forecast of 157,197 MW⁵¹ and the preliminary 2025 load forecast that indicates an increase for 2026 of about 2,700 MW relative to the prior forecast.⁵² Peak load for the

⁴⁹ "Installed Reserve Margin (IRM), Forecast Pool Requirement (FPR), and Effective Load Carrying Capability (ELCC) for 2025/2026 BRA," March 20, 2024. <https://www.pjm.com/-/media/DotCom/committees-groups/committees/mrc/2024/20240320/20240320-item-05---irm-fpr-and-elcc-for-25-26-bra---presentation.ashx>, page 15.

"Installed Reserve Margin (IRM), Forecast Pool Requirement (FPR), and Effective Load Carrying Capability (ELCC) for 2026/2027 BRA," July 24, 2024. <https://www.pjm.com/-/media/DotCom/committees-groups/committees/mrc/2024/20240724/20240724-item-05---irm-fpr-and-elcc-for-26-27-bra---presentation.ashx>, page 10.

⁵⁰ "Consultation With Members Regarding Future 205 Filing on Capacity Market," November 21, 2024. <https://www.pjm.com/-/media/DotCom/committees-groups/committees/mc/2024/20241121/20241121-item-03a---1---member-consultation-regarding-future-205-filing-on-capacity-market---presentation.ashx>, page 6.

⁵¹ 2026/27 Excel spreadsheet attached.

⁵² "2025 Preliminary PJM Load Forecast," December 9, 2024/ <https://www.pjm.com/-/media/DotCom/committees-groups/subcommittees/las/2024/20241209/20241209-item-03---2025-preliminary-pjm-load-forecast.ashx>, page 40.

2025/26 BRA was set at 153,883 MW, so forecast peak load has increased about 3.9% with a slight decrease in the ability of the expected supply to meet load as noted.

Figure 4: Preliminary 2025 Load Forecast Relative to 2024 Load Forecast

- 15/20-year/ Annualized Growth Rate
 - 2024 Forecast: 1.6%
 - Prelim 2025: 2.0%
- Select year comparisons (Prelim 2025 vs 2024 Forecast)
 - 2026: +1.7% (~2,700 MW)
 - 2028: +4.6% (~7,500 MW)
 - 2030: +9.9% (~16,600 MW)
 - 2039: +14.8% (~28,300 MW)

Based on the information noted in the previous section, there is just enough capacity available to meet the peak load, i.e. the estimate of resource mix from July 2024 for the 2026/27 BRA was estimated to be able to meet peak load of 160,351 MW, and my estimate is that peak load is now forecast at about 159,900 MW. This leaves roughly 450 MW of surplus capacity (ICAP) relative to the target, i.e. if all the capacity clears, PJM would exceed its reliability target by 450 MW ICAP.

From a UCAP perspective, the figures imply a UCAP target of about 151,640 MW as compared to available UCAP of 152,000 MW. In effect, if all the RMR capacity is available in the capacity auction, the market will have about 360 MW UCAP excess capacity beyond the estimated reliability requirement. If only 225 MW of RMR UCAP is available, the market will fall short of the reliability requirement even if all other capacity clears by about 1,000 MW UCAP.

5.1.3 Summary of Expected Market Conditions

Based on currently proposed parameters, Point A on the demand curve will be set at the Gross CONE of a dual fuel CT generator, or about \$550/MW-Day in UCAP terms. Point B is taken from the IMM Analysis Report as 0.75 Net CONE, or $\$224.5 \times 0.75 = \$168/\text{MW-Day}$.⁵³ If exactly target volume clears the auction (360 MW fails to clear and all RMR capacity and categorically exempt capacity is available), the price would settle at about \$400/MW-Day (40% of the way from the price cap to Point B). If 100% of the expected available volume clears the auction, the price would still be expected to be about \$360/MW-Day.⁵⁴ If the RMR capacity is 1,000 MW short in UCAP terms of the maximum value, the price would settle at about \$500/MW-Day.⁵⁵

⁵³ "Analysis of the 2025/2026 RPM Base Residual Auction Part D," December 6, 2024. [Analysis of the 2025/2026 RPM Base Residual Auction Part D](#), page 20.

⁵⁴ Calculated as the slope of the demand curve of about $\$0.10/\text{MW UCAP} \times 360 \text{ MW} = \$36/\text{MW-Day}$ movement down the demand curve. Similarly, 1,000 MW reduction in UCAP moves the market \$100/MW-Day up the demand curve.

⁵⁵ If a CCGT unit with \$700/MW-Day Gross CONE sets the price cap as the reference technology and exactly the target volume clears, the price is estimated at about \$420/MW-Day. This is calculated based on a slope of \$0.183/MW for the CCGT derived demand curve with \$0 Net CONE. Point B on the demand curve is \$0/MW-Day (0.75 times Net CONE). The CCGT derived curve yields higher prices unless about 250 MW or more supply clears the market beyond the target.

In summary, with the current parameters in the PJM auction, absent material amounts of capacity that did not indicate participation when the initial IRM was calculated per Table 4, the market price for capacity is estimated to fall between \$360/MW-Day and \$500/MW-Day, or about 50% higher than actual 2025/26 BRA results.⁵⁶ Note that the results are all expected to be above 1.5 Net CONE (the range is 1.6 to 2.2 Net CONE) absent changes to the market parameters and/or unexpected incremental capacity entering the auction.

If the price cap is set at 1.5 Net CONE with the same calculations above, the range of results is about \$265/MW-Day to \$330/MW-Day.⁵⁷ As a comparison, the closest scenario to expected 2026/27 BRA conditions as evaluated by the IMM in its review of the 2025/26 BRA is Scenario 54 shown in Table 5 below.⁵⁸ In the IMM's scenario with 5% load growth, the 1.5 times Net CONE restricted the total cost increase to about 9% relative to the 2025/26 BRA results, implying a market price for the RTO of about \$280/MW-Day, in line with my estimate from above.⁵⁹

Table 5: Scenario Summary for 2025/26 RPM BRA of CT Reference Resource

Scenario	Scenario Description	Scenario Impact			
		RPM Revenue (\$ per Delivery Year)	RPM Revenue Change (\$ per Delivery Year)	Percent Change Scenario to Actual	Percent Change Actual to Scenario
0	Actual results	\$14,687,047,358	NA	NA	NA
	VRR curve based on 1.50 times net CONE calculated				
51	using forward E&AS offset	\$16,667,694,486	(\$1,980,647,128)	(11.9%)	13.5%
52	Scenario 51 and RMR resources	\$16,872,370,463	(\$2,185,323,105)	(13.0%)	14.9%
	Scenario 51 and Winter ratings and IRM at 17.8 percent				
53	(same as BRA) and RMR resources	\$17,549,723,556	(\$2,862,676,198)	(16.3%)	19.5%
	Scenario 51 and all categorically exempt offers, winter				
54	ratings and IRM at 17.8 percent (same as BRA) and RMR resources	\$15,963,442,312	(\$1,276,394,955)	(8.0%)	8.7%

5.2 Price Cap Increase Is Not Justified

The price cap increase is not justified because it does not recognize that new entry is not feasible and is unlikely to incentivize incremental capacity that has exited through deactivation notice to return to the market. It does result in large wealth transfers with little expected value.

⁵⁶ An incremental 483 MW ICAP or about 360 MW UCAP may be available per Section 5.3 from a unit that has canceled its deactivation request.

⁵⁷ In this case the slope of the demand curve is \$0.046/MW UCAP, and the price is about \$280/MW-Day if target capacity clears.

⁵⁸ "Analysis of the 2025/2026 RPM Base Residual Auction Part D," December 6, 2024. [Analysis of the 2025/2026 RPM Base Residual Auction Part D](#), pages 27.

⁵⁹ Specific offer data from non-cleared resources is not public so the analysis in this section cannot precisely replicate IMM results.

5.2.1 *Price Cap Increase and Steeper Demand Curve Inconsistent with Original Design Assumptions*

The 2026/2027 price cap will increase from the greater of Gross CONE and 1.5 Net CONE to the greater of Gross CONE and 1.75 Net CONE. This change is in conjunction with a change in E&AS offset methodology – forward pricing versus historical lookback – that will be first applied in the 2026/27 BRA. The price cap is further increased with the potential use of CCGT as the default resource due to the reliance on Gross CONE if it exceeds Net CONE.

The primary issue that has changed is that excess entry and over-supply risk as a result of a flat demand curve is no longer a risk. The interconnection queue delays have effectively negated the ability of new supply to enter the market, and auction schedules have been compressed. A further change is that load growth expectations have increased dramatically since the curve was constructed, and PJM has now indicated that even the entirety of the existing interconnection queue may be required to meet load growth and retirements by 2030.⁶⁰ The 2026/2027 demand curve was set with a specific objective to tightly manage supply volume relative to demand, reduce over-supply risk and send a strong price signal for new capacity if the market was short of the reliability requirement.^{61,62} The expectations also included the potential for purchasing incremental capacity in a rebalancing auction, which is no longer as realistic an alternative given the compressed schedule.

For example, PJM outlined its rationale for VRR parameters as⁶³:

“Increasing the potential price cap for Point A on the VRR curve from 1.5 to 1.75 times Net CONE will provide stronger pricing signals if a modeled LDA's clearing price falls between Point A and Point B on the VRR curve. This will not impact pricing below Point B on the VRR curve. Providing robust pricing signals will encourage Capacity Resources to enter PJM at the necessary rate to ensure the one-in-ten LOLE standard. In combination with a reduction in VRR curve quantity parameters, the increased price cap produces a steeper VRR curve that more strongly controls RPM quantity clearing outcomes, increasing certainty that sufficient quantity will be procured while guarding against over procurement. Sharper control over quantity outcomes may be advantageous in the future if there is increased uncertainty over new entrants' true net costs of new entry, driven by uncertainties in Gross CONE and/or E&AS revenues.”

As described in more detail below, these underlying assumptions were reasonable at the time given the outlook in 2022 and the VRR curve that PJM proposed in response is suitable to address concerns of over procurement and Net CONE uncertainty. Further, as noted by PJM, the changes would not impact prices below Point B on the demand curve, which is where the market had settled historically and would reasonably have been expected to settle in the future given supply and demand expectations. The 2024/25 BRA results were in line with this range of market assumptions. However, material shifts in market dynamics in the last two years have seen these assumptions disproven and indeed the opposite has

⁶⁰ “PJM Board Letter to Stakeholders.” December 9, 2024. <https://www.pjm.com/-/media/DotCom/about-pjm/who-we-are/public-disclosures/2024/20241209-board-letter-outlining-action-on-capacity-market-adjustments-rri-and-sis.pdf>, page 3.

⁶¹ “Fifth Review of PJM's Variable Resource Requirement Curve”, [Fifth Review of PJM's Variable Resource Requirement Curve for Planning Years Beginning 2026/27](#), pages 6-12

⁶² “PJM Recommendations – Quadrennial Review”, [item-02---3-pjm-position-on-2022-quadrennial-review-recommendations.ashx](#)

⁶³ Ibid.

occurred. The primary market concerns are now managing extremely high load growth at a time of restricted entry from new capacity.

