

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

PJM Interconnection, L.L.C.) Docket No. ER22-2984-000

**MOTION FOR LEAVE TO ANSWER, AND ANSWER
OF THE PJM POWER PROVIDERS GROUP**

Pursuant to Rules 212 and 213 of the Federal Energy Regulatory Commission’s (“FERC” or “Commission”) Rules of Practice and Procedure,¹ The PJM Power Providers Group (“P3”)² respectfully submits this Motion for Leave to Answer and Answer and Reply Affidavit of Tanya L. Bodell, Attachment A, (“Answer”) in response to the November 8, 2022, Motion for Leave to Answer and Answer of PJM Interconnection, L.L.C (“PJM”)³ and to the November 4, 2022, Motion for Leave to File Answer and Answer of the Sierra Club, the Illinois Citizens Utility Board, New Jersey Division of Rate Counsel, Maryland Office of People’s Counsel, the Office of the People’s Counsel for the District of Columbia, the Delaware Division of the Public

¹ 18 C.F.R. §§ 385.212; 385.213 (2022).

² P3 is a non-profit organization dedicated to advancing federal, state and regional policies that promote properly designed and well-functioning electricity markets in the PJM Interconnection, L.L.C. (“PJM”) region. Combined, P3 members own over 67,000 MWs of generation assets and produce enough power to supply over 50 million homes in the PJM region covering 13 states and the District of Columbia. For more information on P3, visit www.p3powergroup.com.

³ *PJM Interconnection, L.L.C.*, Motion for Leave to Answer and Answer of PJM Interconnection, L.L.C., Docket No. ER22-2984-000, (submitted November 8, 2022) (“PJM Answer”).

Advocate, PennFuture, Southern Environmental Law Center, Natural Resources Defense Council, and the Sustainable FERC Project⁴ (collectively “Public Interest Entities”) in the above captioned proceeding.

I. MOTION FOR LEAVE TO ANSWER

Pursuant to 18 C.F.R. § 385.212 and 18 C.F.R. § 385.213, P3 respectfully submits this Motion for Leave to Answer and Answer to the PJM Answer and the Public Interest Entities’ Answer.⁵ P3 respectfully submits this Answer⁶ to respond to various statements made by PJM and the Public Interest Entities. P3 respectfully requests that the Commission accept this Motion for Leave to Answer and Answer in order to help contribute to a fuller record and assist the Commission in its decision-making process.

II. ANSWER

A. PJM Protests Loudly and Repeatedly, yet Fails to Address the Unreasonable and Unsupportable Foundations of its Proposed Changes

PJM’s proposed changes to the reference unit, switch to the proposed E&AS Offset, and steepening of the VRR Curve violate basic tenets of a rationale competitive market design and should be rejected by the Commission.

⁴ *PJM Interconnection, L.L.C.*, Motion for Leave to File Answer and Answer of the Sierra Club, the Illinois Citizens Utility Board, New Jersey Division of Rate Counsel, Maryland Office of People’s Counsel, the Office of the People’s Counsel for the District of Columbia, the Delaware Division of the Public Advocate, PennFuture, Southern Environmental Law Center, Natural Resources Defense Council, and the Sustainable FERC Project, Docket No. ER22-2984-000 (November 4, 2022) (“Public Interest Entities Answer”).

⁵ Although the Commission’s procedural rules do not provide for answers to comments as a matter of right, the Commission has allowed answers where, as here, the answer provides further explanation or otherwise helps ensure a full and complete record. See, e.g., *Empire Pipeline, Inc.*, 164 FERC ¶ 61,076 P 9 (2018), *PJM Interconnection, L.L.C.*, 104 FERC ¶ 61,154, at P 14 (2003), on reh’g, 109 FERC ¶ 61,236 (2004); *Williams Energy Mktg. & Trading Co. v. Southern Co. Servs., Inc.*, 104 FERC ¶61,141, at P 10 (2003); *Ameren Servs. Co.*, 100 FERC ¶ 61,135, at P 15 (2002), on reh’g, 103 FERC ¶ 61,178 (2003).

⁶ The comments contained in this filing represent the position of P3 as an organization, but not necessarily the views of any particular member with respect to any issue.

1) **At issue is how much energy revenues should impact the RPM *demand* curve:**

PJM states that the energy market and RPM market work in tandem.⁷ P3 agrees. P3 agrees that the capacity market's *supply* curve automatically will rise and fall with *expected* capital costs to come or stay online less net revenues that suppliers *expect* to receive from *future* energy and ancillary market conditions.⁸ Where P3 disagrees is how much influence net revenues from energy and ancillary services (i.e., the E&AS Offset) should have on the shape of the *demand* curve. This shape is impacted by the choice of the reference unit, E&AS Offset methodology, and endpoints of the Variable Resource Requirement Curve ("VRR Curve"). P3 acknowledges that the design of a downward sloping demand with a kink at the Net CONE value will create some perverse incentives with the combustion turbine as the reference resource, but as Ms. Bodell indicated, those incentives are muted by a number of assumptions in the current approach to estimating the VRR Curve versus the proposed approach, including existing use of:⁹

⁷ The Public Interest Entities allege that the P3 premise rests on a total bifurcation (*See*, Public Interest Entities Answer at pp 9-10), which is not true.

⁸ PJM Answer, Answering Aff. of Samuel A. Newell, Kathleen Spees, and John M. Hagerty on Behalf of PJM Interconnection, L.L.C. Regarding Variable Resource Requirement Shape and Parameters ("Brattle Answering Aff.") Brattle Answering Aff. at ¶ 7. PJM Answer at footnote 90, "The supply curve is based on capacity suppliers' sell offers."

⁹ *PJM Interconnection, L.L.C.*, Motion for Leave to Answer, and Answer of the PJM Power Providers Group, Reply Affidavit of Tanya L. Bodell on behalf of The PJM Power Providers Group, Docket No. ER22-2984-000, November 14, 2022 ("Bodell Reply Aff.") at ¶ 8.

- **Pricing Methodology:** A more stable historical E&AS pricing methodology versus the more volatile proposed E&AS Offset subject to short-term energy conditions,¹⁰
- **Dispatch Model:** A replicable dispatch spreadsheet model to run with historical prices during peak hours versus a proprietary dispatch model to run 24 x 7 using settlement prices generated for margin calls on a proprietary trading platform,¹¹
- **Pricing Data:** Actual market transactions from three years in the historical approach versus an undisclosed, proprietary, daily settlement price series created for purposes of calculating margin calls for 30 trade days for future delivery more than three and a half years into the future,¹²
- **Reference Unit:** A combustion turbine versus a more frequently dispatched combined cycle unit,¹³ and
- **Steeper VRR Curve:** A VRR curve with a more sloped construct and larger range around the reliability requirement versus the proposed VRR curve parameters that create a significantly steeper demand curve.¹⁴

¹⁰ *PJM Interconnection, L.L.C.*, Protest of The PJM Power Providers Group, Affidavit of Tanya L. Bodell on behalf of The PJM Power Providers Group, Docket No. ER22-2984-000, October 21, 2022 (“Bodell Aff.”), at ¶¶ 24, 25b.

¹¹ Bodell Aff. at ¶ 193.

¹² Bodell Aff. at ¶¶ 24a, 69, 72, 98.

¹³ Bodell Aff. at ¶¶ 10b, 116, 118, 123.

¹⁴ Bodell Aff. at ¶¶ 10c, 13c.

P3's position is and always has been that the VRR Curve should reflect a combustion turbine, which is more reflective of a pure capacity unit, versus a more frequently dispatched combined cycle. Use of a combined cycle in conjunction with the proposed E&AS Offset methodology simply introduces too much missing money and volatility into the capacity market.

- 2) **Finding the “missing money” should not penalize a combustion turbine during scarcity periods and provide excess recovery during non-scarcity hours:** If the goal of the capacity market is to replace the “missing money,” there is no justification for incorporating net revenues from non-scarcity pricing periods into the *demand curve*. The PJM filing and attached affidavits reference the concept of “missing money” multiple times.¹⁵ As Brattle explained in its 2012 report to ERCOT, capacity markets are designed to replace the missing money from mandated reserve margins and price caps that lower heat rates and avoid scarcity prices.¹⁶ By using a combustion turbine as the reference unit, the VRR curve response to changes in energy market conditions is only impacted by net energy revenues projected to be earned during scarcity hours when the combustion turbine operates. The current OATT limits the E&AS Offset of a combined cycle reference unit in the calculation of the Minimum Offer Pricing Rule (“MOPR”) calculations to peak price hours only,

¹⁵ PJM Reply Filing, pp. 6, 7, 31; Brattle Answering Aff. ¶ 9.

¹⁶ The Brattle Group, Samuel Newell, Kathleen Spees, Johannes Pfeifenberger, Robert Mudge, Michael DeLucia, and Robert Carlton, “ERCOT Investment Incentives and Resource Adequacy,” Prepared for ERCOT, June 1, 2012, pp. 115-116, https://www.brattle.com/wp-content/uploads/2017/10/8240_ercot_investment_incentives_and_resource_adequacy_newell_spees_pfeifenberger_mudge_ercot_june_2_2012.pdf.

perhaps for the same reason.¹⁷ Introducing a more frequently-dispatched combined cycle as the reference unit, combined with the proposed E&AS Offset methodology that now allows for potential 24 x 7 energy dispatch, introduces a new net energy revenue component for the E&AS Offset during hours outside of when the missing money occurs that did not exist before.¹⁸ This new component changes the dynamics of the *demand* curve and adds a new level of volatility in capacity prices.¹⁹ In addition, the proposed E&AS Offset for the combined cycle will cause the combustion turbines to recover less missing money when combined cycles are earning high energy margins; it is unclear whether the process will allow for recovery of more missing money during periods with low energy margins when combustion turbines are needed the least.²⁰ The impact of the dynamic maximum point on the VRR Curve²¹ actually supports this point,²² making it more difficult to clear more capacity for a given change in price when PJM is operating below reserve requirements,²³ but even that is not compelling because market conditions change. It is best to try to get the market design correct.

¹⁷ PJM OATT, Attachment DD Section 5.14(h-2)(3)(A)(iv) referencing the handling of the CC units in the Peak Dispatch Model, <https://agreements.pjm.com/oatt/5156>
“ . . . the Peak-Hour Dispatch scenario for both the Day-Ahead and Real-Time Energy Markets shall be modified to dispatch the CC resource continuously during the full peak-hour period.”

¹⁸ Bodell Reply Aff. at ¶ 9.

¹⁹ Bodell Reply Aff. at ¶ 18.

²⁰ Bodell Reply Aff. at ¶ 21.

²² Bodell Reply Aff. at ¶ 22, referencing Brattle Answering Aff. at ¶ 13.

²³ Bodell Reply Aff. at ¶ 22.

- 3) **Perverse price signals are exacerbated:** PJM offers no rational explanation for why the Commission should accept a change to the *demand curve* that would procure *less* capacity and send an even *lower* price signal when the energy market is signaling greater scarcity in capacity resources. We appreciate that the capacity market is meant to recover the missing money but incorporating a combined cycle with an offset tied to non-scarcity net revenues into the demand curve augments the impact beyond what a static demand curve would command. As a result of the proposed E&AS Offset, a reliability unit that primarily operates in the capacity market would receive less of its missing money due to the offset created by non-scarcity net revenues in the demand curve. It is unclear that the offset to the missing money would be recovered during excess market conditions given the opportunity for market intervention.²⁴
- 4) **ICE daily settlement prices to be used in the proposed E&AS Offset are not the forward price for delivered energy:** Brattle supports the use of “forward prices for delivery of electric energy and natural gas to PJM market participants.”²⁵ However, forward prices set by trades are not the same as daily settlement prices set by a futures clearing house. The forward settlement prices PJM proposes to use are not set by market trades;²⁶ the daily settlement price is not specified as a trade or trading window over which trading prices can be averaged.²⁷ Those contracts are not liquidly

²⁴ Bodell Reply Aff. at ¶ 24.