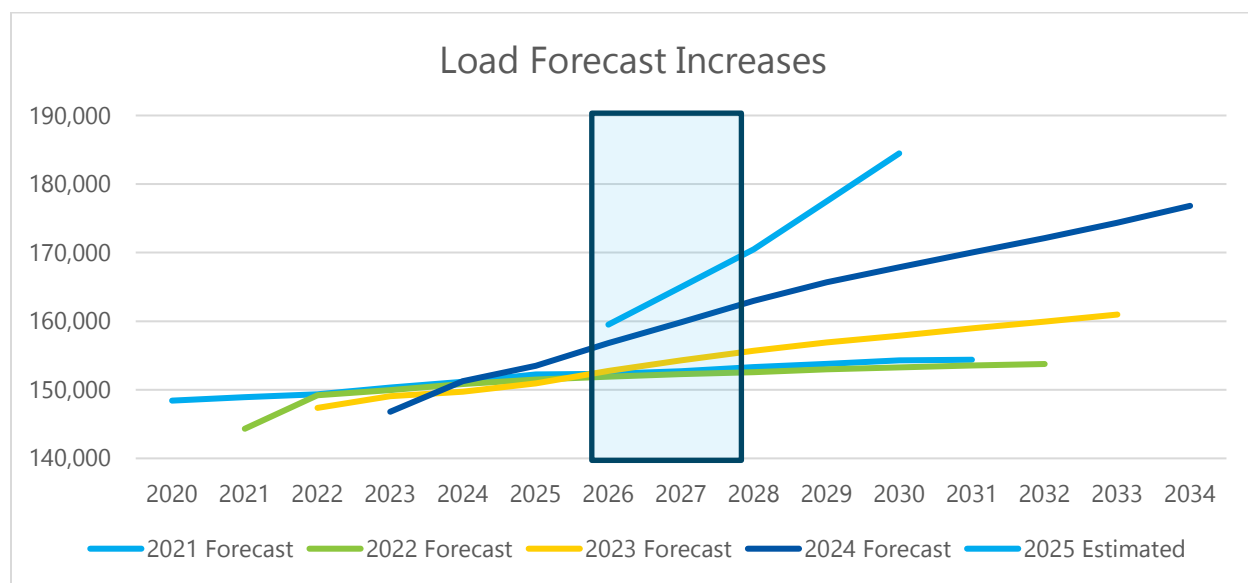
5.2.2 Magnitude of Supply and Demand Shocks Growing

The dramatic increase in load growth expectations is a key factor that has undermined the assumptions used in setting the 2026/2027 demand curve. As noted in PJM's RRI application, queue delays were not seen in the same light in 2022 as they are today due to load growth eroding the expected surplus supply.

“Mr. Bielak notes that this forecasted load growth is unprecedented and could not have been foreseen as recently as a year ago, much less in the 2020 to 2022 time frame in which PJM was working on its comprehensive interconnection queue reform.”⁶⁴

In effect, the queue delays were not expected to be as material an issue in 2022 when PJM set the demand curve parameters because load growth was not expected to drive the same need for capacity. For context, in 2022 PJM's load forecast⁶⁵ indicated a peak load expectation of about 152,000 MW in 2027 whereas the most recent load forecast update suggests about 160,000 peak demand for 2027.⁶⁶ This reflects both a dramatic change in context for the demand curve but also highlights that the delays in the interconnection queue were not viewed as critical in 2022. At the time the demand curve parameters were set, PJM's historical record of over forecasting load was a key issue, which has clearly reversed.

Figure 5: PJM Load Forecast Increases



It is also important to note that the magnitude of the supply and demand shock introduced with the revised marginal ELCC approach was almost certainly unforeseen in setting the demand curve in 2022. As shown in the Figure 6, almost 7,000 MW of surplus UCAP was eliminated with the increase in the IRM and

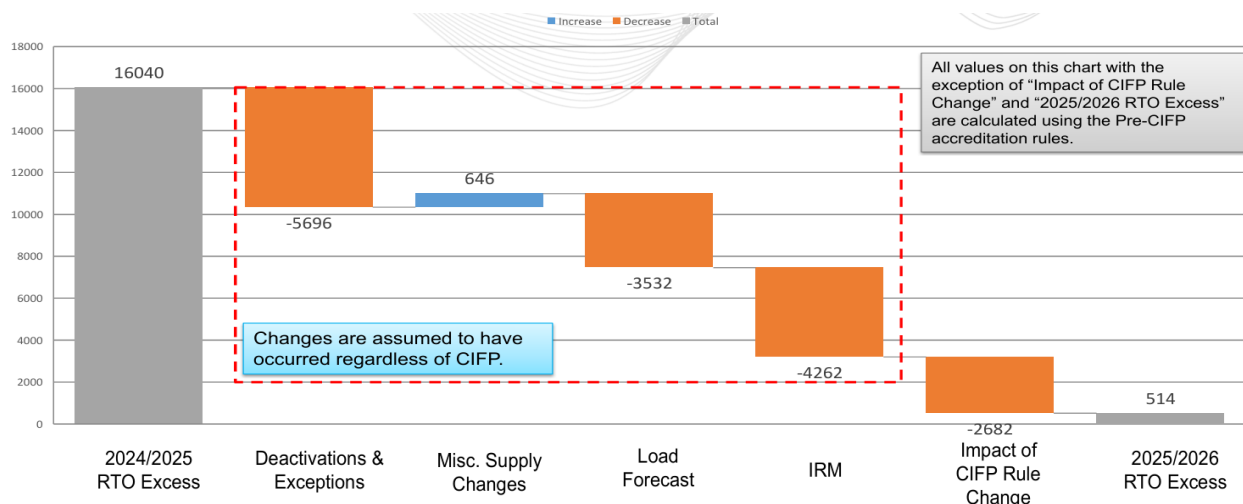
⁶⁴ “Tariff Revisions for Reliability Resource Initiative”, FERC Docket No. ER25-712-000. [20241213-er25-712-000.pdf](https://www.ferc.gov/2024/12/13/er25-712-000.pdf)

⁶⁵ “PJM 2022 Load Forecast Report”, [PJM LOAD FORECAST REPORT](https://www.pjm.com/marketing/forecasting/2022-load-forecast-report.pdf).

⁶⁶ “2025 PJM Preliminary Load Forecast”, [20241209-item-03---2025-preliminary-pjm-load-forecast.ashx](https://www.pjm.com/marketing/forecasting/2025-preliminary-load-forecast.ashx)

the CIFP rule changes, both largely related to the marginal ELCC approach and impact of correlated outage analysis.

Figure 6: 2025/2026 Supply and Demand Shock⁶⁷



In short, the current demand curve parameters were set with the assumption that managing excess supply, mitigating risk in Net CONE estimation and sending a strong entry signal when necessary were the key drivers. The delays in the interconnection queue, tremendous load growth and changes to capacity accreditation and reserve margin requirements have fundamentally changed the market dynamics. As noted by Brattle in the Fifth Quadrennial Review:

"First, we observe that under recent market conditions, the RPM has experienced a sustained long-market condition associated in part with a large turnover of the resource mix. Prices even in the "foot" region of the VRR curve have been high enough to retain existing supply and attract new supply. Reducing administrative Net CONE to a more accurate level based on a CC we expect will prevent the market from continuing to attract additional supply into an already-long market, but this may not sufficiently discipline continued going-forward investments to retain aging supply that could be allowed to retire without posing reliability problems. Put differently, the RPM has attracted large volumes of supply offers beyond what is needed for reliability and across a highly elastic supply stack; under these market conditions a relatively steep demand curve can more effectively "right-size" capacity procurements without introducing large problems with price volatility. A flatter curve is more susceptible to exacerbating current surpluses, particularly if Net CONE would be over-estimated. Our simulation results confirm these same observations (see below)."⁶⁸

The increase in demand uncertainty, in particular, is likely to persist and suggests that in the longer term the PJM capacity demand curve be wider to reduce capacity price volatility for both generators and loads.

⁶⁷ "2025/2026 Base Residual Auction Results", PJM, August 2024. [20240821-item-08---2025-2026-base-residual-auction--presentation.pdf](#)

⁶⁸ "Fifth Review of PJM's Variable Resource Requirement Curve", April 2022, page 16. [Fifth Review of PJM's Variable Resource Requirement Curve for Planning Years Beginning 2026/27](#)

A steep curve exchanges price risk for volumetric risk⁶⁹, and given the magnitude of demand uncertainty even three years from current (as revealed in Figure 5), a generator responding to a strong price signal could easily see prices collapse for several years if load growth is even somewhat lower than forecast.

5.2.3 Price Cap Increase Has Little Expected Impact on Existing Resource Clearing Volumes

The IMM outlined the volumetric impact of a lower price cap in its assessment of the 2025/26 BRA. A price cap of 1.0 times Net CONE was shown to reduce cleared volumes by 253 MW UCAP, with Net CONE set at \$224.50/MW-Day in the analysis (see blue box added to Figure 7).⁷⁰ With the price cap set at 1.5 times Net CONE and 1.75 Net CONE (\$336.75/MW-Day and \$392/MW-Day), 227 MW UCAP and 154 MW UCAP less UCAP cleared, respectively. In effect, the results show about 100 MW UCAP was offered in this price range.

Given that 514 MW that was offered in the 2025/26 BRA did not clear at the Gross CONE price cap actually in place, the inference is that about 770 MW UCAP from existing resources is impacted by the choice of price cap from 1.0 CT Net CONE (\$224/MW-Day) and CCGT Gross CONE of \$700/MW-Day. Price structures from year to year could change given these estimates are from the 2025/26 BRA, but it is a reasonable estimate on the maximum volumetric impact on existing resources of lowering the price cap.

Figure 7: Scenario summary for 2025/2026 RPM Base Residual Auction

Scenario	Scenario Description	Scenario Impact			
		Cleared UCAP (MW)	Change (MW)	Percent Change Scenario to Actual	Actual to Scenario
0	Actual results	135,684.0	NA	NA	NA
35	VRR curve based on 1.00 times net CONE calculated using forward E&AS offset	135,431.4	252.6	0.2%	(0.2%)
36	Scenario 35 and RMR resources	136,996.7	(1,312.7)	(1.0%)	1.0%
37	Scenario 35 and Winter ratings and IRM at 17.8 percent (same as BRA) and RMR resources	142,340.4	(6,656.4)	(4.7%)	4.9%
38	Scenario 35 and all categorically exempt offers, winter ratings and IRM at 17.8 percent (same as BRA) and RMR resources	143,335.4	(7,651.4)	(5.3%)	5.6%

Resource; 1.0 * Net CONE; Forward Net Revenue in VRR curve

5.2.4 Price Cap Increase and Linkage to Gross CONE Risks Transfer of Wealth with Little Potential Reliability Benefit Absent Market Entry

The primary impact of raising the price cap in the capacity market at this time is higher prices with little or no corresponding reliability benefit. This is because the implied cost of achieving incremental reliability would far exceed reasonable estimates of the VOLL.⁷¹ Where market entry is feasible, a higher price cap

⁶⁹ With a flatter curve, the concern is that there is risk of over-procurement, or deferred retirements, because prices do not fall rapidly enough when the market has excess supply.

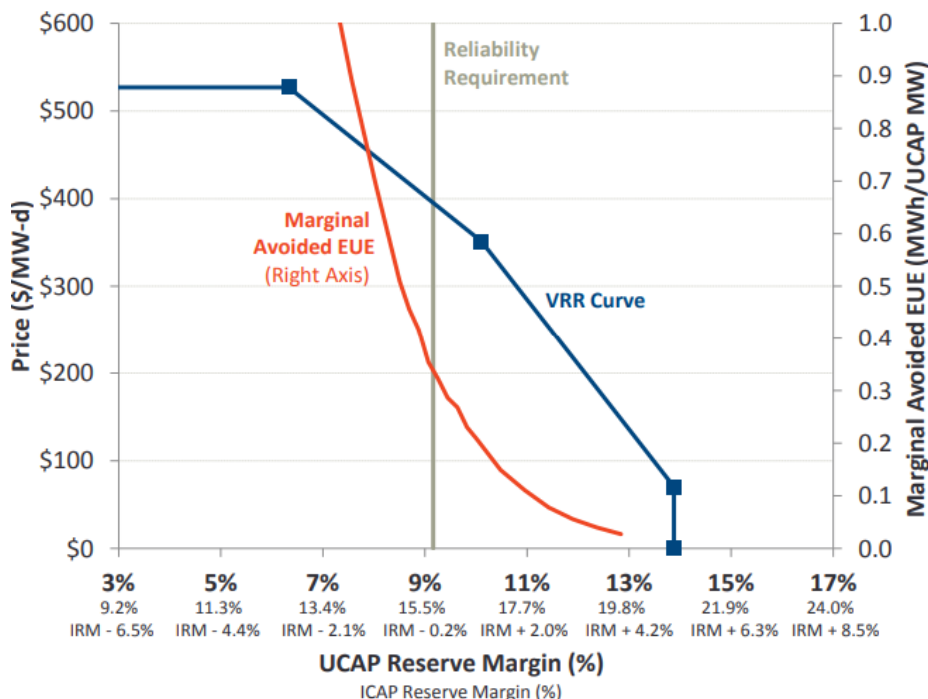
⁷⁰ "Analysis of the 2025/2026 RPM Base Residual Auction Part D," December 6, 2024. [Analysis of the 2025/2026 RPM Base Residual Auction Part D](#), pages 28-29.

⁷¹ VOLL estimates from Executive Summary

serves the function of allowing entry to set the 'true' cost of entry and ensures that the administratively determined Net CONE (or Gross CONE) does not interfere with potential entry.