²⁵ PJM Answer at p. 13; Brattle Answering Aff. at ¶ 6.

²⁶ Per ICE definitions, the terms "Trade" and "Transaction" means "any purchase or sale of any Commodity Contract made in accordance with the Rules."
https://www.ice.com/publicdocs/rulebooks/futures_us/1_Definitions.pdf.

²⁷ Bodell Reply Aff. at ¶ 44.

traded for the time period PJM proposes to use them (i.e., more than three and a half years out).²⁸ Daily settlement prices are primarily used for purpose of meeting interim margin calls before delivery,²⁹ and are not the agreed upon price between a buyer and a seller which would be settled at delivery.³⁰ The so-called “futures prices” that PJM proposes to use for the proposed E&AS Offset are primarily used as a margin call settlement mechanism based on ICE’s non-transparent, proprietary algorithm against which payments between parties are adjusted until actual delivery occurs. It is telling that Brattle never explicitly states that the ICE settlement prices reflect expectations of market conditions in its Answering Affidavit; it is only PJM’s assertion in its filing that connects settlement prices and Brattle’s generalized statements regarding forward prices from the original Brattle E&AS testimony that tries to imply that Brattle testified that this is the case.³¹ It is easy for Brattle to make sweeping statements about the benefits of a generic “forward-looking” price.³² It is more difficult for Brattle to explicitly testify that a non-public algorithmically-generated settlement price used for margin calls without any underlying trade liquidity provides those benefits. Ongoing settlement for margin calls³³ is NOT what the E&AS Offset is

²⁸ Bodell Aff. at sections III.1.3 and III.1.4.

²⁹ *Id.* Per ICE, the “Settlement Price” is “the daily price of a Commodity Contract as determined by the Exchange on any day for the purpose of meeting Margin requirements on such day.”

³⁰ Bodell Reply Aff. at ¶ 45 and Exhibit R-2.

³¹ Compare the statement in PJM’s Answer on pp. 4 and 13 versus the quoted paragraphs from Brattle E&AS Affidavit at ¶ 15. *See also* Bodell Reply Aff. at ¶ 35.

³² Bodell Reply Aff. at ¶ 36.

³³ Bodell Reply Aff. at ¶ 28d for the CME Group definition of settlement prices; Bodell Aff. at ¶ 76 for ICE definition of settlement price.

meant to reflect and therefore the proposed ICE settlement prices are inappropriate to use for this purpose.

5) **Prices PJM proposes to use in the proposed E&AS Offset reflect an average of 30 trade days of a proprietary algorithm, not forward-looking market**

conditions: It does not matter how many times PJM asserts to the contrary, Brattle implies its clients use settlement prices for some vague purpose, or Dr. Graf quotes the CFTC findings from 2010 on ICE real-time contract price,³⁴ there is no proof that the proposed futures settlement prices generated by ICE for purposes of margin calls are “the best evidence of future market conditions,”³⁵ “validated as forward market views,”³⁶ or “ provide a good estimate of the market’s expectations for CCs’ revenues.”³⁷ For the time-period for which the daily settlement prices are to be used in the proposed E&AS Offset, ICE settlement prices are validated *solely* as marks for purposes of credit security and reflect a price that ICE sets for that purpose. Even if someone uses those settlement prices as a forecast of market prices, which has no foundation in the record other than vague assertions, they are not a validation of forward-market views. Any opinion as to how the market views those prices as reflecting future market conditions is speculative and unsupported.

³⁴ Bodell Reply Aff. at ¶ 59b.

³⁵ PJM Answer at p. 13.

³⁶ PJM Answer, Brattle Answering Aff. at ¶ 15.

³⁷ PJM Answer, Brattle Answering Aff. at ¶ 18.

6) **Financial settlement prices based on 30 trade days are not used for long-term investment decisions:** PJM repeats multiple times that forward settlements prices are used by Brattle in advising their commercial clients “when supporting a client in an investment or contract decision for a similar timeframe.”³⁸ Presumably the “similar timeframe” means more than three and a half years into the future. Yet PJM assumes 20 years in its Gross CONE calculation.³⁹ To imply that any investor would make long-term investment decisions in physical power plants by relying on margin call daily settlement prices for financial contracts during a thirty trade-day period for three to four years out into the future is something the Commission should demand evidence of.

7) **Liquidity metrics should not use contracts that are not included in the E&AS Offset:** Dr. Graf’s criticisms are misleading and mistaken. His criticisms of Ms. Bodell rely on real-time forward contracts.⁴⁰ The proposed E&AS Offset methodology for the energy component does not rely upon or use the real-time peak or real-time off-peak contracts.⁴¹ Any conclusions he draws using real-time forward contracts are irrelevant for supporting the proposed E&AS Offset.⁴² Combining peak

³⁸ For example, in the PJM Answer: “consistent with commercial practices, as [Brattle] would [use] when supporting a client in an investment or contract decision for a similar [three-year forward] timeframe” (p. 4). In fact, PJM’s approach adopts “principles and methods that are consistent with commercial practices, as we would when supporting a client in an investment or contract decision for a similar timeframe” (p. 7), “commercial practices, as we [Brattle] would when supporting a client in an investment or contract decision for a similar timeframe” (p. 13).

³⁹ PJM Filing at p. 31.

⁴⁰ Graf Aff. at ¶ 5a.

⁴¹ Bodell Reply Aff. at ¶ 57.

⁴² If the implication is that the underlying daily settlement price is an algorithm based on trade data across multiple contracts, that has not been put into the record or supported in any way.

and off-peak contracts is similarly unwarranted as those contracts are used in the proposed E&AS Offset for peak and off-peak prices, respectively, and combining the number of trades in those different contracts would effectively overstate the number of trades underlying each contract.⁴³

8) **CFTC Statements Concerning Price Discovery are invalid, irrelevant, and inapplicable:** Dr. Graf relies on a 2010 study by the CFTC to claim that the PJM contracts perform a “significant price discovery function.”⁴⁴ He claims that CFTC undertakes such studies from “time to time.”⁴⁵ The CFTC makes clear that its conclusions were only valid for that time.⁴⁶ As Ms. Bodell indicates, “Liquidity changes over time across contracts, within an exchange, and across exchanges.”⁴⁷ If a study from 12 years ago for real-time contracts in PJM’s Western Hub – contracts that are not used in the proposed E&AS Offset -- is his best basis for claiming settlement prices are valid for the E&AS Offset, FERC should reject the claim outright. Any outdated conclusion by the CFTC regarding a contract that is not even used for the proposed E&AS Offset is inapplicable and irrelevant.

⁴³ Bodell Reply Aff. at ¶ 58.

⁴⁴ Graf Aff. at ¶ 21.

⁴⁵ Graf Aff. at ¶ 16.

⁴⁶ CFTC, *Orders Finding That the PJM WH Real Time Peak Contract and PJM WH Real Time Off-Peak Contract Offered for Trading on the IntercontinentalExchange, Inc., Perform a Significant Price Discovery Function*, 75 Fed. Reg. 42,390 (2010), “Specifically, the Commission has determined that the PJM contract meets the material price reference and material liquidity criteria **at this time**.” Emphasis added.

⁴⁷ Bodell Reply Aff. at ¶ 59c.

Brattle asserts, “Our key observations remain unchallenged.”⁴⁸ P3 disagrees. Brattle’s proposed market design changes for the VRR Curve remain unsupported by the original intent of the capacity market to provide stable prices for generators to recoup their missing money, unsupported by economic theory, and unsupported by regulatory ratemaking standards. Ultimately, PJM’s proposal is a step away from, not towards, reliability. One would hope that basic economic theory and market design objectives carry the day, not an inconsistent defense of an indefensible proposal.

B. PJM’s Filing Sets the VRR Parameters for the 26/27, 27/28, 28/27 and 29/30 Delivery Years

The Public Interest Entities wave aside reliability concerns as if the Commission should believe that they do not exist or, remarkably, PJM is over-supplied. The Commission knows better, having been briefed by NERC that most of the country is short of capacity.⁴⁹ PJM does not currently face the same challenges as other parts of the country, but all indications are that PJM is headed down a similar path as other regions of the country.⁵⁰ Any rational regulator looking at the current state of resource adequacy in this country and in PJM specifically would be hard pressed to conclude that PJM has too much capacity as the Public Interest Entities argue.

⁴⁸ PJM Answer, Brattle Answering Aff. at ¶ 18.

⁴⁹ See, https://www.nerc.com/pa/RAPA/PA/Performance%20Analysis%20DL/NERC_SOR_2022.pdf.

⁵⁰ PJM recently summed up the current challenge in saying to the Commission, “Traditional, fossil-fueled resources are forecasted to retire due to both policy and economic drivers and the pace of resource additions is less certain given the fluctuating rate at which resources in the interconnection queue achieve commercial operation. Considering also the forecasted increase to the region’s demand from the addition of large data centers and the trend toward electrification, there is risk to overall resource adequacy in the coming years.” See, <https://pjm.com/-/media/documents/ferc/filings/2022/20221018-ad21-10-000.ashx>.

Moreover, the instant filing is 100% about future reliability in PJM as the parameters set by these proposed reforms will shape capacity supply and price from June of 2026 through May of 2030. PJM CEO Manu Asthana recently told stakeholders, “PJM can say with confidence that it has adequate reserves today, but the emerging longer-term picture is concerning.”⁵¹ He pointed to 40 GWs of potential retirements in PJM combined with substantial load growth and an insufficient number of MW’s in the queue that are likely to address PJM’s needs.⁵² To P3, this sounds like PJM is indeed on the cusp of a reliability crisis and the impact of the instant filing will coincide directly with the predicted reliability challenges in PJM.

As Mr. Asthana rightly observed, “we cannot take the reliability that we enjoy in our region for granted through this energy transition.”⁵³ The Commission should not take comfort in the capacity results of the last 10 years as the Public Interest Entities suggest, but rather take a forward-looking view of what PJM will be in 2026, 2027, 2028, 2029 and 2030. PJM is clearly sending a signal about those years and that signal is not “we have too much capacity.” The Commission has been warned and can act before it is too late – unless, of course, the Commission endorses the “What, me worry?” approach offered by the Public Interest Entities.

C. Public Interest Entities Fail to Grasp the Realities of the Grid of the Future

P3 fully grasps that the capacity market works in tandem with other markets and to suggest otherwise is just nonsense.⁵⁴ Energy market revenues are an important part of the

⁵¹ See. <https://insidelines.pjm.com/pjm-ceo-asthana-opens-2022-annual-meeting/>

⁵² *Id.*

⁵³ <https://insidelines.pjm.com/pjm-ceo-asthana-opens-2022-annual-meeting/>

⁵⁴ See Public Interest Entities Answer at pp. 9-10.

economics of any capacity resource.⁵⁵ However, it is undeniable that PJM will require a subset of resources that will be needed for reliability but not run frequently and therefore not earn significant energy market revenues.⁵⁶ These resources have costs associated with their availability that must be recovered. The capacity market, for those resources, is pretty much the only signal for retention or retirement and the grid of the future will demand more, not fewer, of those resources.

Moreover, Public Interest Entities consistently take refuge behind the talking point of what has historically been built in PJM will be built in the future.⁵⁷ This flawed perspective fails to ponder the more important question of what will be needed in PJM as the grid integrates more carbon-free renewable resources. P3 absolutely concedes and acknowledges that more CCs have been built in PJM than CTs over the last 10 years in PJM. While a historical fact, it says absolutely nothing about the resources PJM will need in the future. PJM's future needs are going to require flexible units (likely in the form of natural gas and coal) – particularly if there is significant renewable energy penetration.⁵⁸ Logic dictates that that smaller, more flexible resources that may not run frequently will be the new entrants that PJM desires to preserve reliability. The Public Interest Entities claim these units are not running in the energy market because they are inefficient. Nothing could be further than the truth. These flexible units are just

⁵⁵ So are production tax credits for those resources that have access to them.