As shown in Figure 8, the VRR curve (blue line) steeply declines with increasing reserve margin, reflecting how prices drop as capacity supply approaches and exceeds the reliability requirement. At higher reserve margins, the price approaches zero, indicating diminishing marginal reliability benefits.⁷² In contrast, the Marginal Avoided EUE curve (red line) shows the relationship between incremental capacity and avoided EUE.

Figure 8: 2017/2018 RTO VRR Curve Compared to Marginal Avoided EUE



To contextualize the implied cost of reliability, consider the scenario where raising the price cap results in the procurement of all the capacity that did not clear the 2025/26 BRA. For instance, consider the impact if the 2025/26 BRA had used the currently estimated CT Gross CONE of \$550/MW-Day as the price cap rather than the prior estimate of \$452/MW-Day. Just over 500 MW⁷³ UCAP was incrementally available but did not clear, and if we assume it was all priced low enough to now clear we can estimate the approximate minimum clearing price with a higher price cap. If not all the volume cleared because some offers were still above the demand curve, the price impact would be higher and the achieved reliability benefit lower.

We know 135,684 MW of UCAP cleared, so with a higher price cap the most that could have cleared was 136,198 MW UCAP, or the incremental 514 MW of capacity available. We can assume Point B on the price

⁷² "Third Triennial Review of PJM's Variable Resource Requirement Curve," May 15, 2014. https://www.brattle.com/wp-content/uploads/2017/10/7510_third_triennial_review_of_pjms_variable_resource_requirement_curve-4.pdf, page 49.

⁷³ "Tariff Revisions for Reliability Resource Initiative", FERC Docket No. ER25-712-000, [20241213-er25-712-000.pdf](https://www.ferc.gov/dockets/2024/20241213-er25-712-000.pdf), page 15.

curve would still be 0.75 Net CONE, or \$326/MW-Day.⁷⁴ This yields a slope of \$0.062/MW of UCAP between Point A and Point B, so the clearing price if all capacity cleared would be about \$386/MW-Day⁷⁵, as compared to \$269.92/MW-Day actual clearing price for the RTO.⁷⁶ In other words, a higher price cap in the would have procured at most 514 MW incremental volume in the 2025/2026 BRA at a cost of \$117/MW-Day higher prices, increasing total capacity costs by a minimum of \$5.8 billion (40% price increase relative to actual results). The key point is that the price cap has a material impact on market price outcomes when total supply is restricted because it impacts the slope of the demand curve and makes the market more inelastic.

We can estimate from the graph above that at most, 500 MWh of unserved energy would be expected to be 'saved' with the incremental capacity available due to the higher price cap.⁷⁷ Given the minimum cost increase of \$5.8 billion estimated above and the maximum reliability benefit, the implied value of lost load from this improved reliability due to a higher price cap for the 2025/2026 BRA is in the range of \$11.6M per MWh, or well over 200 times any reasonable estimate of VOLL.⁷⁸

In summary, I conclude there is little potential benefit in raising the price cap in the absence of potential new resources. The price cap should not interfere with the proper function of the market, but nor should it risk transfer of wealth with little or no associated benefit. I further note that the steeper slope of the revised demand curve further increases the wealth transfer. The material in Section 5.1.3 highlights that linking the price cap to Gross CONE rather than a multiple of Net CONE dramatically increases prices with identical supply assumptions.

5.3 New Capacity Precluded

Historically, new entry has played a critical role in disciplining the market. This feature is particularly valuable in the forward capacity auction design. Historical data demonstrates that capacity additions have occurred even when prices were below the Net CONE, effectively revealing a lower market derived Net CONE. In general, there has been more new supply offered than cleared in the auction, indicating that new capacity serves as a proxy price cap when the market is functioning as intended.

As seen in Table 6 below (estimated in July 2024 by PJM), wind and solar, particularly solar tracking, represent the largest sources of capacity increases from 2025/26 to 2026/27, with wind growing by 1,052

⁷⁴ This price was increased due to the increase in Gross CONE and assumed the same EAS offset as the actual 2025/26 BRA.

⁷⁵ Calculated as 2,644 MW UCAP cleared in excess of Point A on the demand curve. $2,644 \text{ MW} * \$0.062/\text{MW} = \$164/\text{MW-Day}$ reduction from the price cap. $\$550/\text{MW-Day}$ less $\$164/\text{MW-Day} = \$386/\text{MW-Day}$.

⁷⁶ Even if Point B remained at \$245/MW-Day, per the original auction, the increase solely due to the price cap increase would have been to \$326/MW-Day, based on the same methodology.

⁷⁷ 500 MWh is the maximum because at all points on the marginal EUE curve the impact of 1 MW capacity is less than 1 MWh EUE, so 500 MW UCAP at added when price is below the cap has less than 500 MWh impact on EUE.

⁷⁸ PJM uses \$4,000/MWh VOLL in the energy market to anchor its shortage pricing curves, and most VOLL studies place system VOLL in the \$30,000 to \$50,000/MWh range.

MW and solar tracking growing by 958 MW, collectively accounting for most of the expected increases.⁷⁹ At that time, PJM's expectation was for a similar amount of DR. However, while there is growth in wind and solar, the overall changes in capacity for other resource types remain minimal. Categories such as nuclear, hydro, coal, and storage show either no change or slight decreases, indicating that the expected capacity growth is limited when viewed across the full resource mix. Notably, only one new CCGT unit is expected, but this is more than offset by the retirement of CT units. Furthermore, when considering UCAP, which accounts for the reliability and availability of resources, wind and solar typically contribute lower UCAP values relative to their nameplate capacities due to their intermittent nature. As a result, even with increases in wind and solar, the combined impact on system UCAP is negligible.

Table 6:: Assumed Resource Portfolio Installed Capacity (MW)

Resource Type	2025/26	2026/27
Wind	2,405	3,457
Solar Fixed	1,469	1,228
Solar Tracking	7,504	8,462
Landfill Gas Intermittent	125	125
Hydro Intermittent	528	528
Storage	5,704	5,672
DR	7,814	7,954
Nuclear	32,181	32,181
Coal	36,270	35,809
CCGT	56,960	57,735
CT	12,612	11,115
CT Dual	13,123	12,652
Diesel	333	333
Steam	9,857	9,857
Storage Hydro	1,948	1,948
Other Thermal	2,841	3,048

Within this context, the market has generally attracted new capacity at price well below Net CONE, as shown in Figure 9 and Figure 10. The most recent two auctions have cleared the least new capacity since 2015/16, and the 2026/27 BRA is also expected to attract minimal new capacity as noted in Table 6.

⁷⁹ "Installed Reserve Margin (IRM), Forecast Pool Requirement (FPR), and Effective Load Carrying Capability (ELCC) for 2025/2026 BRA," March 20, 2023. <https://www.pjm.com/-/media/DotCom/committees-groups/committees/mc/2024/20240320/20240320-item-01---irm-fpr-and-elcc-for-25-26-bra---presentation.ashx>, page 5.

"Installed Reserve Margin (IRM), Forecast Pool Requirement (FPR), and Effective Load Carrying Capability (ELCC) for 2025/2026 BRA," July 24, 2024. <https://www.pjm.com/-/media/DotCom/committees-groups/committees/mc/2024/20240724/20240724-item-01---irm-fpr-and-elcc-for-26-27-bra---presentation.ashx>

Figure 9: Base Auction RTO Clearing Price and Net CONE⁸⁰

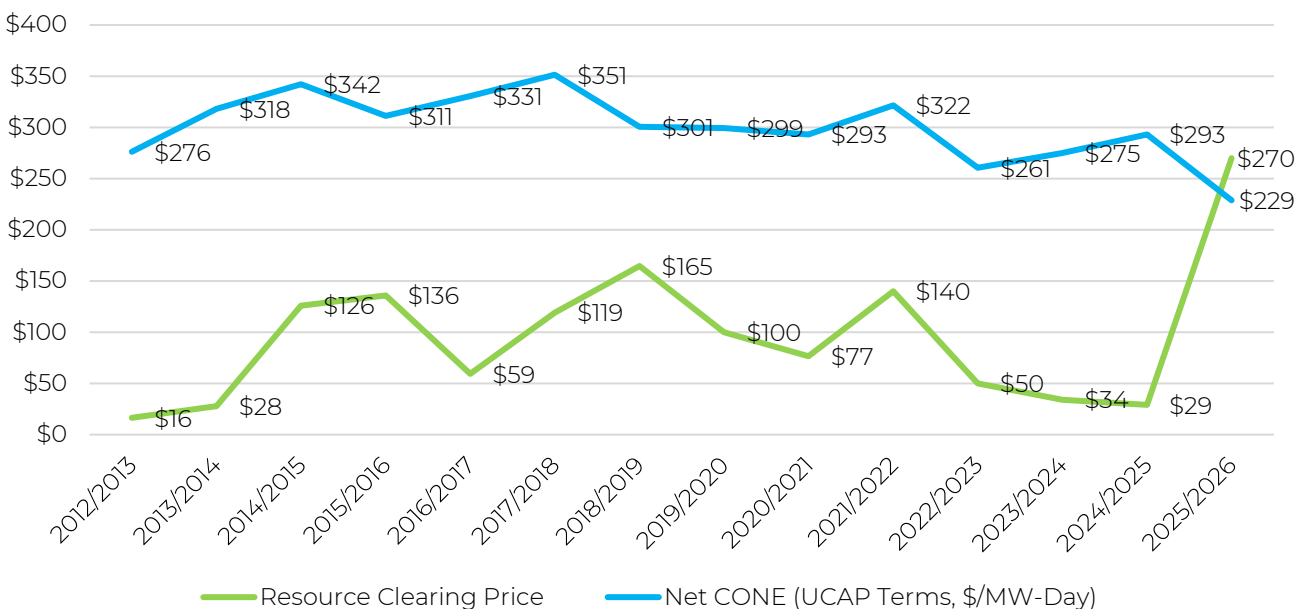
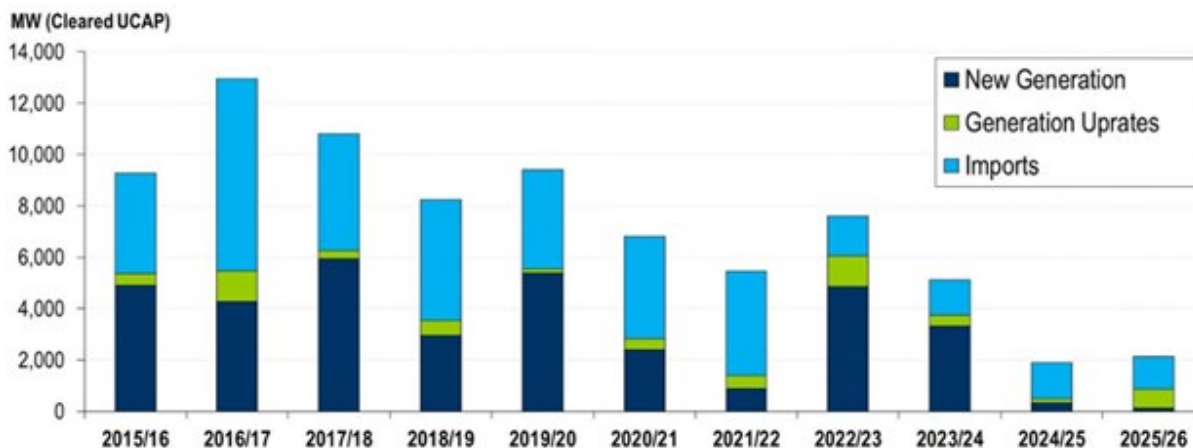


Figure 10: Cleared MW (UCAP) by New Generation/Uprates/Imports by Delivery Year



As shown in Figure 10, which details cleared MWs (UCAP) by new generation, uprates, and imports over delivery years, the last two delivery years exhibit markedly lower new generation additions. For the 2024/25 auction, this outcome aligns with the exceptionally low clearing price, as indicated by the negligible cleared MWs for new generation. However, for the 2025/26 auction, all offered new and uprated generation (864 MW in total) appears to have cleared.

⁸⁰ Data comes from PJM Base Residual Auction Planning Period Parameters and IMM Analysis of Base Residual Auctions, including:

https://www.monitoringanalytics.com/reports/reports/2012/analysis_of_2014_2015_rpm_base_residual_auction_20120409.pdf and <https://www.pjm.com/-/media/DotCom/markets-ops/rpm/rpm-auction-info/2019-2020-rpm-bra-planning-parameters-report.ashx>

Historically, there has been more offered new or uprate capacity than cleared, based on available information. The data in Table 7 is drawn from PJM RPM Base Residual Auction Results Reports. Not all the reports provide new and uprate capacity offered versus cleared, but in general the historical experience shows that incremental new capacity was available beyond cleared capacity that served to discipline the market. Data for 2025/2026 was not available in the PJM reports, but my understanding is that all new offered capacity cleared the market.

Table 7: Offered vs. Cleared (UCAP MW, Total RTO)⁸¹

Auction Year	Offered (UCAP MW)			Cleared (UCAP MW)		
	Uprate	New	Total	Uprate	New	Total
2014/2015	473	1,101	1,574	341	416	757
2017/2018	459	6,128	6,587	340	5,927	6,267
2018/2019	685	3,447	4,133	588	2,954	3,542
2019/2020	213	6,330	6,544	156	5,374	5,529
2020/2021	607	2,537	3,144	435	2,389	2,824
2021/2022	776	322	1,099	508	893	1,401
2022/2023	1,669	7,433	9,102	1,210	4,844	6,054
2023/2024	554	1,722	2,276	405	3,330	3,735

It is extremely unlikely to be the case that more new capacity will be offered to the market than required to reduce prices in the 2026/2027 BRA. Transition Cycle #1 (TC1) is a part of PJM's effort to revise the interconnection process and clear the interconnection queue backlog of projects. The cycle began on January 22, 2024, and the projects are expected to reach agreements by mid-2025. As a result, projects from TC1 are exceedingly unlikely to participate in the 2026/27 BRA given reasonable construction timelines and the risk of being unavailable by June 2026.

PJM anticipates posting the Phase II System Impact Study (SIS) reports on December 20, 2024 for TC1. There are currently 212 active projects in TC1. Table 8 below shows the breakdown of projects by resource type. In UCAP terms, these projects represent 3,000 to 4,000 MW UCAP (depending on specific project parameters such as duration for storage).

Table 8: Active Transition Cycle #1 Projects by Resource Type⁸²

	Number of Projects	Capacity of Projects (MW)
Natural Gas	2	704
Offshore Wind	3	757
Solar	125	8,046
Solar, Storage	28	1,339
Storage	38	2,769
Wind	15	450
Wind, Solar	1	51

⁸¹ Data comes from PJM RPM Base Residual Auction Results Reports" For example, <https://www.pjm.com/-/media/DotCom/markets-ops/rpm/rpm-auction-info/2023-2024/2023-2024-base-residual-auction-report.ashx>

⁸² "Cycle Service Request Status," <https://www.pjm.com/planning/m/cycle-service-request-status>

5.3.1 *Limited Likelihood Capacity Returning Attributable to Price Cap Increase*

A potential source of 'new' capacity in the 2026/2027 BRA is capacity that has been approved for deactivation but has not yet actually deactivated. There are currently 33 generation deactivation requests in PJM, all of which are powered by fossil fuels (diesel, natural gas, oil, coal, and methane). 31 of the 33 generators have requested a deactivation date between May 1, 2025 and December 31, 2027, with a total capacity of 4,582 MW.⁸³

Elgin Energy Center (483 MW ICAP) has canceled its prior deactivation plans as of September 2024⁸⁴ and would likely be incremental capacity relative to prior PJM assumptions for 2026/2027 BRA shown in Table 6, which was developed in July 2024. No other plant has withdrawn deactivation plans since May 2024. About 3,300 MW ICAP (approximately 2,500 MW UCAP) is currently scheduled to be deactivated prior to the 2026/2027 BRA commitment period. It is possible that, in response to high price signals, generators that have requested deactivations may withdraw their request and choose to continue operating beyond their currently requested date. The example shown in Figure 11 outlines both the rationale and the risk of the higher price cap with respect to returning units.

The optimistic supply curve is almost impossible to rationalize as a possible outcome. If a generation owner has true costs of \$200/MW-Day for a 100 MW unit, the price cap increase theoretically allows that unit to offer at that cost if it cancels its deactivation notice. If the unit clears, the market price falls from \$400/MW-Day to \$390/MW-Day, as an example. Assuming a portfolio cost for the owner of \$30/MW-Day and a 2,000 MW portfolio prior to reactivation, there is a negative incentive to re-enter the auction once the deactivation is approved.⁸⁵ A small portfolio and/or relatively low costs for the reactivating unit are the only realistic way that the price cap would incent returning capacity. In this scenario, a lower price cap is very unlikely to be a binding constraint on participation in any event.

A lower price cap and resulting flatter demand curve slope has the potential to improve the incentive for returning units with costs in the same \$200/MW-Day range, as an example. Using the same approach as above, the price would fall from \$280/MW-Day (as an example) to \$277/MW-Day if the unit offered its true costs to reactivate. The portfolio value would increase from \$500,000 to almost \$502,000 per day, reflecting an incentive to return the capacity to the market for the exact same portfolio. In other words, the higher price cap may actually be detrimental to the reactivation incentive due to the steep slope in the demand curve.

It is further important to note that if a capacity seller's true costs are very high, such as \$350/MW-Day, the likelihood of the higher price cap incenting reactivation, or entry in general, is further reduced because the incremental value to the portfolio is minimal and the impact on the clearing price for the rest of the portfolio is unchanged. In other words, the benefit of reactivation when true costs are high is likely to be outweighed by price reductions induced by the inelastic capacity demand curve. For an uprate at an existing project, the incentives are very similar: the option to execute an uprate is generally available in the future, and if the uprate reduces the near-term value of the portfolio due to the steep decline in prices with incremental capacity, the incentive to execute the uprate is harmed by a higher price cap in the current environment.

⁸³ [PJM - Generation Deactivations](#), accessed December 17, 2024

⁸⁴ [elgin-deactivation-withdrawal.ashx](#)

⁸⁵ Profit on the 2,000 MW portfolio is \$400/MW-Day * 2,000 - \$30/MW-Day * 2,000 = \$740,000. Profit on the 1,100 MW portfolio is \$390/MW-Day * 2,100 - \$30/MW-Day * 2,000 - \$200/MW-Day * 100 = \$739,000.

I find that the incentive to return to the market across a range of portfolio sizes and cost structures is mixed at best. The impact of the higher price cap is certainly total higher revenues but the relative incentive to return or not return to the market is not driven by the price cap. In other words, raising the price cap and linking it to Gross CONE is not an effective incentive to return capacity to the market and as a result largely results in wealth transfer with limited expectation of incremental reliability.

Figure 11: 2026/27 BRA Potential Re-Entry Demand Curve Examples

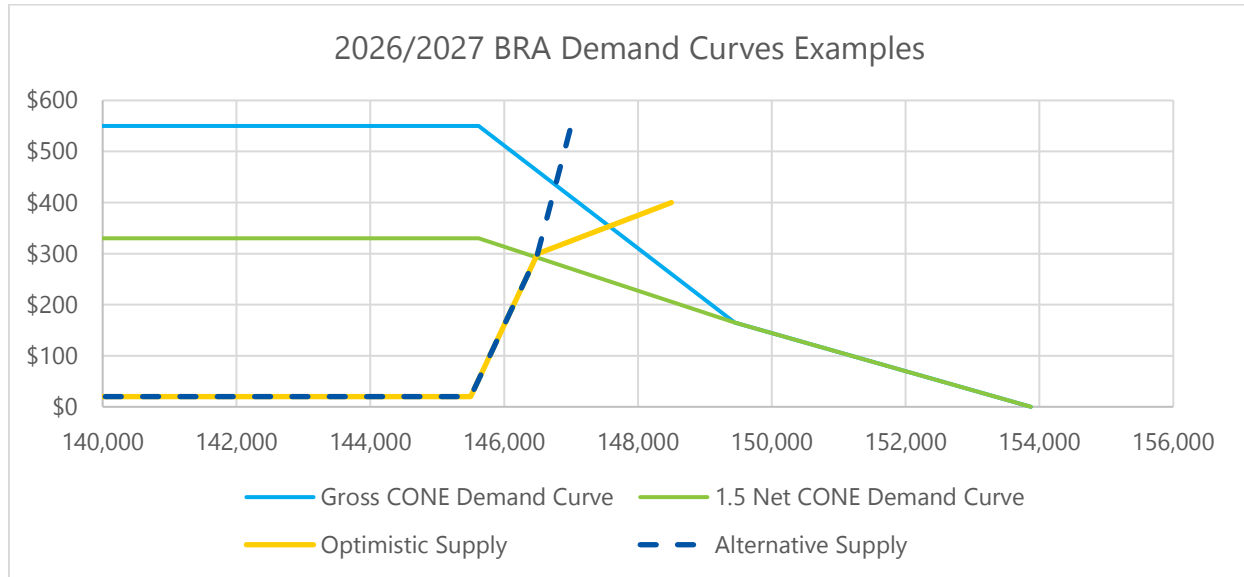


Table 9: Requested Deactivations⁸⁶

Unit Name	Capacity (MW)	Fuel Type	Owner Request Letter Date	Projected Deactivation Date
Manchester 1 LF	4	Methane	11/14/2024	5/1/2025
Perryman 6 Unit 1	54.9	Natural Gas	7/20/2024	5/31/2025
Morris Road 1 D	2	Oil	7/17/2024	5/31/2025
Eddystone Unit 3	380	Oil	12/1/2023	5/31/2025
Eddystone Unit 4	380	Oil	12/1/2023	5/31/2025
Vienna 8	153	Oil	3/24/2023	6/1/2025
Vienna CT 10	14.3	Oil	3/24/2023	6/1/2025
Wagner CT 1	13	Diesel	10/16/2023	6/1/2025
Elwood CT 1	150	Natural Gas	5/29/2024	6/1/2025
Elwood CT 2	150	Natural Gas	5/29/2024	6/1/2025
Elwood CT 3	150	Natural Gas	5/29/2024	6/1/2025
Elwood CT 4	150	Natural Gas	5/29/2024	6/1/2025
Elwood CT 5	150	Natural Gas	5/29/2024	6/1/2025
Elwood CT 6	150	Natural Gas	5/29/2024	6/1/2025
Elwood CT 7	150	Natural Gas	5/29/2024	6/1/2025
Elwood CT 8	150	Natural Gas	5/29/2024	6/1/2025
Elwood CT 9	150	Natural Gas	5/29/2024	6/1/2025
Wagner 1	126	Natural Gas	10/16/2023	6/1/2025
Fisk CT 31	49.1	Oil	7/22/2024	6/1/2026
Fisk CT 32	50.8	Oil	7/22/2024	6/1/2026
Fisk CT 33	47.9	Oil	7/22/2024	6/1/2026
Fisk CT 34	22.9	Oil	7/22/2024	6/1/2026
Indian River CT10	16.1	Oil	7/22/2024	6/1/2026
Waukegan CT 31	52.5	Oil	7/22/2024	6/1/2026
Waukegan CT 32	48.9	Oil	7/22/2024	6/1/2026
Morgantown CT 3	54	Oil	7/19/2024	6/1/2026
Morgantown CT 4	54	Oil	7/19/2024	6/1/2026
Kenilworth	15	Natural Gas	9/13/2024	6/1/2026
Brandon Shores 1	638.9	Coal	4/6/2023	12/31/2028
Brandon Shores 2	642.7	Coal	4/6/2023	12/31/2028
Indian River 4	411.9	Coal	6/29/2021	12/31/2026
Wagner 3	305	Oil	10/16/2023	12/31/2028
Wagner 4	397	Oil	10/16/2023	12/31/2028

Similarly, mothballed units may choose to return to operating before their expected date and participate in upcoming auctions. The total capacity of mothballed units and potentially deferred deactivations is small, as shown in Table 10. It is possible 220 MW of ICAP from the Sayreville could return to service but

⁸⁶ "Generation Deactivations," <https://www.pjm.com/planning/service-requests/gen-deactivations>

would likely need to be repowered or otherwise modified due to New Jersey carbon dioxide emission limits and are therefore less likely to be available earlier than the noted date.⁸⁷

Table 10:: Current Mothballed Units⁸⁸

Unit Name	Capacity (MW)	Fuel Type	Mothball Expected Return Date
Cape May County Municipal LF2	0.6	Methane	12/1/2024
Sayreville 1	57.1	Combustion Turbine (gas and oil)	6/1/2027
Sayreville 2	56.7	Combustion Turbine (gas and oil)	6/1/2027
Sayreville 3	54.6	Combustion Turbine (gas and oil)	6/1/2027
Sayreville 4	48.5	Combustion Turbine (gas and oil)	6/1/2027

In summary, an increase in the price cap is extremely unlikely to incent new capacity due to compressed auction timelines and the lack of UCAP exiting the queue in the near-term. The increase in the price cap is unlikely to reverse deactivation decisions because the steepness of the demand curve impacts existing portfolios. There is little if any capacity likely to return from a mothball outage in the short term. In summary, there is little evidence or reasonable expectation that a price cap of \$550/MW-Day will increase available supply.