⁵⁶ See, <https://www.pjm.com/-/media/library/reports-notice/special-reports/2022/20220517-energy-transition-in-pjm-emerging-characteristics-of-a-decarbonizing-grid-white-paper-final.ashx>.

⁵⁷ Public Interest Entities Answer at pp 3, 7-8.

⁵⁸ <https://www.pjm.com/-/media/library/reports-notice/special-reports/2022/20220517-energy-transition-in-pjm-emerging-characteristics-of-a-decarbonizing-grid-white-paper-final.ashx> at 22.

not economic when units with PTCs and zero-cost fuel are available to meet energy market needs when system needs are low.

D. The Impact of Minimum Offer Price Rule ('MOPR') Repeal and Market Seller Offer Cap ('MSOC') "Reform" Cannot be Ignored

The PJM filing represents yet another action in a series of efforts that have served to devalue PJM's capacity market and erode its ability to reliably procure sufficient resources to meet the demands of PJM's consumers. This filing cannot be viewed separate and apart from the overall trend to harm the ability of capacity markets to send appropriate price signal reflective of market conditions.

For capacity auctions prior to 2021, investors had the reasonable expectation the capacity market would have an effective mechanism in place to police the exercise of buyer market power. Those protections are no longer present in PJM's capacity market and as the PJM IMM has told the Commission in no uncertain terms, "The PJM markets would be better off, more competitive, and more efficient with no MOPR than with PJM's proposed approach. PJM's proposal would effectively eliminate the MOPR while creating a confusing and inefficient administrative process that effectively makes it both unnecessary and impossible to prove buyer side market power as PJM has defined it."⁵⁹

Also, for auctions prior to 2021, investors had more flexibility to evaluate their costs and risks when formulating their offers into the capacity market. That flexibility has been erased and

⁵⁹ See Protest of the Independent Market Monitor for PJM, Docket No. ER21-2582-000 (August 20, 2021); Answer and Motion for Leave to Answer of the Independent Market Monitor for PJM, Docket No. ER21-2582-000 (September 22, 2021).

all suppliers must go through troubling process in which their view of the cost and risk must be effectively blessed by PJM and the IMM.⁶⁰ Telling business owners who have invested billions of dollars that they do not control the ability to price their product is a tough message for any rational business owner to swallow.

The proposed changes to the VRR curve should be considered in light of the overall state of PJM's capacity market. The last two PJM auctions sent a retirement signal to over 15,000 MW of resources that did not clear the auction. Revised approaches to the MSOC and the MOPR clearly played a role in those auctions. If this is the trend that PJM and the Commission desire, then the PJM filing should accelerate the retirement of even more resources. If PJM and the Commission are concerned about the reliability challenges that PJM is now clearly articulating, this filing would be a great opportunity to send a message that the Commission is concerned and reject PJM's attempt to further squelch capacity market price signals.

E. Public Interest Entities Ignore the Reality of State Policies

Again, as it relates to the impact of state policies, the Public Interest Entities offer arguments that are nearly impossible to square with reality. It is irrefutable that under current Illinois law combined cycle plants would have to close in 2045 if not sooner.⁶¹ While it may be “legally” possible for a new CC to be permitted, financed, constructed and operational by 2030, Illinois law would require that CC to shut down in 2045. Just as there is nothing to legally

⁶⁰ See, Request for Rehearing of Calpine Corporation, LS Power Associates, L.P., Talen Energy Marketing, LLC, the Electric Power Supply Association and The PJM Power Providers Group, Docket Nos EL19-47 -000 and EL19-63-000, October 4, 2021.

⁶¹ See, <https://www.sierraclub.org/illinois/climate-and-equitable-jobs-act>.

prevent Chairman Glick from playing for the New York Mets⁶², the prospects for a new CC in IL in 2028 are equally remote because of the state policies in that state.

P3 also fully agrees with the Public Interest Entities that the same state policies that challenge the prospect of CC's would also challenge the prospects of a CT which is precisely why P3 recommends that PJM and the Commission begin the process of identifying the appropriate carbon-free reference resource for the next VRR reset in 2026. Given the numerous statements by members of the Public Interest Entities in promoting clean energy resources, this would seem to be a ripe area for collaboration.⁶³

F. The Goal of the Capacity Market is to Produce Prices that are Reflective of Market Conditions

It is laughable to suggest, as the Public Interest Entities attempt to do on multiple occasions, that P3 and its members' goal is "unduly high" capacity prices. P3 has consistently advocated for competitive capacity markets that are well-designed and will lead to lower prices to consumers. Capacity prices should be neither too high nor too low in order to effectively send the appropriate price signals to resources that should retire, continue, or be constructed. Confidence in those price signals is essential to the overall success of the markets. If prices are consistently below market conditions due to a flawed market structure, non-market, or out of market actions will be the new normal and consumers will be paying higher prices than they should. That is not a world P3 members aspire to operate within.

⁶² See, <https://www.utilitydive.com/news/FERC-iso-ne-ercot-miso-extreme-winter-weather-report/634682/>.

⁶³ See, <https://coal.sierraclub.org/campaign>. Sierra Club's posture in this proceeding (in which it is arguing that a natural gas fired combined cycle plant is an appropriate reference resource) seems at odds with its national goals which include, "We want to stop all new gas infrastructure."

Consumers should be incredibly concerned about the proliferation of non-market and out-of-market solutions to resolve reliability issues that are on the horizon if regulatory actions are not taken. The Fixed Resource Requirement or FRR is trotted out as an available tool that utilities can use to assure resource adequacy. While true, PJM struggles to think that the consumers of Appalachian Power who are paying \$503/MW/Day for capacity while most of PJM is paying \$50/MW/Day are feeling great about the option that was chosen for them.⁶⁴

Reliability Must Run or RMR contracts are another less than ideal option. The Commission has struggled with RMR arraignments in California⁶⁵ and New England⁶⁶ and in PJM the IMM recently commented about RMR's that, "The need to retain uneconomic units in service reflects a flawed market design and/or planning process problems."⁶⁷ Commissioner Danly has been even more direct in his criticism of RMR contracts, "RMR agreements are a product of market failure, and they themselves cause markets to fail. This further failure arises as RMR agreements obscure the market signals that would create incentives for the very development that the markets are intended to deliver."⁶⁸ A future that involves more RMRs brought about by market failure is not one in which consumers are the winners.

Suppliers, consumers, and regulators should have the shared goal of competitive capacity prices that are reflective of market conditions to avoid expensive tools such as RMRs and FRR. It also is unwise to tinker with the capacity market design every time energy market conditions

⁶⁴ See, <https://www.pjm.com/markets-and-operations/billing-settlements-and-credit/fr-lse-capacity-rates>.

⁶⁵ See, 168 FERC ¶ 61,199

⁶⁶ See, *Constellation Mystic Power, LLC*, Docket No. ER18-1639-000 (and all subdockets).

⁶⁷ See, https://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2022/2022q2-som-pjm.pdf at 347.

⁶⁸ See, 172 FERC ¶ 61,111, Danly dissent.

change. Clearly, given PJM's stated need for more resources, the current complexion of the queue, and the strong demand that is anticipated to grow, PJM's capacity market should be sending the appropriate price signals through a properly-designed competitive market for more capacity. Given PJM's public warnings that reliability is not guaranteed, PJM should not be implementing a capacity market design that decreases procurement and lowers prices to decrease recover of missing money or diminish capacity market revenues that will lead to more out of market actions to preserve reliability.

G. PJM's and the Public Interest Entities' Reference to Prior P3 Comments on the Proposed E&AS Offset are Misplaced and Out of Context

Both PJM and the Public Interest Entities point to prior P3 comments related to the forward-looking methodology to suggest that P3 should now be comfortable with PJM's current proposal.⁶⁹ These prior P3 comments were made in the context of the ORDC proceeding which has an extremely muddled procedural history.⁷⁰ P3 fully supported PJM's reserve pricing proposal in 2019 which originally did not include a change from a historical E&AS to what PJM referred to as a "forward-looking E&AS." It was only after FERC accepted the ORDC that the Commission required PJM to file a compliance filing to implement a forward-looking mechanism. P3 did not appeal the Commission's decision (although other parties did) because the ORDC represented a significant and appropriate improvement to PJM's markets AND P3 knew that the CT would remain the reference unit for subsequent auctions. Ironically, the Commission eventually reversed its position on the ORDC and required PJM to reinstate the

⁶⁹ PJM Answer at p. 5 and Public Interest Entities Answer at p. 23.

⁷⁰ 177 FERC ¶ 61,209.

historical offset so the changes to which PJM and the Public Interest Entities offer comment never went into effect.

There were many cross currents associated with the ORDC proceeding that make it difficult to consider comments regarding the appropriate offset in isolation. However, P3's current concerns with the move to the proposed E&AS are compounded by the decision to switch to a CC reference unit, implications associated with the proposed E&AS Offset dispatch rules, and timeframe against which PJM proposes to use ICE daily settlement prices as a "forward-looking" proxy. The problems associated with the proposed calculation of the forward E&AS are magnified by the decision to switch to a reference unit that runs more frequently in the energy markets. Had the Commission attempted to change the reference unit in the ORDC docket (ER19-58) as it was changing to a forward-looking EAS, P3 certainly would have raised a concern.

III. CONCLUSION

The Public Interest Entities seem confident that the market conditions that existed from 2010 to 2020 still exist and will continue to be in existence in 2030. They are mistaken in that view. Rejecting PJM's VRR proposal will not fix the other problems associated with the capacity market, but it would be a meaningful start and certainly send a signal that the Commission is concerned about future reliability issues in PJM, that PJM is clearly acknowledging, and is willing to take the regulatory actions necessary to reverse the recent and consistent efforts to neuter the PJM capacity construct so that it can meet its promise of providing adequate resources to meet the needs of the PJM region. 2028 will be very different than 2018. The Commission needs to recognize that and act in 2022.

For the foregoing reasons, P3 respectfully requests that the Commission grants this Motion and consider this Answer.

Respectfully submitted,

On behalf of The PJM Power Providers Group

By: Glen Thomas

Glen Thomas

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November 14, 2022

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document on each person designated on the official service list compiled by the Secretary of the Federal Energy Regulatory Commission in this proceeding.

Dated at Washington DC, this 14th day of November, 2022.

On behalf of The PJM Power Providers Group

By: Diane Slifer
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Attachment A

Reply Affidavit
Tanya L. Bodell

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**REPLY AFFIDAVIT OF TANYA L. BODELL
ON BEHALF OF PJM POWER PROVIDERS GROUP**

I. INTRODUCTION

1. My name is Tanya L. Bodell. I am a Partner at StoneTurn Group LLC.
2. I previously submitted an affidavit with a copy of my curricula vitae to the Federal Energy Regulatory Commission (“Commission”) in this docket.¹
3. To summarize the relevant experience listed in my curricula vitae, I have worked on multiple projects related to analyzing tradebooks, physical energy markets, forward trading, and centralized futures exchanges to assess the validity of market-to-market, forward transactions, and financial futures. As part of my consulting practice that performs market modeling, price forecasting, market assessments, I rely on understanding market conditions and the price series available to price the market. I have had multiple conversations with representatives at data service providers such as Bloomberg, ICE, CME Group, Energy Exemplar, Ventyx, GE, and other companies that license trade data and proprietary production cost models for projecting the fundamentals of energy and natural gas markets in the United States and Canada.

II. PURPOSE OF AFFIDAVIT

4. The purpose of this reply affidavit is to respond to the PJM Answering Filing,² the Answering Affidavit of the Brattle Group (referred to as “Brattle” for the authors and “Brattle Answering Affidavit” for their report),³ the Affidavit of Dr. Walter F. Graf (“Graf

¹ *PJM Interconnection, L.L.C.*, Protest of The PJM Power Providers Group, Affidavit of Tanya L. Bodell on behalf of The PJM Power Providers Group, Docket No. ER22-2984-000, October 21, 2022 (“Bodell Affidavit”).