Given that entry is expected to be largely precluded for the next several years, there is no expected reliability benefit from a higher price cap. The risk that the price cap understates the cost of entry and thereby restricts supply is a non-factor because that entry cannot occur in any event. As a result, the market will very likely settle on the upper portion of the demand curve, so the primary outcome from raising the price cap is higher prices. In effect, raising the price cap absent the possibility of entry further exposes customers to the administrative risk associated with an estimated Gross CONE set in 2022 because the true cost of sufficient entry to meet demand cannot be determined by the market.

⁸⁷ [sayreville-deactivation-letter.ashx](#)

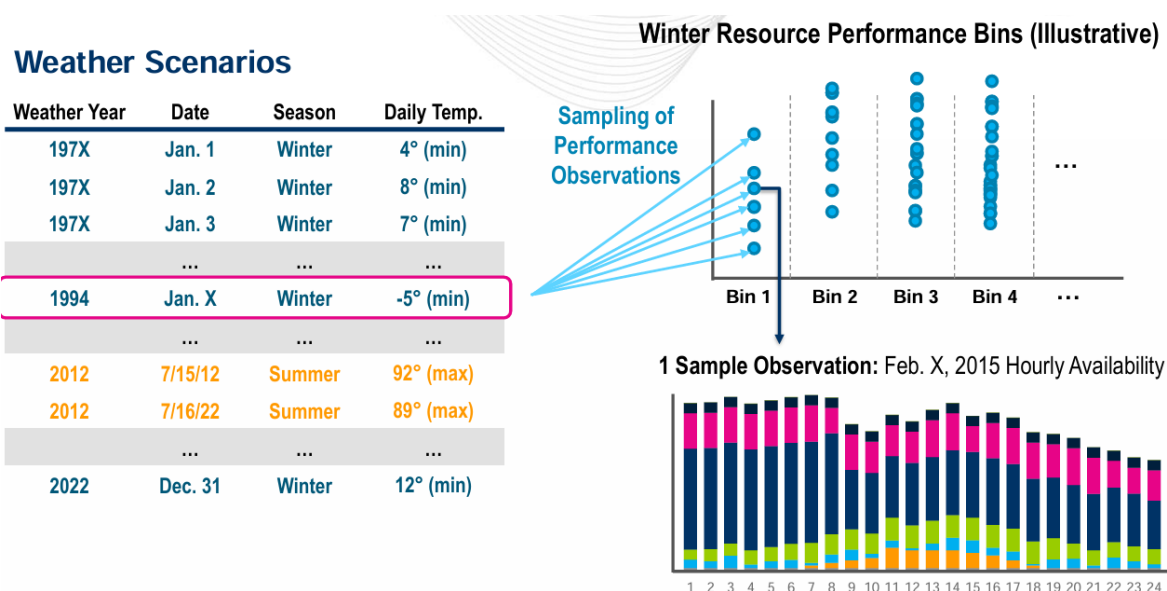
⁸⁸ "Generation Deactivations," <https://www.pjm.com/planning/service-requests/gen-deactivations>

5.4 Reliability Requirement is Overstated by PJM Methodology

PJM implemented its Marginal ELCC accreditation process for capacity and establishing the reliability requirement for the market RRS.⁸⁹ PJM's methodology for estimating the reliability requirement is highlighted in the graphic below. The methodology is reasonable and provides an intuitive result that the primary driver of a shortfall in available supply relative to demand is a function of extreme weather that increases load and simultaneously creates correlated outages amongst the generation fleet. For example, extreme cold weather both increases load and raises forced outage rates at thermal generators.

The approach estimates resource adequacy through a binned approach to supply availability. Resource availability is drawn from a bin of historical availability consistent with the weather draw under-pinning the given simulation draw.⁹⁰

Figure 12: PJM ELCC Methodology Schematic⁹¹



Our concern is that in its approach, PJM has implicitly assumed that none of the actions it took in response to the Polar Vortex are expected to improve fleet performance. 2014 availability data is used in the

⁸⁹ Need a footnote to point at this study and its background.

⁹⁰ "ELCC Education," February 16, 2024. <https://www.pjm.com/-/media/DotCom/committees-groups/committees/pc/2024/20240216-special/elcc-education.pdf>, page 30.

⁹¹ "ELCC Education," February 16, 2024. <https://www.pjm.com/-/media/DotCom/committees-groups/committees/pc/2024/20240216-special/elcc-education.pdf>, page 13.

simulation ‘as is’ and the data from 2012 through 2014 have an extremely outsized impact on the model results.^{92,93}

Figure 13 - Key Historical Load and Performance Days Based on LOLH contribution

Date	Weight	Performance Day	LOLH Share
7 Jan 2014	44.1%	1/7/2014	37.5%
24 Dec 2022	10.8%	12/24/2022	13.3%
8 Jan 2014	4.5%	1/8/2014	9.1%
28 Jan 2014	3.0%	1/22/2014	3.3%
22 Jan 2014	2.6%	7/18/2012	2.0%
26 Dec 2022	1.8%	12/25/2022	1.4%
18 Jul 2012	1.7%	12/23/2022	1.4%
25 Dec 2022	1.2%	1/31/2019	1.4%
17 Jul 2012	1.1%	12/26/2022	1.3%
29 Jun 2012	0.8%	7/17/2012	1.3%
31 Jan 2019	0.7%	6/29/2012	1.3%
23 Dec 2022	0.5%	1/28/2014	0.8%
25 Jul 2016	0.4%	7/25/2016	0.5%
29 Jun 2021	0.4%	7/26/2016	0.5%
18 Jul 2013	0.4%	1/23/2013	0.4%
19 Jul 2012	0.4%	6/29/2021	0.4%
25 Aug 2020	0.4%	8/25/2021	0.3%
23 Jan 2013	0.3%	8/24/2020	0.3%
17 Jul 2013	0.3%	7/18/2013	0.3%
7 Jul 2012	0.3%	7/17/2013	0.3%
...	...	...	...

About 77% of the LOLH is concentrated in 20 performance days:

- 10 in the winter
- 10 in the summer

Note: The tables represent relative performance risk in the 2025/26 BRA model (left hand table) and the 2026/27 BRA model (right hand table).

The tables shown in Figure 13 above represent the generator availability ‘draw’ that corresponds to the “relative frequency at which different historical days are represented among all hours in which loss of load is observed in the risk simulation model.”^{94,95} The tables represent about 75% of all outage risk identified, i.e., the sum of the presented values is about 75%, indicating the tables continue with small amounts of risk for a large number of additional days. However, of the data shown, 75% to 80% of the outage risk occurs prior to implementation of the Capacity Performance Framework.^{96,97} In fact, 2014 generator performance

⁹² PJM Manual 20A: states that forced outage rates are modeled using data starting June 1, 2012. “PJM Manual 20A,” June 27, 2024. <https://www.pjm.com/-/media/DotCom/documents/manuals/m20a.ashx>, page 12.

⁹³ “Installed Reserve Margin (IRM), Forecast Pool Requirement (FPR), and Effective Load Carrying Capability (ELCC) for 2026/2027 BRA,” July 24, 2024. <https://www.pjm.com/-/media/DotCom/committees-groups/committees/mrc/2024/20240724/20240724-item-05---irm-fpr-and-elcc-for-26-27-bra---presentation.pdf>, page 14-15.

⁹⁴ “ELCC Education,” February 16, 2024. <https://www.pjm.com/-/media/DotCom/committees-groups/committees/pc/2024/20240216-special/elcc-education.pdf>, page 30.

⁹⁵ “Installed Reserve Margin (IRM), Forecast Pool Requirement (FPR), and Effective Load Carrying Capability (ELCC) for 2026/2027 BRA,” July 24, 2024. <https://www.pjm.com/-/media/DotCom/committees-groups/committees/mrc/2024/20240724/20240724-item-05---irm-fpr-and-elcc-for-26-27-bra---presentation.pdf>, page 14-15.

⁹⁶ This is calculated based on the start of the Framework, June 2018. If the cutoff is June 2020, when the Framework was fully in place, the proportion of risk pre-Framework increases further.

⁹⁷ The 2020/2021 BRA is the first where PJM has procured 100% Capacity Performance (“CP”) Resources. CP Resources must be capable of sustained, predictable operation, and are expected to be available and capable of providing energy

creates about 51% to 54% of the total risk in the model, and 60% or more of total risk is 2014 or earlier in general. In our opinion, it is unreasonable to conclude that generator performance has not broadly improved during extreme weather since the 2014 Polar Vortex based on the data and simulation results. The relatively better performance of capacity during Winter Storm Elliot (December 23 to 25, 2022 in Figure 13) further supports the finding.

In our estimation, the change in methodology to the ELCC approach now used is reasonable and consistent with the capacity accreditation approach. However, the actual implementation of the revised approach overstates the reserve requirement because it completely ignores improvements in system performance associated with changes to the market framework and operational practices. PJM has in fact noted at various times that it believes the Capacity Performance framework is effective.⁹⁸ For example, Mike Bryson, Vice President of Operations at PJM, stated that “the key to the performance during the cold weather was the transmission and generation operators, who have made reliability under stressed conditions a priority,” and that “preliminary results suggest those efforts are paying off.”⁹⁹

This methodology is inappropriate because it fails to recognize a clear trend break in the generator availability data. The concern is strengthened by the fact that the break was an expected outcome of an intervention initiated by PJM that PJM recognizes as having benefit.

The lack of winter capacity ratings in the model is a secondary concern. The IMM noted in its evaluation of the 2025/26 BRA that the reliability requirement would be lower if winter capacity ratings were used for thermal units.¹⁰⁰

PJM disputes the IMM’s conclusion, stating,

“Secondly, the IMM claims, without supporting evidence, that ‘the installed reserve margin (IRM) and reliability requirement would be lower if the higher generation capacity of these resources during the winter months were recognized.’ This assertion is not accurate and oversimplifies the relationship between resource capacity and reliability requirements. An increase in a resource’s ELCC or Unforced Capacity (UCAP) is fundamentally a supply-side impact. The secondary impact on the demand side (including reserve margin) depends on whether the assumed supply changes tend to shift risk toward lower or higher load hours relative to the base case. To make a conclusive statement regarding how the IRM would change if thermal resources had additional

and reserves when needed throughout the entire Delivery Year. Also, the 2020/2021 BRA was conducted under the provisions of PJM’s Enhanced Aggregation filing (Docket ER17-367-000 & 001) which was accepted by FERC on March 21, 2017.

⁹⁸ “How PJM Remained Reliable During Record Cold,” February 14, 2019. <https://insidelines.pjm.com/how-pjm-remained-reliable-during-record-cold/>

⁹⁹ “Report: System Performed Under Stressed Conditions,” February 4, 2019. <https://insidelines.pjm.com/report-system-performed-under-stressed-conditions/>

¹⁰⁰ Analysis of the 2025/2026 RPM Base Residual Auction Part A,” September 20, 2024. https://www.monitoringanalytics.com/reports/Reports/2024/IMM_Analysis_of_the_20252026_RPM_Base_Residual_Auction_Part_A_20240920.pdf, page 6.

capability requires more analysis and would depend on the outage patterns of the resources to which the additional capability was granted.”¹⁰¹

PJM’s statement is inconsistent with the logical implications of their modeling approach. If incremental capacity is added to the model through an increase in winter availability at already existing assets, it will unavoidably improve the ability of the existing fleets to serve load. In effect, winter capacity is added to resources that are currently capped at an artificially low level based on their summer rating. This allows the existing fleet to serve more load to the extent the incremental capacity reduces outage risk. Given that outage risk is weighted to winter months, and incremental capacity is added to winter months, the only possible result of allowing winter capacity ratings to be used is a reduction in the IRM requirement. An increase in the ELCC of natural gas generation will be an output of the use of winter ratings, but the primary market impact will be a reduction in the IRM and therefore a lower reliability requirement. There are many complexities and interactions that will drive the size of the reduced reliability requirement, but a functional model could not result in an increase to the IRM because of recognizing more capacity from the existing fleet, regardless of the availability and outage patterns of that increased capacity.¹⁰²

In summary, PJM’s approach in its revised RRS approach over-states the required capacity reserve margin by ignoring fleet performance improvements that PJM itself has implemented and supported as effective. PJM has also taken conservative assumptions with respect to the winter capacity of thermal resources. This serve to inflate capacity and volumes because the demand curve is right-shifted.