² *PJM Interconnection, L.L.C.*, “Motion for Leave to Answer and Answer of PJM Interconnection, L.L.C.,” United States of America Before the Federal Energy Regulatory Commission, PJM Interconnection, L.L.C., Docket No. ER22-2984-000, November 7, 2022.

³ *PJM Interconnection, L.L.C.*, “Motion for Leave to Answer and Answer of PJM Interconnection, L.L.C.,” Answering Affidavit of Samuel A. Newell, Kathleen Spees, and John M. Hagerty on Behalf of PJM Interconnection, L.L.C. Regarding Variable Resource Requirement Shape and Parameters, United States of America Before the Federal Energy Regulatory Commission, PJM Interconnection, L.L.C., Docket No. ER22-2984-000, November 7, 2022.

Of note, the Brattle Answering Affidavit does not include James A. Read Jr. who was one of the authors of the original Brattle EAS Affidavit, previously prepared an expert report on the determination of settlement prices for natural gas and crude oil futures contracts in a dispute between the NYMEX and the Intercontinental Exchange (ICE), and is listed on the Brattle website as having been an expert in matters concerning “securities, energy trading . . . and . . . alleged manipulation of electricity and natural gas markets.”

Affidavit”),⁴ Answer of the Public Interest Entities (“Public Interest Entities Reply Filing”),⁵ and the Reply Affidavit of James F. Wilson.⁶

5. My conclusions are as follows:
- a. The intersection of energy markets and capacity markets is why PJM’s proposed changes to the Variable Resource Requirement Curve (“VRR Curve”) are problematic.
 - b. The “missing money” problem is the problem with PJM’s proposal.
 - c. PJM’s reply affidavit blurs the important distinction between “forward prices” and “settlement prices.”
 - d. Settlement prices used for mark to market do not necessarily equal market expectations or validation for use in the proposed Energy & Ancillary Services Offset (“E&AS Offset”).
 - e. Dr. Graf’s criticisms of my analysis are unfounded and erroneous.

III. THE INTERSECTION BETWEEN ENERGY AND CAPACITY MARKETS ARE WHY PJM’S PROPOSED CHANGES ARE PROBLEMATIC

6. The Public Interest Entities’ Reply Filing claims that a statement in my affidavit presumes that capacity markets operate in isolation from PJM’s other markets. This accusation is untrue.
7. I agree that capacity markets should interact with energy markets through the *supply curve* where reliability resources submit bids based on their estimates of expected revenues required to provide reliability less net revenues that they expect to receive in other markets. If expectations of net revenues in other markets increase, the *supply curve* for the capacity market should decrease, prices in the capacity market should *decrease* and, with a

⁴*PJM Interconnection, L.L.C.*, “Motion for Leave to Answer and Answer of PJM Interconnection, L.L.C.,” Affidavit of Walter F. Graf, United States of America Before the Federal Energy Regulatory Commission, PJM Interconnection, L.L.C., Docket No. ER22-2984-000, November 4, 2022

⁵ *PJM Interconnection, L.L.C.*, “Motion for Leave to File Answer and Answer of the Sierra Club, Illinois Citizens Utility Board, New Jersey Division of Rate Counsel, Maryland Office of People’s Counsel, The Office of The People’s Counsel for the District of Columbia, Delaware Division of the Public Advocate, Pennfuture, Southern Environmental Law Center, Natural Resources Defense Council, and The Sustainable FERC Project,” United States of America Before the Federal Energy Regulatory Commission, PJM Interconnection, L.L.C., Docket No. ER22-2984-000, November 4, 2022.

⁶ *PJM Interconnection, L.L.C.*, Answer of Public Interest Entities, “Reply Affidavit of James F. Wilson in Support of the Reply Comments of the Public Interest Entities,” United States of America Before the Federal Energy Regulatory Commission, PJM Interconnection, L.L.C., Docket No. ER22-2984-000, November 4, 2022.

downward-sloping demand curve, the quantity procured would *increase*.⁷ That is consistent with economic theory and that is how the PJM’s capacity market is structured to work.⁸

8. The issue created by PJM’s proposal occurs with the interaction between other PJM markets and the capacity *demand curve*. As structured, the VRR Curve incorporates an administratively-set estimate of net revenues from other markets through the E&AS Offset. This design has the potential for generating perverse price signals,⁹ but the impact currently is mitigated by a number of market design characteristics that PJM proposes to change as part of this quadrennial review.¹⁰
9. Under PJM’s quadrennial filing, the move to a combined cycle reference unit and the proposed E&AS Offset introduces a new dynamic into the demand curve that did not exist before. Namely, significantly greater energy margins for hours outside of scarcity periods, magnified by the proposed E&AS Offset, would be incorporated into the Net CONE and impact the shape and dynamic of the demand curve. The respondents support this impact by claiming it is minimal or consistent with choosing the combined cycle as the reference unit. It remains undisputed that PJM’s proposed changes serve to accentuate the relationship between energy markets outside of scarcity hours and the *demand curve*, increasing the magnitude of incorrect price incentives and procurement.¹¹
10. Aside from sending an inappropriate economic price signal for reliability procurement,¹² the introduction of energy market margins during non-scarcity hours into the *demand curve* will have a disproportional impact on reliability units that operate primarily in capacity markets.
11. In the capacity market *supply curve*, as part of the Minimum Offer Price Rule (“MOPR”) Effective with the 2023/24 Delivery Year, the E&AS Offset of a combined cycle reference unit is limited to peak price hours only (i.e., 5 x 16).¹³ This design decision is consistent

⁷ Conversely, if expectations of net revenues increase, the supply curve would shift to the left, prices in the capacity market should increase, and the quantity procured would decrease.

⁸ If the market-clearing resource in PJM’s capacity market is a pure capacity unit – a unit that does not operate in energy and ancillary services markets – then the net revenues from interaction with other markets would be zero, and the influence of other PJM markets on capacity market prices and quantity would not be affected at the margin.

⁹ Bodell Affidavit at section IV.1.

¹⁰ See Bodell Affidavit at ¶¶ 10, 13, 20, 24, 25, 69, 72, 98, 116, 118, 123, 193.

¹¹ Ibid.

¹² Bodell Affidavit at section IV.

¹³ PJM OATT, Attachment DD Section 5.14(h-2)(3)(A)(iv) referencing the handling of the CC units in the Peak Dispatch Model, <https://agreements.pjm.com/oatt/5156>

(iv) for combined cycle resource type, the net energy and ancillary services revenue estimate shall be determined in the same manner as that prescribed for a combustion turbine resource type, except that the heat rate assumed for the combined cycle resource shall be 6,553 BTU/kwh, the variable operations and maintenance expenses for such resource, inclusive of Maintenance Adder costs, shall

with limiting energy market net revenues to periods in which scarcity events, and therefore the “missing money,” may occur.

12. In contrast, PJM’s proposal would generate an E&AS Offset for the combined cycle reference unit based on economic dispatch 24 hours per day, 7 days per week (“24 x 7”). As a result, net revenues estimated to come from energy markets for non-scarcity pricing hours would be incorporated into the capacity *demand curve*, even though they currently are excluded from the *supply curve*. This inconsistency remains unexplained.
13. Although the reply filings and affiants explained why energy market margins should be incorporated into the capacity market, none of them explain why net revenues for hours outside of scarcity periods should impact the shape of the *demand curve* for reliability and reduce recovery of capacity market revenues for pure capacity units when the combined cycle reference unit is experiencing high energy margins.

IV. THE MISSING MONEY PROBLEM IS THE PROBLEM WITH PJM’S PROPOSAL

14. The reply filings and associated affidavits reference the “missing money” problem and explain that the capacity market price is meant to recover the “missing money” that a new entrant requires in addition to other net revenues in order to recover its cost of new entry.¹⁴ In addition, the interaction between energy and capacity markets would encourage new development and retirements of existing units.¹⁵ I agree, and this is exactly why the PJM proposal is flawed and antithetical to the purpose of the capacity market design.
15. Capacity markets originally were designed to make up for missing money lost during scarcity conditions,¹⁶ but there is a discrepancy between the intent of the capacity market to recover the “missing money” and PJM’s proposed VRR Curve changes.

be \$2.11/MWh, the Peak-Hour Dispatch scenario for both the Day-Ahead and Real-Time Energy Markets shall be modified to dispatch the CC resource continuously during the full peak-hour period, as described in Peak-Hour Dispatch, for each such period that the resource is economic (using the test set forth in such section), rather than only during the four-hour blocks within such period that such resource is economic, and the ancillary services revenue shall be \$3,350/MW-year.

¹⁴ See for example Wilson Reply Affidavit at ¶ 17; his reference to “E&AS revenues” should be “net E&AS revenues” to net out the cost of achieving the E&AS revenues.

¹⁵ Reply Filing of Public Interest Entities at p. 9.

¹⁶ **Roy Shanker** is credited with introducing the term in his 2003 FERC filing for standard market design, “I refer to the difference between revenues generated by the current market and revenues that are needed to both motivate new entry in the market and properly compensate existing resource adequacy suppliers as the ‘missing money’.” (Shanker, 2003).

Dr. William Hogan noted in 2005, “. . . the missing money problem arises when occasional market price increases are limited by administrative actions such as price caps,” and can be resolved in energy markets by either eliminating the caps or creating a scarcity price signal (Hogan, 2005).

16. The capacity market *supply curve* incorporates expectations of the missing money given reliability supplier expectations of Gross Cost of New Entry (“Gross CONE”) less net revenues from energy and ancillary services markets (“Net CONE”).
17. The *demand curve* is meant to reflect the demand for reliability, with the kink set at an administrative value that historically has reflected the Net CONE of a generation technology representing something close to a pure reliability unit. The choice of a combustion turbine is appropriate because it only operates during scarcity conditions. As Brattle explained in a 2012 report to ERCOT:

Capacity payments only replace the “missing money” that results from high mandated reserve margins depressing energy market prices (by lowering market heat rates **and avoiding scarcity prices**). In capacity markets as well as energy-only markets, the all-in “price” paid by customers must be sufficient to support investment in new generation. It is even conceivable that such all-in prices could be lower with a capacity market, if it reduces revenue volatility and regulatory risk, thereby lowering investors’ cost of capital (emphasis added).¹⁷

18. Introducing an energy-producing combined cycle as the reference unit, combined with the proposed E&AS Offset methodology that now allows for economic dispatch in all hours of the day every day, and creates a new offset and dynamic for the E&AS Offset due to hours outside of scarcity events. This new component inserts a price signal into the *demand curve* and increases price volatility in capacity market prices that did not exist before, disproportionately impacting peaking units¹⁸ and potentially increasing the cost of capital.¹⁹ It also serves to offset quantity cleared.
19. The result of this inconsistency is exacerbation of an incorrect market price signal created by the VRR Curve construct:

Dr. Paul Joskow noted in 2008: “Improvements in “energy-only” wholesale electricity markets, especially those that improve pricing when capacity is fully utilized, can reduce the magnitude of the missing money problem.” (Joskow, 2008).

¹⁷ The Brattle Group, Samuel Newell, Kathleen Spees, Johannes Pfeifenberger, Robert Mudge, Michael DeLucia, and Robert Carlton, “ERCOT Investment Incentives and Resource Adequacy,” Prepared for ERCOT, June 1, 2012, pp. 115-116 (“Brattle ERCOT Report”), https://www.brattle.com/wp-content/uploads/2017/10/8240_ercot_investment_incentives_and_resource_adequacy_newell_spees_pfeifenberger_mudge_ercot_june_2_2012.pdf

¹⁸ The higher volatility in Net CONE and therefore prices is illustrated in multiple ways in Bodell Affidavit (see Figures 12, 13 and 15. Mr. Wilson suggests that I could have performed an analysis of the alleged volatility using historical prices. With all due respect, I refer him to the results of the analysis I performed using five years of historical conditions to compare the volatility of Net CONE using the historical versus the proposed approach using both a combustion turbine and combined cycle reference units, Bodell Affidavit, section VI.2.

¹⁹ See the Brattle ERCOT Report, p. 116.

- a. The shape of the *demand curve* for reliability, which is based on a 1-in-10 year reliability requirement, would respond to net revenues earned by a combined cycle outside of scarcity events, including off-peak hours, shoulder hours, weekends, and seasonal periods when such scarcity events generally do not occur.
- b. The higher sensitivity of the combined cycle to changes in natural gas prices magnifies the volatility and distortion that these hours can have on the proposed E&AS Offset, especially during periods of significant changes in short-term energy market prices that will influence ICE daily settlement prices that are incorporated into the proposed E&AS Offset.²⁰
- c. As already explained, the incorporation of energy margins for a combined cycle with round-the-clock economic dispatch into the *demand curve* increases price volatility in the capacity market and sends the wrong market price signal for existing and potential reliability units.²¹
 - i. When energy margins increase (e.g., due to scarcity or natural gas price spikes) for the thirty day trading period in the proposed E&AS Offset, the adjustment causes the *demand curve* to shift down, which results in a *lower price* signal and procurement of *less capacity*.
 - ii. When excess capacity or lower natural gas prices during the thirty day trading period in the proposed E&AS Offset generate lower energy margins, the *demand curve* shifts up, *increasing the price* signal for new capacity and *increasing the quantity* procured.

20. Brattle responds by claiming the impact is minimal, without providing any associated analysis of price volatility, and does acknowledge that the quantity impact is an offset to what would clear on the capacity supply curve.²² However, the supply curve already includes expectations of the missing money – any offset would increase or decrease the missing money that is required by suppliers who either 1) do not operate in energy markets; or 2) who could clear the market but for the quantity offset in the *demand curve*.

21. Incorporating the non-scarcity period net revenues into the E&AS Offset serves to accentuate the direction of capacity market clearing prices and offset the quantity procured. Reliability resources that are not hedged in energy markets would receive greater revenue volatility and a temporal change with respect to when recovery of missing money occurs.

²⁰ Brattle acknowledges the higher volatility in natural gas prices, but not the impact on capacity market clearing prices, “Net energy revenues (especially for CCs) are much more sensitive to changes in gas prices, as the market has demonstrated over the past year” (Brattle Answering Affidavit at ¶ 12).

²¹ Bodell Affidavit Figures 10 and 11, p. 31.

²² Brattle Answering Affidavit at ¶ 7. “As resources’ net energy revenues rise, for example, capacity supply curves shift downward. This should set lower capacity prices—and higher reserve margins if the VRR curve remained unchanged.”

- During periods of high energy margins setting the E&AS Offset, a pure capacity unit would lose its own missing money due to the combined cycle's non-scarcity period revenues shifting the demand curve beyond what would occur with a combustion turbine as the reference unit.
22. Brattle claims that the impact is mitigated because the price cap would increase from 1.75 x Net CONE to 1 x Gross CONE whenever the E&AS Offset is very large.²³ This aspect of the supply curve design actually is problematic because it serves to decrease price elasticity of demand²⁴ to be more like a vertical curve²⁵ during the extreme ends of both high and low energy margin conditions, which serve to steepen the demand curve above the kink and increase price volatility regardless of market conditions.²⁶
 23. The problem with PJM's proposal is that the proper price signal embedded in the *supply curve* is offset by an incorrect price signal exacerbated by combined cycle net revenues outside of scarcity periods in the *demand curve*. This can challenge recovery of the "missing money" for all suppliers, but especially reliability units that primarily operate in the capacity market during periods of scarcity.
 24. On the other hand, a market design that reduces the missing money for capacity units during scarcity periods could overpay those units during periods of excess supply when combined cycles experience lower energy margins and the proposed E&AS Offset raises the combined cycle Net CONE. However, overpayment of the "missing money" would be inconsistent with the stated objectives of PJM's capacity market espoused by the Reply Filings as well as state environmental policy programs, and face the risk of never being realized.²⁷ PJM's dramatic changes to the VRR Curve proposed during the currently high energy margin environment supports this point.
 25. Shifting the reference unit to a combined cycle unit that can be dispatched 24 x 7 as part of the E&AS Offset reduces recovery of actual missing money during periods of higher energy margins. It is uncertain whether this lost missing money can or would be recovered

²³ Brattle Answering Affidavit at ¶ 13.

²⁴ Price elasticity of demand is the percentage change in quantity demanded for a given percentage change in price. A vertical demand curve would have a price elasticity of demand equal to zero, implying that no matter what the price, demand would be the same.

²⁵ The point at which $1 \times \text{Gross CONE} = 1.75 \times \text{Net CONE} = 1 / 1.75 \times \text{Gross CONE} = 0.57143 \times \text{Gross CONE}$.

²⁶ Brattle Answering Affidavit at ¶ 13. Brattle acknowledges that the structure of the demand curve could allow a combustion turbine to earn "the full levelized cost of a CC (which exceeds that of a CT, incidentally)," but this situation seems less theoretical as it would be likely to occur when energy margins are high and the supply curve is suppressed, and more likely to happen when the Net CONE reflects conditions with low energy margins. This statement does not seem to follow from the example Brattle provides for when the E&AS Offset is large as the supply curve would not be likely to be anywhere near Gross CONE when the E&AS Offset is large (and Net CONE could even go negative as described in Bodell Affidavit at ¶ 164). However, the point could apply to periods of low energy margins when the maximum point of the demand curve could increase to 1.75 Gross CONE and the supply curve theoretically could clear above Gross CONE.

²⁷ PJM Answering Filing at p. 6, Public Interest Entities Reply Filing at p. 9; Affidavit of Mr. Wilson at ¶ 17.

during periods of lower energy margins and excess capacity. This asymmetric pay-out results in units that primarily provide capacity from being able to recover their lost missing money.

V. PJM’S REPLY AFFIDAVIT BLURS THE IMPORTANT DISTINCTION BETWEEN “FORWARD PRICES” AND “ICE SETTLEMENT PRICES”

26. To call PJM’s proposed approach the “forward-looking E&AS Offset” is a misnomer.
27. ICE settlement prices for the proposed energy products are used for margin calls, are not explicitly based on traded prices but on a proprietary algorithm, and during illiquidly-traded periods, cannot be claimed to be forward prices.
28. The initial Brattle EAS Affidavit clearly distinguishes between forward contracts, futures contracts, and settlement prices.²⁸ This distinction is important. Although ICE does not provide a comprehensive set of definitions, the CME Group, another exchange that transacts energy futures, does:²⁹
 - a. **“Forward Contract** A private, cash-market agreement between a buyer and seller for the future delivery of a commodity at an agreed price. In contrast to futures contracts, forward contracts are not standardized and not transferable.”
 - b. **“Futures** Standardized contracts for the purchase and sale of financial instruments or physical commodities for future delivery on a regulated commodity futures exchange.”
 - c. **“Settlement** The delivery of cash or commodities in exchange for payment, as specified by the terms of the underlying contract.”
 - d. **“Settlement Price** The official daily closing price of futures and options on futures contracts, as determined in accordance with Rule 813, used by the Clearing House for marking all open positions at the close of the daily settlement cycle.”
29. In summary, forward contracts and futures contracts are transacted between buyers and sellers, and generate an agreed-upon market price for settlement in the future. Such trades may generate price discovery and reflect market expectations concerning future market conditions.³⁰ Actual transactions produce forward prices.

²⁸ Brattle EAS Affidavit at ¶ 44. As noted extensively in the Bodell Affidavit, exchanges consider their settlement prices proprietary and do not make them “publicly available.”

²⁹ CME Group Glossary of Terms, <https://www.cmegroup.com/education/glossary.html>

³⁰ There are exceptions. A bundled or block transaction may not reflect the price of an individual trade. In addition, a small contract may be offered into the market in order to test market demand and/or test market prices.

30. In contrast, daily settlement prices are generated to manage credit risk. ICE settlement prices are explicitly generated for purposes of margin³¹ calls to mitigate credit risk for futures contracts in the period between transaction and delivery. Settling for margin is not a transaction or trade.
31. If the daily settlement price listed in a product guide for a futures contract explicitly refers to prices from a traded contract and trading window, then the daily settlement price would obviously reflect forward prices for periods when those trades are transacted. More generally, however, an exchange such as ICE uses a clearing house that generates settlement prices on a daily basis for purposes of margin calls, regardless of whether there are actual transactions or trade liquidity in the market.
32. Specifically, for periods further out where there are no trades, an exchange clearing house may still produce a settlement price (see Exhibit No. R-1).
33. In the Brattle Answering Affidavit, Brattle only opines on “forward” prices. This generalized term is vague and could mean many things, including forward prices generated from customized forward transactions between parties, forward-looking prices generated by standardized contract transactions in a futures market, or forward-price projections generated by exchanges, consultants, market participants, or proprietary algorithms.
34. This generalization of “forward prices” allows Brattle to truthfully make multiple assertions regarding the benefits of forward prices as a general matter, without specifically opining on whether the proprietary daily settlement prices used by ICE for purposes of

³¹ See Bodell Affidavit at ¶ 76, repeated here for convenience: “The term ‘Settlement Price’ shall mean the daily price of a Commodity Contract as determined by the Exchange on any day for the purpose of meeting Margin requirements on such day.”

Per ICE, “Margin” includes the following:

Maintenance Level (i) The term "Maintenance Level" shall mean the minimum amount of Original Margin and Option Margins a Carrying Member is required to maintain in a Customer Account at all times, as provided in the Rules.

Maintenance Margin (ii) The term "Maintenance Margin" shall mean the minimum amount of Original Margin and Option Margin a Carrying Member is required to maintain in a Customer Account at all times, as provided in the Rules.

Option Margin (iii) The term "Option Margin" shall mean the amount of money, securities or other property required as security for the performance of Options carried in a Customer Account as provided in the Rules.

Original Margin (iv) The term "Original Margin" shall mean the amount of money, securities or other property required as security for the performance of Futures Contracts carried in a Customer Account, as provided in the Rules.

margin calls do or do not reflect market transactions and market expectations of future conditions.³²

35. Brattle's broad generalizations, however, do not stop PJM from connecting Brattle's generalized accolades regarding forward prices to the more specific PJM methodology and reliance on ICE daily settlement prices. Specifically:

- a. PJM's Reply Filing makes two claims that are not supported by the actual testimony:

PJM's forward-looking EAS Offset is just and reasonable and "consistent with commercial practices, as [Brattle] would [use] when supporting a client in an investment or contract decision for a similar [three-year forward] timeframe."³³

...

Brattle has testified that PJM's approach, which uses the ICE settlement prices, utilizes "commercial practices, as we [Brattle] would when supporting a client in an investment or contract decision for a similar timeframe"³⁴

Clearly, PJM is trying to draw a link between Brattle's commercial practices and PJM's proposed methodology, even explicitly claiming that Brattle has testified that they are consistent.

However, the referenced paragraph only provides a generalized discussion on principles and methodology:

To estimate expected net EAS revenues in the delivery year, we recommend that PJM adopt **principles and methods** that are consistent with commercial practices, as we would when supporting a client in an investment or contract decision for a similar timeframe. One of those **principles** is to rely on market prices to the extent they are observable. In this case, we recommend using forward prices for delivery of electric energy and natural gas to PJM market participants. **Forward prices reflect expectations of market conditions at contract delivery dates and locations,** and thus should incorporate assessments of the many factors that will determine prices at delivery, including such factors as fuel supply and demand, additions and retirements of generation and

³² Other than opining on the benefits of a forward-looking approach in general, Brattle only addresses the issues we raised on settlement prices in one paragraph, leaving the primary defense on using settlement prices to Dr. Graf.

³³ PJM Answering Filing, p. 4, referencing the Brattle EAS Affidavit at ¶ 15.