5.4.1 *Estimate of the Magnitude of the Excess Reserve Requirement*

It is challenging to accurately estimate the excess reserve requirement in a manner directly comparable to the PJM model. Absent sensitivity analysis from PJM, an independent study will be subject to numerous assumptions and methodological choices that may differ from PJM. The estimate presented here is indicative based on professional experience with various simulation models combined with the publicly available data noted in this report.

The assessment is based on observation that about 80% of the risk occurs from availability data prior to 2018, as highlighted in Section 5.2. If 2018 onwards is used as the dataset for performance, with the given fleet we’d expect resource adequacy events roughly 40% as frequently as indicated from the full data set. In essence, the model would show 20% as many outage events at the target IRM in roughly half the amount of total sampled time, so the relative frequency of an event would be roughly 40% by changing the sample period.¹⁰³ PJM’s approach would then find that the IRM could be lowered with the given asset mix until the target reliability was again achieved. This yields an initial estimate that PJM is in fact targeting

¹⁰¹ “PJM Response to Independent Market Monitor Report on 2025/2026 Base Residual Auction,” October 11, 2024. <https://www.pjm.com/-/media/DotCom/library/reports-notice/reliability-pricing-model/20241011-response-to-imm-25-26-bra-report.pdf>, page 6.

¹⁰² If available capacity is added to an existing asset in any hour, without reducing available capacity in another hour, the incremental capacity can at worst have no impact on the ability to serve load. If the incremental availability intersects with any modeled hours with unserved energy, the reserve requirement will fall.

¹⁰³ If the data set was selectively set as starting in 2015 to reflect that some actions were implemented prior to the Capacity Performance Framework, the relative risk ratio would be further reduced because it does not appear 2015 through 2017 performance data caused material issues, as seen from the table in section 5.4.

0.04 LOLE rather than the 0.1 LOLE target through the choice of historical period, i.e. relative risk with the relevant sample is 40% of the risk seen in the longer sample.

Using winter capacity rather than summer capacity would serve to further improve the estimated ability of the current fleet to meet load. The combined impact of the two changes is very unlikely to be directly additive because the largest historical driver of risk was poor fleet performance during the 2014 Polar Vortex, so using more recent performance data that reflects current experience will reduce the importance of winter capacity.

One further source of information is from Brattle's capacity assessment of PJM's market for the Third Triennial Review.¹⁰⁴ The PJM system at target reliability has a Loss of Load Expectation (LOLE) of 0.1 events per year, which is the reliability target used by PJM to establish its IRM. As outlined, our view is that implementing winter capacity ratings and using more recent outage data would reduce LOLE to below 0.04 with the same capacity mix used to estimate the 0.1 LOLE with the overly conservative assumptions.¹⁰⁵

In my opinion, based on the information available, a realistic impact of the proposed changes would decrease the 2026/27 IRM by 1.5 to 2.5 percentage points, i.e., properly estimated the IRM would range from 16.1% to 17.1%. This is informed by Figure 14 (shown below) from the Brattle Group report "Fourth Review of PJM's Variable Resource Requirement" that shows a 1% excess reserve margin over the target where the LOLE is 0.06 rather than 0.1.¹⁰⁶ The continuously declining marginal reliability impact of excess capacity further informs this estimate.

Figure 14: Reliability at VRR Curve Quantity Points and Backstop Trigger

Quantity Point	LOLE (Ev/Yr)	Reliability Index (1-in-X)
Point "a" at IRM - 3%	0.42	1-in-2.4
Backstop Trigger at IRM - 1%	0.18	1-in-5.6
Reliability Requirement at IRM	0.10	1-in-10.0
Point "b" at IRM + 1%	0.06	1-in-17.9

PJM should re-estimate the IRM with the updated assumptions, but I note my high-level estimate falls within a reasonable range between the current PJM estimate of 18.6% required IRM and the 14.5% IRM to 16.6% IRM range estimated with the prior methodology in recent years. In my opinion, there is a reasonable expectation that the correlated outage risk seen during extreme weather events yields a larger reserve requirement than the approach with purely EFORD, but PJM's approach is overly conservative and does not consider performance improvements and winter capacity ratings.

¹⁰⁴"Third Triennial Review of PJM's Variable Resource Requirement Curve," May 15, 2014. https://www.brattle.com/wp-content/uploads/2017/10/7510_third_triennial_review_of_pjms_variable_resource_requirement_curve-4.pdf

¹⁰⁵ In fact, the 0.04 estimate is purely from changing the sample period to 2018 onwards without considering the impact of using winter capacity ratings.

¹⁰⁶ "Fourth Review of PJM's Variable Resource Requirement Curve." April 19, 2018. [20180425-pjm-2018-variable-resource-requirement-curve-study.pdf](https://www.brattle.com/wp-content/uploads/2018/04/20180425-pjm-2018-variable-resource-requirement-curve-study.pdf), page 57.

5.4.2 *Impact of Excess Reserve Requirement*

The impact of over-stating the reserve margin requirement is a rightward shift in the demand curve. If the estimated IRM from the RRS using 2018 onwards data and winter capacity ratings is 16.6% rather than the most recent estimate of 18.6%, the solved load in the model would increase to 165,134 MW, or roughly a 5,000 MW margin over the estimated peak load (approximately 4,000 MW in UCAP terms). This is very different from the finding in Section 5.1.3 that the market with current parameters is expected to roughly have sufficient capacity to meet the target reserve margin with very little excess available.

5.5 Net CONE is Over-Stated on UCAP Basis

PJM inaccurately measures capacity performance and uses a flawed accreditation process, particularly with respect to new capacity, by using class average performance and ignoring the impact of increased winter capacity. These issues undervalue the reliability of new capacity and decrease its expected UCAP. The aggregate impact of these choices inflates Net CONE values through inaccurate UCAP calculations for new assets.

Of note, PJM has established an Effective Load Carrying Capability Senior Task Force (ELCCSTF) that “will examine capacity market incentives for current and new assets under the marginal ELCC accreditation methodology and will investigate enhancements in the ELCC design to align incentives with long-term system needs. Consideration will be given to uncertainty about what investors can do to improve unit resource accreditation or efficiently invest in resources that will improve overall resource adequacy. The ELCCSTF will also examine ELCC data and analytical transparency. The ELCCSTF will report to the Markets and Reliability Committee (MRC).”¹⁰⁷

As noted in the ELCC Accreditation Methodology Issue Charge within the ELCCSTF, the current methodology dulls the incentive for investors to make investment choices that improve the ELCC of new or existing capacity.¹⁰⁸

As discussed in the prior section, another issue with the current methodology is that generator performance is generally expected to improve due to the Capacity Performance program. Capacity Performance program incentivized generators to invest in resiliency measures, therefore, PJM should expect that existing unit performance has improved. However, PJM accredits capacity based on forced outage, planned outage, and resource performance data that stretches back to 2012, six years before the capacity performance program was fully implemented.¹⁰⁹ PJM either does not believe that the penalties incent availability at critical times or understates the resilience improvements from thermal generation units as a result of the program. If the latter is the case, then the program increases capacity costs without serving a purpose. If it does provide incremental reliability benefits, these improvements should be captured in resource accreditation. This would occur naturally from model outputs if the sample period in

¹⁰⁷ “Effective Load Carrying Capability Senior Task Force.” <https://www.pjm.com/committees-and-groups/task-forces/elccstf>

¹⁰⁸ “Capacity Market Enhancements – ELCC Accreditation Methodology.” <https://www.pjm.com/-/media/DotCom/committees-groups/task-forces/elccstf/postings/elcc-capacity-accreditation-methodology-issue-charge.pdf>

¹⁰⁹ “ELCC Education,” February 16, 2024. <https://www.pjm.com/-/media/DotCom/committees-groups/committees/pc/2024/20240216-special/elcc-education.pdf>, page 4.

the RRS study was adjusted to 2018 onwards as noted in Section 5.1 because system wide and class level UCAP is an output of that process.

Additionally, the resource accreditation design, by tying new entrants to class ELCCs from all resources in the class, undervalues new resource performance. PJM explains that, in a marginal ELCC accreditation framework, resources are accredited based on their marginal contribution to system resource adequacy across simulated weather and availability scenarios given the anticipated resource mix. PJM states that the marginal ELCC framework exclusively considers the output of resources in hours of system risk identified after adding the last resource to the expected system portfolio, and therefore it better identifies which resource types will provide more reliability benefit given the expected system resource mix. PJM states that a marginal ELCC framework can develop an economically efficient signal to the market for entry and exit because it sends investment signals that are consistent with the marginal reliability benefit of a resource. PJM explains that these signals result in strong incentives to invest in resources that directly improve resource adequacy and steer investors away from resources that are relatively more costly when considering the incremental reliability they provide.¹¹⁰

However, PJM's approach is problematic because it does not drive reliability improvements in practice. The same class-based forced outage, de-rate, and planned outage is applied to new thermal resources, regardless of their actual expected performance based on observable characteristics.¹¹¹ Since new resources are accredited based on class, there is a muted or limited incentive to invest in greater than class average availability.¹¹² Even if developers invest in reliability, the class-based accreditation diminishes the true value of entrants and over-states Net CONE as a result. The change in class ELCC ratings from 2025/26 to 2026/27 shown in Table 11 highlights this issue for natural gas CT units.¹¹³

¹¹⁰ ER24-99-000, "Order Accepting Tariff Revision Subject to Condition." <https://www.pjm.com/pjmfiles/directory/etariff/FercOrders/7145/20240130-er24-99-000.pdf>, page 11.

¹¹¹ "ELCC Education," February 16, 2024. <https://www.pjm.com/-/media/DotCom/committees-groups/committees/pc/2024/20240216-special/elcc-education.pdf>, page 11.

¹¹² The incentive is limited to a reduction penalty risk and potential bonus payments under the Performance Framework. The number of Performance Intervals is extremely variable year to year, so these values are highly volatile.

¹¹³ "Installed Reserve Margin (IRM), Forecast Pool Requirement (FPR), and Effective Load Carrying Capability (ELCC) for 2026/2027 BRA," July 24, 2024. <https://www.pjm.com/-/media/DotCom/committees-groups/committees/mc/2024/20240724/20240724-item-01---irm-fpr-and-elcc-for-26-27-bra---presentation.ashx>, page 6.

Table 11: 2026/2027 Final ELCC Class Ratings Compared to 2025/2026 Ratings

ELCC Class	2026/27 Rating	2025/26 Rating	Change (%)
Onshore Wind	34%	35%	-1
Offshore Wind	61%	60%	+1
Solar Fixed Panel	8%	9%	-1
Solar Tracking Panel	13%	14%	-1
Landfill Gas Intermittent	54%	54%	0
Hydro Intermittent	38%	37%	+1
4-hr Storage	57%	59%	-2
6-hr Storage	65%	67%	-2
8-hr Storage	68%	68%	0
10-hr Storage	78%	78%	0
DR	74%	76%	-2
Nuclear	95%	95%	0
Coal	84%	84%	0
Gas CC	78%	79%	-1
Gas CT	68%	62%	+6
Gas CT Dual Fuel	79%	79%	0
Diesel	91%	92%	-1
Steam	74%	75%	-1

Gas CT performance improved due to retirement of several older units in that category. The relative incentive to invest in dual fuel capability materially decreased year over year due to the retirement of older units in the gas CT category. This highlights both the concern around poor investment signals but also the risk that the UCAP of the default unit used in setting the Gross CONE and Net CONE is understated, thereby inflating the cost of new capacity. This trend is also seen in PJM's longer-term projections of ELCC values.