³⁴ PJM Answering Filing, p. 13. Note that the reference to Brattle EAS Affidavit at ¶ 6 is incorrect and should be at ¶ 15.

transmission capacity, and changes to market design. (emphasis added)³⁵

Brattle’s recommendations pertain to principles and methods, including relying on “market prices to the extent they are observable.”³⁶ The cited testimony does not claim the proposed reliance on settlement prices reflects market conditions.

ICE daily settlement prices that do not explicitly reference actual trades and rely on a proprietary algorithm that does not disclose any observable price observations violate this principle.

- b. PJM’s Reply Filing also asserts: “The record shows that the ICE settlement prices for PJM forward energy prices are relied on by market participants — both to estimate expected energy market revenues and for mark to market purposes.”³⁷

The record does not show that ICE settlement prices are used to estimate expected energy market revenues. There is no testimony that identifies by name a single market participant or group of market participants that uses ICE daily settlement prices to estimate “expected energy market revenues.” Although both Brattle and Mr. Wilson claim to use “forward prices” for forecasting, and Dr. Graf references a 2010 CFTC study to claim they provide “price discovery,”³⁸ none of the affiants define the period for which they use those prices or the purpose. And neither of them explicitly claim that they use ICE daily settlement prices to project expected “energy market revenues” for illiquidly-traded periods further out into the future.

36. Despite Brattle’s generalized discussion regarding the market-based benefits of forward prices, there is nothing in the record that supports those benefits with respect to ICE daily settlement prices and what they represent more than three and a half years out. Despite all of the reply filings and affidavits, the actual ICE settlement prices recommended to be used in the proposed E&AS Offset:
 - a. Have not had the underlying basis that underpins the daily settlement price revealed (average of daily trades, last trade, the underlying algorithm, etc.);
 - b. Have not been “validated as forward market views”³⁹;

³⁵ Brattle EAS Affidavit at ¶ 15.

³⁶ Ibid.

³⁷ PJM Answering Filing, pp. 5-6.

³⁸ Graf Affidavit at ¶ 16.

³⁹ Brattle Answering Affidavit at ¶ 15.

- c. Are not proven to "provide a good estimate of the market's expectations for CCs' revenues"⁴⁰;
- d. Do not "rely on market prices"⁴¹ because there are few to no trades in the forward-looking period;
- e. Have not been shown to reflect "expected forward-looking market conditions that actual developers face"⁴²;
- f. Do not prove that "a forward EAS offset meets RPM objectives better than a historical one because it reflects expected forward-looking market conditions"⁴³;
- g. Do not "reflect the expected range of possible supply, demand and export conditions prevailing in future delivery periods"⁴⁴;
- h. Have not been shown to be relied on by the market "for estimating expected energy market revenues"⁴⁵ during illiquidly-traded periods;
- i. Have not been shown to "allow the capacity market to better fulfill its purpose of providing the "missing money" the resource requires but is not recovering from the energy and ancillary services market and thus ensure just and reasonable rates."⁴⁶

Without access to the underlying algorithm for the ICE settlement prices PJM proposes to use, or a better understanding of the basis for the settlement prices that ICE uses to collect margin for the PJM hubs, there is no way to test and verify the above assertions.

37. In the end, Brattle only specifically references the ICE daily settlement prices in its Answering Affidavit by stating two unconvincing facts:

It remains the case that these forward settlement prices are validated as forward market views by (1) their use to mark outstanding contracts (i.e., "open interest") to market and adjust margin requirements; and (2) their widespread use by market participants for forecasting purposes.⁴⁷

Neither supports use of ICE daily settlement prices as a market expectation, market price, or forward prices, for the reasons elaborated upon in the next section.

⁴⁰ Brattle Answering Affidavit at ¶ 18.

⁴¹ Brattle Answering Affidavit at ¶ 6.

⁴² Brattle Answering Affidavit at ¶ 18.

⁴³ Brattle Answering Affidavit at ¶ 18.

⁴⁴ Brattle Answering Affidavit at ¶ 17.

⁴⁵ PJM Answering Filing, p. 14.

⁴⁶ Brattle Answering Affidavit at ¶ 9.

⁴⁷ Brattle Answering Affidavit at ¶ 15.

VI. USE AS MARK TO MARKET DOES NOT EQUAL MARKET EXPECTATIONS OR VALIDATION FOR USE IN THE PROPOSED E&AS OFFSET

38. The use of ICE settlement prices for daily marks for purposes of margin calls is undisputed and irrelevant for assessing whether such marks should be used in the proposed E&AS Offset.

39. Any exchange and its clearing house will define a daily means of marking to market a futures contract traded on the exchange. The daily settlement price usually is specified by a product guide issued by the exchange as well as other information regarding the clearing house rules. For purposes of daily settlement, marks generally can take a variety of forms, depending on the liquidity and availability of observable prices.

40. The CME Group, an exchange that serves as the market for a number of energy futures contracts,⁴⁸ defines settlement prices as follows:

“Settlement is an official CME Group price established for the instrument at a given point in the trading day. CME Group staff determines the daily settlements for all contracts with volume or open interest.”⁴⁹

41. The CME Group explicitly lists the potential ways it calculates settlement prices:⁵⁰

- a. Preliminary/Final
- b. Actual/Theoretical
- c. Settlement at Trading Tick / Settlement Clearing Tick
- d. Intraday

A “theoretical” settlement prices as: “Any settlement price that is not an actual settlement, often a system-generated price not derived from any fundamental market information.”⁵¹

42. ICE provides its own clearing house services in support of its exchanges. Energy futures identified for use in the proposed E&AS Offset are subject to ICE Clear U.S., which is primarily regulated by the U.S. Commodities Futures Trading Commission (“CFTC”).⁵²

⁴⁸ CME Group, Energy, <https://www.cmegroup.com/markets/energy.html>

⁴⁹ CME Group, Definition of Settlement Prices, <https://www.cmegroup.com/confluence/display/EPICSANDBOX/Settlement+Prices>

⁵⁰ Ibid.

⁵¹ Ibid.

⁵² Some of the reply filings questioned the application of the definition of publicly-available data that cited the CFTC definition claiming that the Commission was not subject to CFTC oversight (Reply Filing of the Public Interest Entities at p. 11).

The Clearing House disclosure indicates that the goal of daily settlements is to ensure adequate protection against default.⁵³

43. In addition, ICE publishes product guides for each type of contract detail: 1) the specifics of the settlement price at delivery and, 2) whether the daily settlement price is based on traded forward prices.
44. When market prices can be used as the settlement price, the exchange can define the contract traded and specific trading window. For example, ICE product guides define daily settlement prices for the following energy futures contracts:
 - a. **Brent Crude:** The ICE product guide for Brent Crude lists the daily settlement price as the “weighted average price of trades during a two minute settlement period . . .”⁵⁴
 - b. **Global Carbon Index:** The Global Carbon Index Futures also have daily settlement listed as “16:05-16:15 LLT”⁵⁵ where “LLT” means Last Trading Day Last business day of the month before the Contract Series.
45. There is nothing in the record to indicate that ICE daily settlement prices for the PJM hubs reference transaction prices for a specified window of time, which would support a claim that those settlement prices are based on forward prices created by actual trades.⁵⁶ The ICE Clearing House U.S. does not define specific transactions or trading windows for a “daily settlement” in contracts relevant for the proposed E&AS Offset.⁵⁷ Exhibit No. R-2 provides the product guides for Brent Crude, Global Carbon Index, Henry Hub, and PJM Western Hub Day-Ahead Peak Fixed Price contracts to illustrate the distinction between daily settlement that is explicitly based on forward prices.
46. In summary, there is no standard for establishing the settlement price. Ideally, the settlement price would be based on market prices informed by market trades, but in the absence of trades and transactions, could be based on any number of indices or estimation

ICE Futures U.S. is a Designated Contract Market pursuant to the Commodity Exchange Act and regulated by the CFTC, making the CFTC definition of publicly-available information directly relevant to ICE and the personal data it maintains.

⁵³ ICE does publish a description of its central clearing rules, “Central Clearing Proven, Transparent, Regulated Means of Reducing Systemic Risk,”

https://www.theice.com/publicdocs/Central_Clearing_Reducing_Systemic_Risk.pdf, p. 5.

⁵⁴ ICE Clearing House Europe, Brent Crude Futures product guide, <https://www.theice.com/products/219/brent-crude-futures>

⁵⁵ ICE Clearing House Europe, Global Carbon Index product guide, <https://www.theice.com/products/82118761/Global-Carbon-Index-Futures>

⁵⁶ Mr. Wilson claims that I do not provide a citation that the ICE settlement prices rely on an algorithm, Reply Affidavit of Mr. Wilson at ¶ 21.

⁵⁷ ICE Clearing House U.S., Henry Hub Fixed Price Future product guide, <https://www.theice.com/products/6590258/Henry-LD1-Fixed-Price-Future>

methods. As a result, there may be considerable differences across exchanges for settlement prices of similar contracts.

47. Both Brattle and Mr. Wilson attempt to explain away the clear pattern of an algorithm in the prices for PJM Western Hub beyond two to three years out, including periods when there are no trades. Neither provide credible or supportable explanations that would indicate the repeating pattern reflects market expectations about future market conditions:

- a. Brattle cites a 1965 article in *Industrial Management Review* to claim that “forward prices” are not as volatile as spot prices due to the Samuelson Hypothesis.⁵⁸

Response: Settlement prices without underlying trades are not forward prices, they are a price generated for purposes of margin calls, so this article is irrelevant to validating PJM’s proposed use of ICE settlement prices and explaining why the ICE daily settlement prices converge into a stable pattern over time.

- b. Mr. Wilson expects that financial players would arbitrage away any difference from “reasonable expectations of future prices.”

Response: Financial traders arbitrage the market, not settlement prices that are used for margin calls.

- c. Dr. Graf claims that prices for futures contracts further out move more slowly than nearer term products which decreases incentives to trade frequently to adjust their positions.⁵⁹

Response: Even if this is true, it supports the fact that the day-ahead contracts are illiquidly-traded in the out-years but does not explain why ICE settlement prices continue past the point where there are any trades on those trading days. In this case, a better explanation is that the prices are being set by an algorithm for purposes of collecting margin, not by transactions that generate forward prices.

48. There is no wondrous market forecasting characteristic of ICE exchange settlement prices that are used as marks for margin calls outside of liquidly-traded periods when actual transaction prices can be observed. Every exchange clearing house has its own settlement price. Data service providers, such as Bloomberg, also provide price indices that can be used for purposes of marking a futures contract to market. Settlement prices can also reference published indices or rely on a proprietary algorithm to ensure adequate coverage for default.

⁵⁸ Brattle Answering Affidavit at ¶ 17, footnote 8.

⁵⁹ Graf Affidavit at ¶ 8

49. To claim that the use of an exchange settlement price created for purposes of settling a margin call tied to open interest during periods of illiquidity “are validated as forward market views” is inaccurate and untrue.
50. Furthermore, there is no basis for deciding what would be the “the best evidence of future market conditions”⁶⁰ and there is no analysis in the record to show that ICE daily settlement prices actually do represent future market conditions. The algorithm that the ICE Clearing House U.S. uses to produce the daily settlement price for purposes of collecting margin has neither been submitted nor assessed as part of these proceedings to allow for such statements to be verified.
51. Although the theoretical use of a settlement price as a forecasting tool may have some support when there is a liquidly-traded market and daily settlements are based on those trades, daily settlement prices produced by an exchange’s proprietary algorithm do not necessarily offer a valid metric of a forward-looking approach for illiquidly *traded* contracts at illiquidly *traded* hubs, regardless of what the open interest may be.
52. As CME’s settlement price description indicates, a daily settlement price does not have to be “derived from any fundamental market information.”⁶¹ There is no evidence in the record that the ICE daily settlement prices for PJM energy and natural gas hubs to be used more than three and a half years out into the future are any better.

VII. DR. GRAF’S CRITICISMS OF MY ANALYSIS ARE UNFOUNDED AND IRRELEVANT

53. Dr. Graf provides a critique of my analysis that is irrelevant.
54. Dr. Graf claims that my liquidity analysis using the ICE contract traded for PJM Western Hub Day-ahead Peak Fixed Price is incomplete because:⁶²
 - a. I only focus on the PJM Western Hub;
 - b. I do not include the off-peak day-ahead prices; and
 - c. I do not include the real-time contracts for peak and off-peak prices.
55. As PJM noted, the PJM Western Hub is one of the most liquidly-traded hubs in North America.⁶³ Any other PJM electricity delivery point is likely to be less liquid. If PJM Western Hub Day-Ahead contracts are shown to be illiquidly-traded, then other hubs are likely to be even less liquidly traded, and therefore do not need to be analyzed to show lack

⁶⁰ Brattle EAS Affidavit at ¶ 42.

⁶¹ CME Group, <https://www.cmegroup.com/confluence/display/EPICSANDBOX/Settlement+Prices>

⁶² Graf Affidavit at ¶ 8

⁶³ PJM Filing, p. 36, “PJM Western Hub remains one of the most liquid trading hubs in the nation.”

of actual trades underlying the settlement prices. Similarly, Henry Hub is one of the most liquidly-traded hubs in North America, and any basis for a different delivery point is likely to be less liquid.

56. I do not combine peak with off-peak day-ahead contracts because the proposed E&AS Offset uses those daily settlement price series for different hours. Including off-peak hours in the analysis of peak trades would double-count activity that is applied to separate hours (peak versus off-peak) in the proposed E&AS Offset.
57. Dr. Graf's focus on the real-time price is irrelevant for the energy component of the proposed E&AS Offset, which is what I address, because the proposed E&AS Offset does not use real-time contracts.

- a. Brattle's recommendation focuses exclusively on futures for the day-ahead contracts:

We recommend using day-ahead futures settlement prices reported by Intercontinental Exchange ("ICE") at these trading hubs from the most recent 30 trading days . . . for PJM Western Hub, PJM Western Hub **Day-Ahead** Peak Fixed Price Future and PJM Western Hub **Day-Ahead** Off-Peak Fixed Price Future; for AEP-Dayton Hub, PJM AEP-Dayton Hub **Day-Ahead** Peak Fixed Price Future and PJM AEP-Dayton Hub **Day-Ahead** Off-Peak Fixed Price Future; for NI Hub, PJM NI Hub **Day-Ahead** Peak Fixed Price Future and PJM NI Hub **Day-Ahead** Off-Peak Fixed Price Future (emphasis added).⁶⁴

- b. The proposed changes to the market rules do not include reliance on ICE real-time contracts for the energy component of the proposed E&AS Offset:

For each liquid hub, calculate the average **day-ahead** on-peak and **day-ahead** off-peak energy prices for each month during the Delivery Year over the most recent thirty trading days as of 180 days prior to the Base Residual Auction. (emphasis added)⁶⁵

- c. Incorporating a metric of real-time prices into a liquidity analysis would overstate the number of trades in the forward-looking timeframe for the specific contract proposed to be used for setting the proposed E&AS Offset.

⁶⁴ Brattle EAS Affidavit at ¶ 24.

⁶⁵ PJM Filing at p. 81; see also the instructions listed on pages 81-83 which reference day-ahead forward prices.

58. It is true, as Dr. Graf indicates, that the Brattle EAS Affidavit included an open interest calculation for day-ahead and real-time peak and off-peak contracts for a single day to illustrate liquidity. My critique remains unchanged.⁶⁶
- a. As previously noted, I disagree with multiple aspects of this liquidity analysis, including the use of open interest to measure the ability of the forward price to reflect market expectations.⁶⁷
 - b. I acknowledge that Brattle did include real-time price trades with the peak and off-peak trades to measure liquidity, but this overstates open interest for the recommended contract settlement prices that PJM proposes to use for the peak versus off-peak periods.
 - c. It is unclear why peak contracts should be used to estimate the liquidity of off-peak contracts and vice versa given that each type of contract is used to feed into separate pricing time periods in the proposed E&AS Offset.
 - d. Also perplexing is Dr. Graf's criticism that I ignored trade liquidity for contracts outside of the day-ahead contracts proposed E&AS Offset approach despite the fact that they have similar settlement prices.⁶⁸ In illiquidly-traded markets, daily settlement prices across contracts may be similar if the underlying algorithm used to calculate the daily settlement price to collect margin was applied to both contracts. However, neither Brattle nor Dr. Graf have admitted that an algorithm is used to calculate settlement prices or presented any other support for combining the set of contracts that Dr. Graf claims should be combined when assessing trade liquidity.⁶⁹
 - e. Dr. Graf's criticisms do not change my opinion regarding the lack of trade liquidity for the recommended day-ahead contracts for the timeframes to be used in the proposed E&AS Offset. For more than three and a half years out into the future when there are few observable trades and illiquidly-traded contracts, ICE settlement prices would be more reflective of a margin call, not market expectations about future conditions.

⁶⁶ Brattle EAS Affidavit at ¶ 48.

⁶⁷ Bodell Affidavit, section III.1.1.

⁶⁸ Brattle EAS Affidavit at ¶ 48.

⁶⁹ "ICE's Clearing Admin application has been historically used by Clearing Firms to create and manage accounts for trading clearable OTC and Futures products . . ." ICE, Clearing Admin Broker Permissioning User Guide, 2009, p. 3, https://www.theice.com/publicdocs/Clearing_Admin_Permissioning_User_Guide.pdf

59. Dr. Graf's use of a CFTC Report from 2010 concerning price discovery is similarly irrelevant.⁷⁰
- a. The CFTC Report refers to the PJM Western Hub Real-time Fixed Prices. The proposed E&AS Offset does not use ICE contracts for PJM real-time fixed price delivery.
 - b. The report is from 12 years ago and clearly states that the findings are only relevant for that time: "Specifically, the Commission has determined that the PJM contract meets the material price reference and material liquidity criteria **at this time.**" (emphasis added)
 - c. Liquidity changes over time across contracts, within an exchange, and across exchanges. To illustrate, CME Group used to exchange a number of natural gas contracts for PJM locations. Many of those were dropped from the exchange due to lack of liquidity.⁷¹
60. This concludes my reply affidavit.

⁷⁰ CFTC, Orders Finding That the PJM WH Real Time Peak Contract and PJM WH Real Time Off-Peak Contract Offered for Trading on the IntercontinentalExchange, Inc., Perform a Significant Price Discovery Function, 75 Fed. Reg. 42,390 (2010).

⁷¹ CME Clearing, CME Group Advisory Notice, Advisory # 17-401, October 16, 2017, <https://www.cmegroup.com/notices/clearing/2017/10/Chadv17-401.html>

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18. *PJM Interconnection, L.L.C.*, Public Interest Entities Answer, “Affidavit of Walter F. Graf,” United States of America Before the Federal Energy Regulatory Commission, PJM Interconnection, L.L.C., Docket No. ER22-2984-000, November 4, 2022.
19. *PJM Interconnection, L.L.C.*, “Motion for Leave to Answer and Answer of PJM Interconnection, L.L.C.,” United States of America Before the Federal Energy Regulatory Commission, PJM Interconnection, L.L.C., Docket No. ER22-2984-000, November 7, 2022.
20. *PJM Interconnection, L.L.C.*, “Motion for Leave to File Answer and Answer of the Sierra Club, Illinois Citizens Utility Board, New Jersey Division of Rate Counsel, Maryland Office of People’s Counsel, The Office of The People’s Counsel for the District of Columbia, Delaware Division of the Public Advocate, Pennfuture, Southern Environmental Law Center, Natural Resources Defense Council, and The Sustainable FERC Project,” United States of America Before the Federal Energy Regulatory Commission, PJM Interconnection, L.L.C., Docket No. ER22-2984-000, November 4, 2022.
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UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

PJM Interconnection, L.L.C.

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Docket No. ER22-2984-000


REPLY AFFIDAVIT OF TANYA L. BODELL
ON BEHALF OF THE PJM POWER PROVIDERS GROUP

I, Tanya L. Bodell, being duly sworn, depose and state that she is the Tanya L. Bodell referred to in the document titled "Reply Affidavit of Tanya L. Bodell on Behalf of PJM Power Providers Group," that the document was prepared by her or under her direction, that she has read such testimony and is familiar with the contents thereof, and that the facts set forth therein are true and correct to the best of her knowledge, information and belief in this proceeding.



Tanya L. Bodell

SUBSCRIBED AND SWORN to
Before me this 14 day of Nov, 2022

Notary Public 
My commission expires: 11-09-2023

Norfolk County
Massachusetts

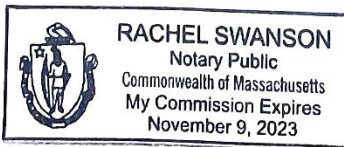
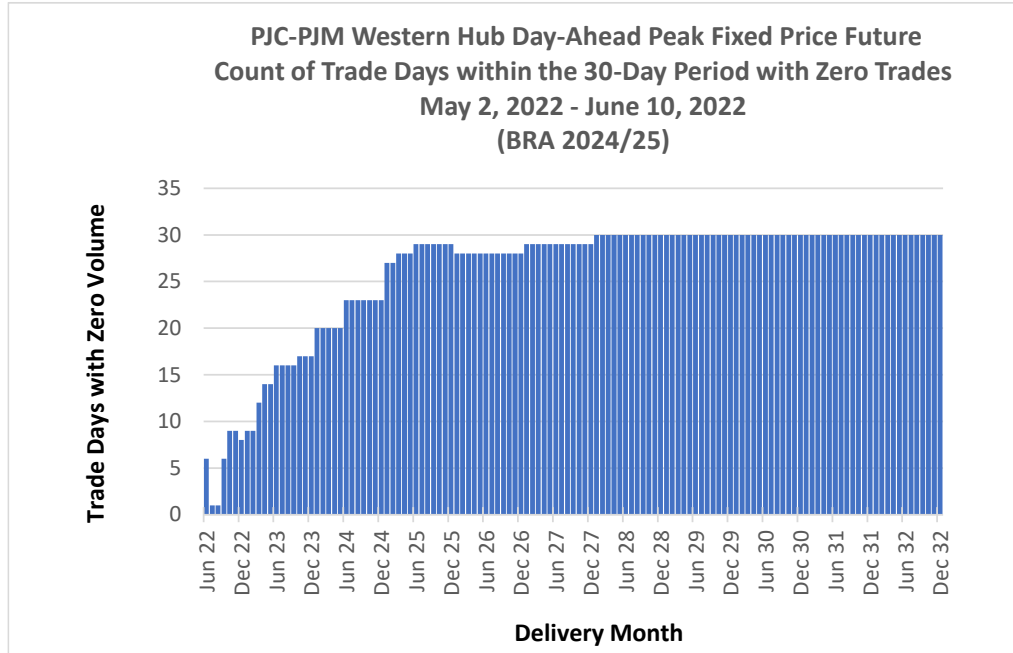


EXHIBIT NO. R-1

**ICE Settlement Prices for
PJM Western Hub Day-Ahead Fixed Price Futures
Peak versus Off-peak**

PEAK HOURS
PJM Western Hub Day-Ahead Peak Fixed Price Futures
Trade Days in the 30-day Period with No Trades versus Reported Settlement Prices



OFF-PEAK
PJM Western Hub Day-Ahead Off-Peak Fixed Price Futures
Trade Days in the 30-day Period with No Trades versus Reported Settlement Prices