The preliminary ELCC class rating from 2026/2027 through 2034/2035, displayed below indicate a general increase in thermal class ELCC.¹¹⁴ This highlights the fundamental concern with using class averages that change as older, less reliable generation retires. Gas CT generation UCAP increases from 61% to 78% over the 10-year period, approaching near parity with Dual Fuel CT generation by 2034/35. The PJM approach yields a very misleading investment signal that performance of CTs improves over time and the relative benefit of dual fuel CTs erodes over time, as seen when comparing Dual Fuel CT to Gas CT in Table 12.

¹¹⁴ "Preliminary ELCC Class Ratings for period Delivery Year 2026/27 – Delivery Year 2034/35." <https://www.pjm.com/-/media/DotCom/planning/res-adeq/elcc/preliminary-elcc-class-ratings-for-period-2026-2027-through-2034-2035.ashx>

Table 12: Preliminary ELCC Class Ratings for period Delivery Year 2026/27 – Delivery Year 2034/35

ELCC Class	2026/ 27	2027/ 28	2028/ 29	2029/ 30	2030/ 31	2031/ 32	2032/ 33	2033/ 34	2034/ 35
Onshore Wind	35%	33%	28%	25%	23%	21%	19%	17%	15%
Offshore Wind	61%	56%	47%	44%	38%	37%	33%	27%	20%
Fixed-Tilt Solar	7%	6%	5%	5%	4%	4%	4%	4%	3%
Tracking Solar	11%	8%	7%	7%	6%	5%	5%	5%	4%
Landfill Intermittent	54%	55%	55%	56%	56%	56%	56%	56%	54%
Hydro Intermittent	38%	40%	37%	37%	37%	37%	39%	38%	38%
4-hr Storage	56%	52%	55%	51%	49%	42%	42%	40%	38%
6-hr Storage	64%	61%	65%	61%	61%	54%	54%	53%	52%
8-hr Storage	67%	64%	67%	64%	65%	60%	60%	60%	60%
10-hr Storage	76%	73%	75%	72%	73%	68%	69%	70%	70%
Demand Resource	70%	66%	65%	63%	60%	56%	55%	53%	51%
Nuclear	95%	95%	95%	96%	95%	96%	96%	94%	93%
Coal	84%	84%	84%	85%	85%	86%	86%	83%	79%
Gas Combined Cycle	79%	80%	81%	83%	83%	85%	85%	84%	82%
Gas Combustion Turbine	61%	63%	66%	68%	70%	71%	74%	76%	78%
Gas Combustion Turbine Dual Fuel	79%	79%	80%	80%	81%	82%	83%	83%	83%
Diesel Utility	92%	92%	92%	92%	92%	93%	93%	93%	92%
Steam	74%	73%	74%	75%	74%	75%	76%	74%	73%

Undervaluing new thermal resources lowers their UCAP relative to their ICAP and effectively makes the default entrant more expensive than reality on a UCAP basis. Revising the accreditation of resources to more accurately reflect within class reliability based on observable characteristics, including vintage, will increase the veracity of the investment signal and reduce Net CONE as a result.

As noted by the IMM, Net CONE UCAP should be calculated including winter capability. This is very feasible as a new unit would be able to obtain CIRs that include winter capability. There is no realistic concern that winter deliverability is a barrier to using winter ratings for the reference technology entrant.

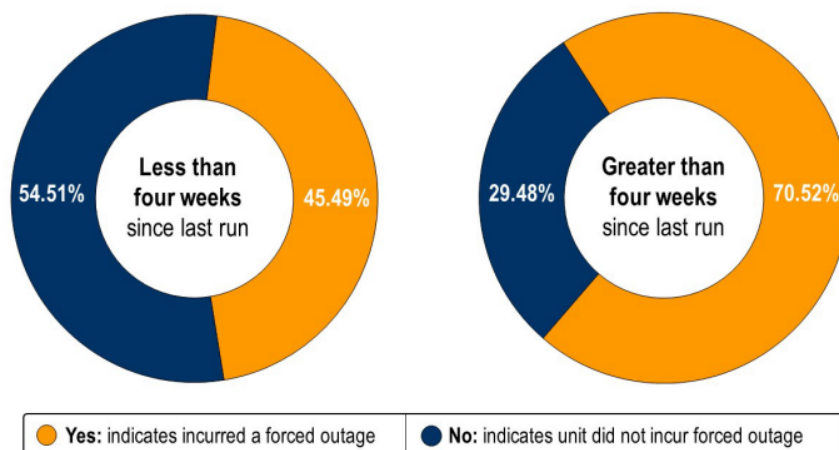
“The MMU analyzed the impact of limiting generation capacity from combined cycle (CC) and combustion turbine (CT) resources to their summer rating rather than their higher winter ratings. The MMU estimated that, on average, the ELCC resource performance adjusted accreditation of each of these resources would have been 8.8 percent higher and the resultant pool wide accredited UCAP factor (AUCAP) would have increased from 79.69 percent to 82.53 percent if the higher winter ratings had been used. The average ELCC class ratings for CC resources in the 2025/2026 RPM Base Residual Auction was 79 percent and the average ELCC class accreditation factor for CT resources was 62 percent.”¹¹⁵

¹¹⁵ “Analysis of the 2025/2026 RPM Base Residual Auction Part A,” September 20, 2024.

https://www.monitoringanalytics.com/reports/Reports/2024/IMM_Analysis_of_the_20252026_RPM_Base_Residual_Auction_Part_A_20240920.pdf, page 10.

Further support for differentiating amongst units is seen in the fleet performance during 2022 Winter Storm Elliot.¹¹⁶ The data illustrated that units that had more recently operated had materially better performance during the storm. The event analysis notes, “this data supports continuing or expanding the Generation Resource Operational Exercise described in PJM Manual 14D, Section 7.5.1, which is currently recommended, but not required for Generation Owners to perform.” To the extent it is reasonable to expect that newer units operate more frequently due to a better heat rate, at a minimum, there is certainly evidence that a new entrant would not expect the same performance as the average member of the given resource class fleet. It also supports design capacity accreditation changes that differentiate within class UCAP based on observable characteristics.

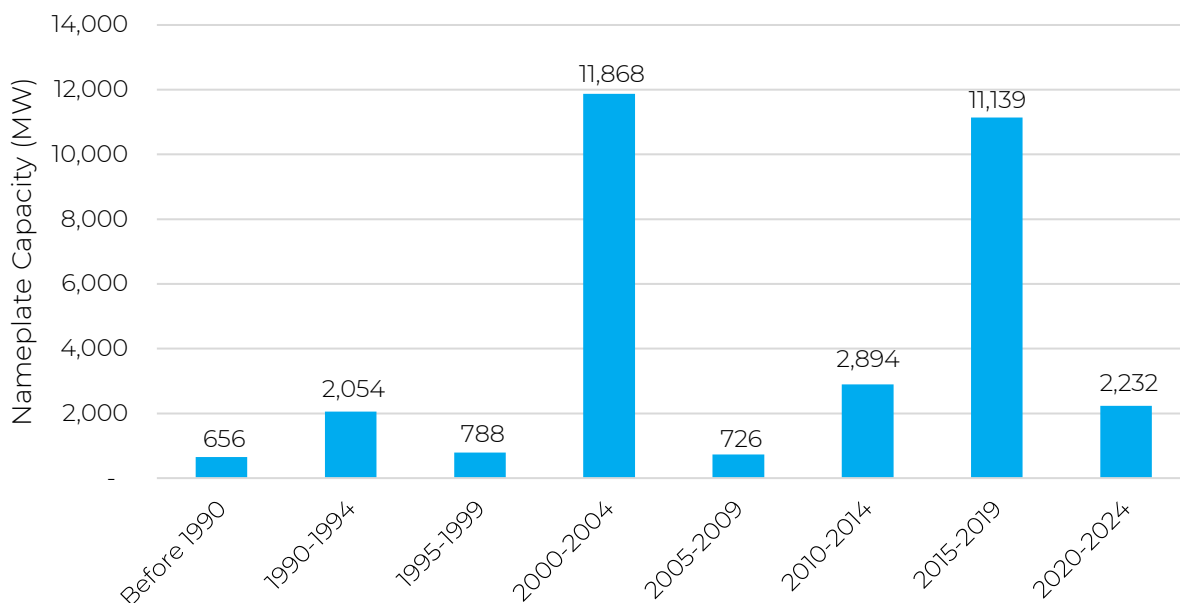
Figure 15: Forced Outages Versus Last Run Time



The distribution of CT generation by online date is illustrated in Figure 16. While relative performance data during critical periods by vintage is not available, about 10% of the CT fleet is more than 25 years old, and about another 35% is between 20 and 25 years old. As highlighted earlier, PJM has indicated a material improvement in CT performance from 2025/26 to 2026/27 due to older unit retirements and the trend appears to follow for the next decade. To the extent that vintage is a key driver, CONE should be adjusted to accurately represent the expected availability of a new unit, i.e., units built from 2015 to 2020 are likely more representative and if the historical performance record focuses on 2018 onward, the reliability of the measurement will be further improved. Note that roughly 40% of the CT fleet was not yet built during the Polar Vortex, further distorting the expected performance of more modern turbines during extreme conditions.

¹¹⁶ “Winter Storm Elliot,” July 17, 2023. <https://www.pjm.com/-/media/DotCom/library/reports-notice/special-reports/2023/20230717-winter-storm-elliott-event-analysis-and-recommendation-report.pdf>.

Figure 16: PJM CT Capacity by Vintage¹¹⁷



The use of more delineated class averages that incorporate observable characteristics would address this concern without exposing individual generators to UCAP accreditation volatility associated with a single event.¹¹⁸ It is akin to a performance adjustment for an individual unit, and suggests at least 6% increase in UCAP is appropriate for the reference unit, reasonably assuming it would perform at least at the 75th percentile level. Winter capacity rating is an incremental understatement of the reference technology UCAP because hourly performance in the performance adjustment framework is capped at a unit's CIR level, which currently reflects summer capacity.¹¹⁹ The expected impact on reference technology UCAP is unlikely to be purely additive between the performance adjustment and winter capacity, but based on the IMM's estimated 8.8% increase in ELCC value for winter capacity and the performance adjustment of 6% to reflect expected better performance than average from Table 13, PJM is likely overstating Net CONE and Gross CONE in UCAP terms for the reference technology by at least 10% in total.

¹¹⁷ Data comes from EIA 860: <https://www.eia.gov/electricity/data/eia860/>

¹¹⁸ This is akin to an insurance approach where performance is pooled so a single instance of poor availability at one generator does not impact future revenues through dramatically reduced UCAP.

¹¹⁹ "PJM Manual 21B: PJM Rules and Procedures for Determination of Generating Capability." https://www2.pjm.com/pjmfiles/directory/manuals/m21b/index.html#Sections/4.2_Calculation_of_ELCC_Resource_Performance_Adjustment.html

Table 13: PJM Performance Adjustment Factors¹²⁰

ELCC Class	Min	25%	50%	75%	Max
Coal	0.81	0.97	1.025	1.06	1.11
Diesel Utility	0.85	0.985	1.01	1.04	1.05
Gas Combined Cycle	0.58	0.98	1.01	1.05	1.09
Gas Combustion Turbine	0.44	0.965	1.05	1.12	1.18
Gas Combustion Turbine Dual	0.72	0.94	1.03	1.06	1.09
Hydro Intermittent	0	0.5725	1	1.4225	1.8
Landfill Intermittent	0.33	0.8575	0.985	1.19	1.52
Nuclear	0.8	1	1.02	1.02	1.03
Offshore Wind	0	0.705	0.97	1	1
Onshore Wind	0.4	0.81	1.01	1.12	1.4
Solar Fixed	0.25	0.81	0.93	1.05	1.31
Solar Tracking	0.15	0.94	1.03	1.08	1.24
Steam	0.53	1.015	1.06	1.1	1.21

¹²⁰ "Performance Adjustment Statistics." <https://www.pjm.com/-/media/DotCom/planning/res-adeq/elcc/2026-2027-stats-performance-adjustment.xlsx>

6. RECOMMENDATIONS

Two immediate recommendations are focused on addressing the core concern of excessive wealth transfer before the next quadrennial review. This means that first, the price cap should be temporarily reduced and second, it must be tied to a lower multiple of Net CONE and de-linked from Gross CONE.

6.1 Reduce the Price Cap

The price cap should be reduced until a new demand curve is established by the ongoing PJM Quadrennial Review. The current price cap level is informed by potential for new entry and is not reasonable with the current auction schedule and prolonged queue delays that interfere with that underlying assumption. The slope and narrow width of the demand curve do not reflect lack of entry due to interconnection delays, compressed auctions and the underlying uncertainty of load growth that has arisen since 2022. The current demand curve parameters are driving unjustified high prices, but in the future the narrow curve could create risk for entrants responding to a load growth forecast that materializes below expectations.

The potential risk of undue wealth transfer from a high price cap in the absence of competitive entry is very high and there is little estimated reliability benefit. As outlined in Section 5.1.3, with the currently expected parameters for the 2026/27 BRA (a price cap at the greater of Gross CONE and 1.75 Net CONE), the market price for capacity is estimated to fall between \$360/MW-Day and \$500/MW-Day, or about 50% higher than actual 2025/26 BRA results. Note that the results are all expected to be above 1.5 Net CONE (the range is 1.6 to 2.2 Net CONE) absent changes to the market parameters and/or unexpected incremental capacity entering the auction.

Rationalizing extremely high prices as a necessary response to current supply demand fundamentals ignores there is very little potential new supply available to respond and the steep demand curve does not incent a response canceling deactivations due to the price impact of incremental capacity clearing the auction. Projects in the transmission queue are very unlikely to be able to be online for the 2026/27 BRA, and the mothballed generation seems unlikely to be available as well.

6.2 Reduce the Net CONE Multiplier and Drop Gross CONE Linkage

Net CONE represents the best available estimate of competitive outcomes over the long-term and could be used directly as a price cap with the current market conditions. PJM has suggested a Capacity Performance penalty rate of 1.0 times Net CONE to reflect an estimate of the cost of replacement capacity in the event of non-performance during an emergency.¹²¹ Given that Net CONE is an administrative estimate incorporating future conditions and therefore subject to error, 1.5 times Net CONE is a reasonable

¹²¹ "Consultation with Members Regarding Future 205 Filing on Capacity Market," November 21, 2024. <https://www.pjm.com/-/media/DotCom/committees-groups/committees/mc/2024/20241121/20241121-item-03a---1---member-consultation-regarding-future-205-filing-on-capacity-market---presentation.ashx>, page 22.

PJM Board Letter to Stakeholders," December 9, 2024. <https://www.pjm.com/-/media/DotCom/about-pjm/who-we-are/public-disclosures/2024/20241209-board-letter-outlining-action-on-capacity-market-adjustments-rri-and-sis.pdf>, page 4.

upper boundary on the potential cost of capacity¹²², particularly as this bound is re-estimated every four years via PJM's Quadrennial Review process. As shown in Section 5.4.1, a lower price cap is expected to have very little impact on clearing volumes in the market. Gross CONE cannot be justified in the absence of potential entry because it arbitrarily sets the price cap at a level unrelated to realistic capacity costs.

To accompany this 1.5 times Net CONE ceiling, the RTO Net CONE should set the minimum price cap for all LDAs. If Net CONE is higher in a constrained LDA, 1.5 Net CONE would use the LDA specific Net CONE. Gross CONE should not be considered in the price cap formulation. This addresses the concern that a constrained LDA has very low Net CONE and an arbitrarily low price cap as a result.

¹²² It should further be noted that using a CT to define the Gross and Net CONE further insulates the market from error that risks reliability given that there is a very strong probability CCGT units have a lower Net CONE.

APPENDIX: KRIS AKSOMITIS CV

SUMMARY

Mr. Aksomitis is an electricity market economist with over 20 years of increasingly senior experience in project evaluation, risk assessment, energy market analysis, market design, forecasting and regulatory affairs. Mr. Aksomitis is currently the Director of Commercial Power Development and Strategy at Power Advisory LLC (Power Advisory). Power Advisory is an energy sector management consulting firm focused on the North American electricity markets with expertise in wholesale market design, price forecasting electricity planning for distribution and bulk systems, market risk assessment, governance, structure and organization of wholesale and retail electricity markets.

Kris Aksomitis has worked in various market design, regulatory, analytical, forecasting and commercial roles over the last 25 years. At Power Advisory, Mr. Aksomitis is responsible for overseeing wholesale market forecasts and analysis for the US Based team, which produces forecasts for NYISO, ISO-NE, PJM and occasionally other markets as requested by clients. He provides regular updates to clients on energy, capacity, ancillary services, transmission and policy changes in US markets with a focus on PJM, MISO, ERCOT and SPP. He has worked on projects for US Federal and State agencies, system operators as well as Provincial Governments in Canada, on projects evaluating long term electricity price expectations, evolving market dynamics and risks. He has submitted a range of expert evidence on behalf of clients to the Alberta Utilities Commission and defended that evidence in written and oral hearings. He has spoken at various conferences on price forecasting and market design topics, including capacity market design.

Professional History

Senior Director, Market Strategy, Liberty Power
Director, Power Advisory
Manager, Market Analysis and Forecasting, TransAlta
Program Manager, Market Design, AESO

Education

University of Calgary, MA Economics, 2002
Thesis "Strategic Behaviour in the Alberta Electricity Market"
Specialized in Competition Theory and Industrial Organization

SELECTED PROFESSIONAL EXPERIENCE

Capacity Market Design

While with Power Advisory, Mr. Aksomitis spent roughly 2.5 years engaged in the evaluation, design, stakeholder consultation and regulatory process to establish an Alberta capacity market from 2017 through 2019. The project initiated with capacity market education and discussion sessions with the generation owners considering participation in the representation group, and concluded with and Utility Commission regulatory process to approve final ISO rules. Mr. Aksomitis represented and advocated for the group throughout the entire process of developing a capacity market.

- Represented a group of eight of the largest industrial power consumers in the Alberta market representing about 4,000 MW of installed generation capacity. The group was made up of CNRL, Cenovus, Dow Chemical Canada, Imperial Oil Resources, MEG Energy, Suncor Energy, Syncrude Canada and TC Energy. Group was collectively known as the CWG.
- Developed an education session for potential member companies that assessed all existing North American capacity markets and highlighted risks and implications for industrial consumers with onsite cogeneration.
- Represented the CWG in ISO working groups tasked with initial design option evaluation.
- Elected Industry Chair of Market Mechanics Design Stream Working Group.
- Developed submissions and presented options on market design elements across all stakeholder working groups.
- Developed formal feedback material on design options as part of the consultation process. Worked with the CWG members to get to consensus positions and recognize design tradeoffs for different portfolios.
- Submitted written evidence on behalf of CWG and defended evidence during oral hearing phase. Hearing was to establish final ISO rules for all aspects of the Alberta capacity market operation, including capacity qualification (UCAP), demand curve parameters, treatment of onsite generation, penalty structures, energy market changes, and settlement. The capacity market was not implemented due to a change in government and resulting cancellation of the market design.
 - Alberta Utilities Commission, Proceeding 23757, Exhibit 23757-X0509, rebuttal evidence regarding the capacity market rules, April 4, 2019.
 - Alberta Utilities Commission, Proceeding 23757, Exhibit 23757-X0375, expert evidence regarding the capacity market rules, February 28, 2019.
 - Alberta Utilities Commission, Proceeding 23757, Exhibit 23757-X0147, preliminary issue submission regarding the capacity market rules, November 2, 2018.
 - Served as expert witness representing CWG during oral hearing to defend evidence.
- Represented CWG in consultation on tariff design (TDAG working group) to allocate capacity costs to end customers. Consultation was independent from the capacity market design workstream.

Energy and Ancillary Services Market Design

While with the Alberta ISO (known as AESO), Mr. Aksomitris was Program Manager for Ancillary Services and Demand response. He also worked as a Manager of Market Design while at the AESO. In this role, he developed proposals for market design changes in response to government policy, AESO market improvement objectives and/or stakeholder concerns. His role included discussion and recommendation paper development, stakeholder consultation, internal consultation with impacted groups, rule change filings and oversight of IT tool requirements where applicable.

- Price cap evaluation – Discussion and Recommendation papers, stakeholder consultation and analysis of potential impacts associated with raising the market price cap.

- Operating reserve market redesign – Developed market changes to remove AESO as an active bidder in the ancillary services market. Evaluated options and developed a solution that was implemented by NGX (ICE), the operator of the Alberta ancillary services market for day-ahead products.
- Load Shed Service for Imports (LSSi) – developed a product with technical and commercial specifications for fast response frequency support service that supported higher import capacity into Alberta. Conducted stakeholder sessions on product design and worked with Commercial and Operations and IT groups to procure and utilize the new product.
- Wind Integration – developed new operational approaches to using Standby reserves to support reliability during high wind uncertainty. Also developed wind power ramp rate mitigation rule and operational tools to mitigate rapid increases in wind output. Collaborated with various ISO's throughout the US on development of wind integration recommendations.
- Worked with AESO internal stakeholders such as system controllers and IT groups to ensure market design proposals were practical and workable.
- Worked with external stakeholders to evaluate market design tradeoffs and seek consensus from as broadly as possible.

Market Evaluation and Forecasting

Market evaluation and forecasting has been a core skillset across various roles. Recent large projects at Power Advisory and most recent prior role at Algonquin Power and Utilities (also known as Liberty Utilities) are highlighted, but experience in market evaluation and forecasting extends 25 years including energy markets, capacity market, resource adequacy modeling, scenario evaluation and risk assessment.

Recent Power Advisory Projects

- Provided an evaluation of a large scale merchant storage project located in Zone J within NYISO for the US Department of Energy Loan office. The project included a market report highlighting energy and capacity market risks for storage, with a particular focus on the risk associated with declining capacity value due to the marginal ELCC accreditation approach. Developed a long-term revenue forecast of energy, ancillary services, capacity prices and expected ELCC for storage in support of the lenders model.
- Supported Newfoundland Hydro (NLH) in contract renegotiation with Hydro Quebec. An agreement to renegotiate the existing Churchill Falls contract and jointly develop expansion hydro projects was recently reached. Key aspects of the support included long term evaluation of export market risks and opportunities, with a focus on NYISO and ISO-NE. Energy and capacity value forecasts in the long term under several scenarios were provided along with qualitative assessment of market evolution. Scope of work also included evaluation of potential offtake customers in US and Canadian markets, as well as construction of long-term escalation indices for power market contracts. Capacity market CONE studies in all US markets were examined as a source of potential approaches to indices.
- In the process of developing a basis and risk study for NYSERDA renewable procurements. The project will develop long-term assessment of potential contract risk with current contract terms and determine if alternative contract design would serve to lower renewable procurement costs without creating undue risk for NY ratepayers.

- Market monitoring support for Power Advisory clients includes ongoing monitoring and evaluation of the PJM market (SPP, MISO and ERCOT are also covered). Evaluated and highlighted all recent changes to the PJM capacity market.
- Market forecasting is an ongoing service. Forecasts for PJM, ISO-NE and NYISO energy and capacity prices have been completed in recent months in support of project transactions and client business development efforts. Forecasts have been used by lenders, project proponents, acquisition client and sell side clients. Capacity price forecasts have been expanded in recent version to include an outlook of long-term ELCC for renewable and storage projects.

Algonquin Power and Utilities

- Senior Director of Market Strategy group reporting to the Senior Vice President of Business Development. Responsible for long-term market views, development of long-term portfolio strategy, risk evaluation and providing all market exposed assumptions in project financial models.
- Supported individual project evaluation and strategic decisions for renewable generation and storage development. Evaluated long-term revenue projections, market assumptions, risk assessments and fit within existing portfolio to determine the attractiveness of a given asset.
- Developed a revenue at risk framework for long-term portfolio risk assessment for renewable assets. Framework evaluated the impact of market exposures in the near term while the assets were under contract (fixed block settlement risk, basis risk and production risk) as well as long-term (merchant prices, basis, production). The model was used to inform strategic planning such as contracting strategy, asset development such as storage and budgeting.
- Evaluated battery storage options for an existing ERCOT wind portfolio as part of a strategy to reduce earnings variability. Size, duration and location of storage was examined in relation to an existing portfolio against a wide range of potential market conditions to determine a risk minimizing strategy for the portfolio.
- Assessed value and the ability to contract solar and battery assets located in the Imperial Irrigation District to participate in the CAISO market. The analysis resulted in the purchase of a portfolio of development assets.
- Created a standardized basis risk analysis for greenfield development of wind and solar assets. Historical basis, responsiveness to wind and solar generation, local load patterns, expected long-term trends and expected transmission upgrades were incorporated into the analysis to score the relative risk of the development site.
- Performed research to evaluate new states and markets to pursue for greenfield development.