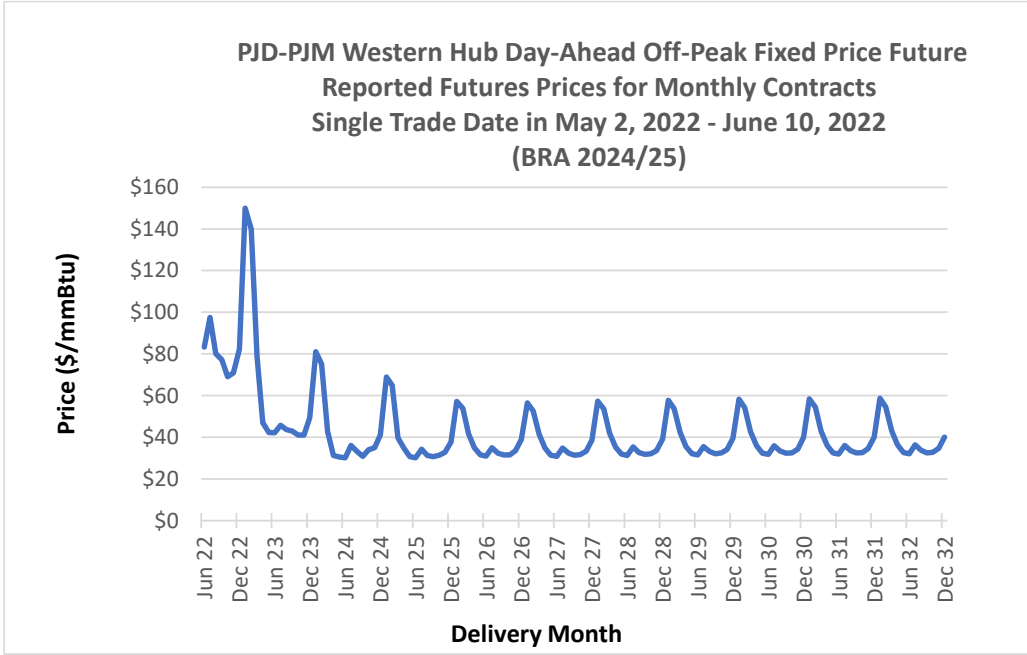
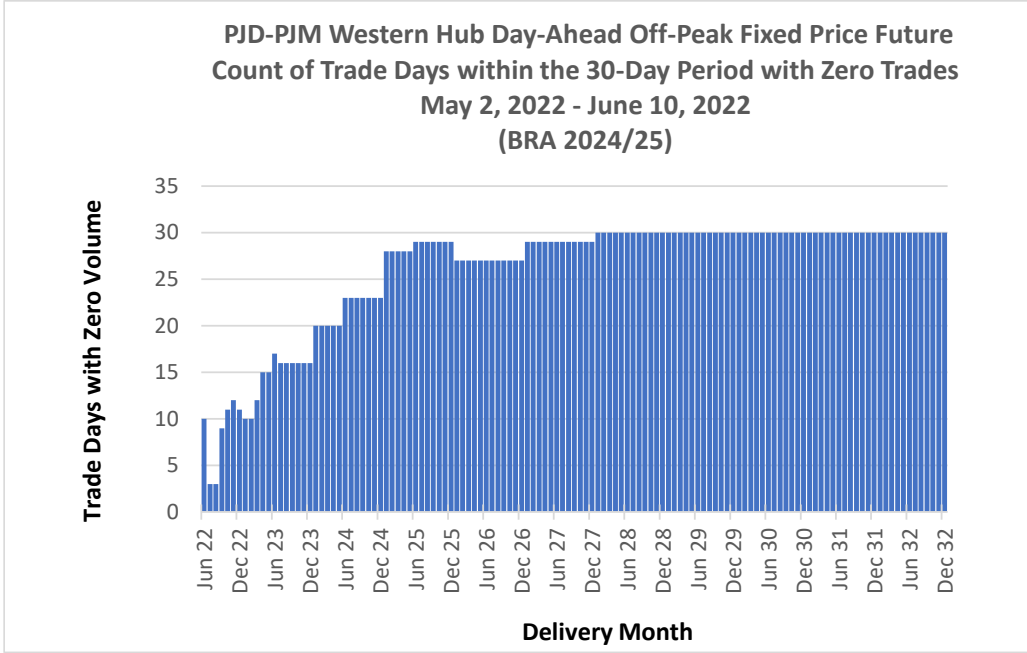


EXHIBIT NO. R-2
Selected ICE Product Guides

ICE: Brent Crude Futures Product Guide

<https://www.theice.com/products/219/brent-crude-futures>



ICE Futures Europe
Nov 12, 2022

ICE FUTURES EUROPE

Brent Crude Futures

Contract Specifications

Description	The ICE Brent Crude futures contract is a deliverable contract based on EFP delivery with an option to cash settle.
Contract Symbol	B
Contract Size	1,000 barrels
Unit of Trading	Any multiple of 1,000 barrels
Currency	US Dollars and cents
Trading Price	One cent (\$0.01) per barrel
Settlement Price	One cent (\$0.01) per barrel
Minimum Price Fluctuation	One cent (\$0.01) per barrel
Expiration Date	Trading shall cease at the end of the designated settlement period on the last Business Day of the second month preceding the relevant contract month (e.g. the March contract month will expire on the last Business Day of January). If the day on which trading is due to cease would be either: (i) the Business Day preceding Christmas Day, or (ii) the Business Day preceding New Year's Day, then trading shall cease on the next preceding Business Day

Contract Specifications

Contract Security	ICE Clear Europe acts as the central counterparty for trades conducted on the London exchanges. This enables it to guarantee the financial performance of every contract registered with it by its members (the clearing members of the exchanges) up to and including delivery, exercise and/or settlement. ICE Clear Europe has no obligation or contractual relationship with its members' clients who are non-member users of the exchange markets, or non-clearing members of the exchanges.
Daily Settlement	The weighted average price of trades during a two minute settlement period from 19:28:00, London time.
Daily Margin	All open contracts are marked-to-market daily.
Position Limit	The Brent crude future is a cash-settled contract. The Exchange's daily position management regime requires that all positions in any contract month must be reported to the exchange on a daily basis. The Exchange has powers to prevent the development of excessive positions or unwarranted speculation or any other undesirable situation and may take any steps necessary to resolve such situations including the ability to mandate members to limit the size of such positions or to reduce positions where appropriate
Expiry Limits	The Exchange may impose limits on positions in this contract at its discretion in accordance with Exchange Rule P3. Current expiry limit: 6,000 contracts in the last five business days, up to and including the expiry day in the spot month, inclusive of futures-equivalent position in Brent Options. Exemptions from expiry limits may be granted at the Exchange's discretion to participants who provide and document a commercial rationale for their requirement
Contract Series	Up to 96 consecutive months
Trading Methods	Electronic futures, Exchange of futures for physical (EFP), Exchange of futures for swap (EFS) and Block Trades are available for this contract.
Delivery/Settlement Terms	The ICE Brent Crude futures contract is a deliverable contract based on EFP delivery with an option to cash settle against the ICE Brent Index price for the last trading day of the futures contract. The Exchange shall publish a cash settlement price (the ICE Brent Index price) on the next trading day following the last trading day for the contract month.

Contract Specifications

NCR, RL and IPL Levels	*NCR: 0.50; RL: 0.75 IPL: 1.00, 3 second recalculation and 5 second hold periods. To access NCR documentation click here
Markers	TAS (Trade at Settlement) MM (Minute Marker) Sing MM (Singapore Minute Marker)
Business Days	ICE Business Days

ICE: Global Carbon Index Funds,
<https://www.theice.com/products/82118761/Global-Carbon-Index-Futures>



ICE Futures Europe
Nov 12, 2022

ICE FUTURES EUROPE

Global Carbon Index Futures

Contract Specifications

Description	A financially settled contract against the Global Carbon Futures Index as published on the ICE Consolidated Feed (Source ID 1827)
Underlying Index	ICECRBN - Global Carbon Futures Index Excess Return
Contract Symbol	CO2
Settlement Method	Cash Settlement
Unit of Trading	\$50 times the Global Carbon Futures Index
Price Quotation	Index Points to two decimal points
Tick Size	0.20 Index points = \$10
Currency	US Dollar and Cents
Daily Settlement	16:05-16:15 LLT
Last Trading Day	Last business day of the month before the Contract Series. If the Underlying Index is not calculated on that day the Last Trading Day shall be the preceding business day on which the Underlying Index is calculated.
Final Settlement	Final Settlement Price shall be the official closing index level of the excess return index on the Last Trading Day.
Listing Cycle	Twelve months in the March, June, September and December quarterly cycle

Contract Specifications

Block Trade Minimum	10 contracts
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ICE: Henry Hub Futures

<https://www.theice.com/products/6590258/Henry-LD1-Fixed-Price-Future>



ICE Futures U.S.
 Nov 12, 2022

ICE FUTURES U.S.

Henry LD1 Fixed Price Future

Contract Specifications

Description	A monthly cash settled Exchange Futures Contract based upon the monthly price published by NYMEX for the location specified in Reference Price A.
Contract Symbol	H
Settlement Method	Cash settlement
Contract Size	2500 MMBtus
Currency	USD
Minimum Price Fluctuation	The price quotation convention shall be One tenth of a cent (\$0.001) per MMBtu; minimum price fluctuation may vary by trade type. Please see Table in Resolution 1 to this Chapter 18.
Listing Cycle	Up to 156 consecutive monthly Contract Periods
Last Trading Day	Three Business Days prior to the first calendar day of the Contract Period
Final Settlement	Reference Price A
REFERENCE PRICE A	NATURAL GAS-NYMEX
a) Ref Price A - Description	"NATURAL GAS-NYMEX" means that the price for a Pricing Date will be that day's Specified Price per MMBTU of natural gas on the NYMEX of the Henry Hub Natural Gas Futures Contract for the Delivery Date, stated in U.S. Dollars, as made public by the NYMEX on that Pricing Date.
b) Ref Price A - Pricing Date	Last scheduled trading day of the NYMEX Henry Hub Natural Gas Futures Contract for the Delivery Date

Contract Specifications

c) Ref Price A - Specified Price	Settlement price
d) Ref Price A - Pricing calendar	NYMEX
e) Ref Price A - Delivery Date	Contract Period
Final Payment Date	The first Clearing Organization business day following the Last Trading Day
Markers	TAS (Trade at Settlement)

ICE: PJM AEP-Dayton Hub Day-Ahead Fixed Price

<https://www.theice.com/products/64286882/PJM-Day-Day-Ahead-Peak-Fixed-Price-Future>



ICE Futures U.S.
Nov 12, 2022

ICE FUTURES U.S.

PJM Day Day-Ahead Peak Fixed Price Future

Contract Specifications

Description	A monthly cash settled Exchange Futures Contract based upon the mathematical average of daily prices calculated by averaging the peak hourly electricity prices published by PJM for the location specified in Reference Price A.
Contract Symbol	DCP
Settlement Method	Cash settlement
Contract Size	1 MW
Currency	USD
Minimum Price Fluctuation	The price quotation convention shall be One cent (\$0.01) per MWh; minimum price fluctuation may vary by trade type. Please see Table in Resolution 1 to this Chapter 18.
Listing Cycle	Up to 50 consecutive monthly Contract Periods
Last Trading Day	The last Business Day of the Contract Period
Final Settlement	Reference Price A
REFERENCE PRICE A	ELECTRICITY-PJM-DAY-DAY AHEAD

Contract Specifications

a) Ref Price A - Description	"ELECTRICITY-PJM-DAY-DAY AHEAD" means that the price for a Pricing Date will be that day's Specified Price per MWh of electricity for delivery on the Delivery Date, stated in U.S. Dollars, published by PJM at http://www.pjm.com/markets-and-operations/energy/day-ahead/lmpda.aspx , under the headings "Daily Day-Ahead LMP: DAY" or any successor headings, that reports prices effective on that Pricing Date.
b) Ref Price A - Pricing Date	Each Monday through Friday, excluding NERC holidays, that prices are reported for the Delivery Date
c) Ref Price A - Specified Price	Average of LMPs for all hours ending 0800-2300 EPT
d) Ref Price A - Pricing calendar	PJM
e) Ref Price A - Delivery Date	Contract Period
Final Payment Date	The second Clearing Organization business day following the Last Trading Day