



Monitoring
Analytics

**Activities of the
Market Monitoring Unit
2022**

Independent Market Monitor for PJM
November 28, 2023

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Preface

This report is posted pursuant to Section VI.C of Attachment M to the PJM Open Access Transmission Tariff (the “PJM Market Monitoring Plan” or “Plan”), which directs the Market Monitoring Unit (“Market Monitor,” also known as the “MMU,” Independent Market Monitor for PJM” or “IMM”) “to prepare a detailed public annual report about the Market Monitoring Unit’s activities, subject to protection of confidential, proprietary, and commercially sensitive information and the protection of the confidentiality of ongoing investigations and monitoring activities.”¹

Monitoring Analytics, LLC serves as the Independent Market Monitor for PJM.² PJM is a regional transmission organization (RTO) that is responsible for ensuring the reliability of the electric power supply system and operating the wholesale power market in 13 states and the District of Columbia. The MMU is responsible for promoting a robust, competitive and nondiscriminatory electric power market in PJM by implementing the PJM Market Monitoring Plan.

The Federal Energy Regulatory Commission (FERC) assigns three core functions to the MMU: monitoring, reporting, and market design.³ The PJM Market Monitoring Plan provides that the Market Monitoring Unit shall objectively monitor the competitiveness of PJM Markets, investigate violations of FERC or PJM Market Rules, recommend changes to PJM Market Rules, prepare reports for the Authorized Government Agencies and take such other actions as are specified in the Plan.⁴

The PJM Market Monitoring Plan provides that the MMU is responsible for monitoring: compliance with the PJM Market Rules; actual or potential design flaws in the PJM Market Rules; structural problems in the PJM markets that may inhibit a robust and competitive market; the potential for a market participant to exercise market power or violate any of the PJM or FERC Market Rules; the actual exercise of market power or violation of the PJM or FERC Market Rules; PJM’s implementation of the PJM Market Rules or operation of the PJM markets; and such matters as are necessary to prepare reports.⁵

¹ PJM Open Access Transmission Tariff (OATT) Attachment M § VI.C.

² See 144 FERC ¶ 61,238 (2013).

³ 18 CFR § 35.28(g)(3)(ii); see also *Wholesale Competition in Regions with Organized Electric Markets*, Order No. 719, FERC Stats. & Regs. ¶31,281 (2008) (“Order No. 719”), *order on reh’g*, Order No. 719-A, FERC Stats. & Regs. ¶31,292 (2009), *reh’g denied*, Order No. 719-B, 129 FERC ¶ 61,252 (2009).

⁴ PJM Open Access Transmission Tariff (OATT) Attachment M § IV.A.

⁵ OATT Attachment M § IV; 18 CFR § 1c.2.

To perform its monitoring function, the MMU screens and monitors the conduct of market participants under the MMU's broad purview to monitor, investigate, evaluate and report on the PJM markets.⁶ The MMU has direct, confidential access to the FERC.⁷ The MMU may also refer matters to the attention of state commissions.⁸

The MMU monitors market behavior for violations of FERC Market Rules.⁹ The MMU investigates and refers "Market Violations," which refers to any "tariff violation, violation of a Commission-approved order, rule or regulation, market manipulation, or inappropriate dispatch that creates substantial concerns regarding unnecessary market inefficiencies..."^{10 11} The MMU also monitors PJM for compliance with the rules, in addition to market participants.¹²

Another important component of the monitoring function is the review of inputs to mitigation. The actual or potential exercise of market power is addressed in part through *ex ante* mitigation rules incorporated in PJM's market clearing software for the energy market, the capacity market, the regulation market, and reserves markets. If a market participant fails the TPS test in any of these markets its offer should be set to the lower of its price-based or cost-based offer. The MMU monitors offer capping and identifies

⁶ OATT Attachment M § IV.

⁷ OATT Attachment M § IV.K.3.

⁸ OATT Attachment M § IV.H.

⁹ OATT § 1 (Definitions–E-F) ("FERC Market Rules' mean the market behavior rules and the prohibition against electric energy market manipulation codified by the Commission in its Rules and Regulations at 18 CFR §§ 1c.2 and 35.37, respectively; the Commission-approved PJM Market Rules and any related proscriptions or any successor rules that the Commission from time to time may issue, approve or otherwise establish."); OATT § 1 (Definitions–O-P-Q) ("PJM Market Rules' shall mean the rules, standards, procedures, and practices of the PJM Markets set forth in the PJM Tariff, the PJM Operating Agreement, the PJM Reliability Assurance Agreement, the PJM Consolidated Transmission Owners Agreement, the PJM Manuals, the PJM Regional Practices Document, the PJM-Midwest Independent Transmission System Operator Joint Operating Agreement or any other document setting forth market rules.")

¹⁰ The FERC defines manipulation as engaging "in any act, practice, or course of business that operates or would operate as a fraud or deceit upon any entity." 18 CFR § 1c.2(a)(3). Manipulation may involve behavior that is consistent with the letter of the rules, but violates their spirit. An example is market behavior that is economically meaningless, such as equal and opposite transactions, which may entitle the transacting party to a benefit associated with volume. Unlike market power or rule violations, manipulation must be intentional. The MMU must build its case, including an inference of intent, on the basis of market data.

¹¹ OATT Attachment M § I (Definitions–L-M-N).

¹² OATT Attachment M § IV.C.

situations when it does not prevent the exercise of market power. Effective offer capping prevents the exercise of market power and ensures competitive pricing, provided that the cost-based offer accurately reflects short run marginal costs.

The MMU performs its reporting function by preparing annual and quarterly state of the market reports, including detailed market design recommendations, and detailed reports on specific market issues. The MMU issues reports on each RPM base residual auction. The MMU's reports also respond to the needs of FERC, state regulators, or other regulatory authorities, to assist policy development, decision making in regulatory proceedings, and in support of investigations. The MMU participates in FERC technical conferences as appropriate.

In order to perform its role in PJM market design, the MMU evaluates existing and proposed PJM Market Rules as well as the design and implementation of the PJM markets.¹³ The MMU initiates and proposes changes to the design of such markets or the PJM Market Rules in stakeholder or regulatory proceedings.¹⁴ In support of this function, the MMU engages in discussions with stakeholders, state commissions, PJM management, and the PJM Board; participates in PJM stakeholder meetings regarding market design matters; publishes proposals, reports or studies on such market design issues; and makes filings with the Commission on market design issues.¹⁵ The MMU may also recommend changes to the PJM Market Rules to the staff of the Commission's Office of Energy Market Regulation, state commissions, and the PJM Board.¹⁶ The MMU may provide in its annual, quarterly and other reports "recommendations regarding any matter within its purview."¹⁷

The MMU posts market data, public reports, presentations, regulatory filings and market messages on the Monitoring Analytics web page at: <http://www.monitoringanalytics.com>.

Monitoring

Market Surveillance

The MMU analyzes and monitors all of the PJM markets, including the Day-Ahead Energy Market, the Real-Time Energy Market, the RPM Base Residual Auctions and Incremental Auctions, the Regulation Market, the Primary Reserve Markets both Synchronized and Nonsynchronized, the Day-Ahead Scheduling Reserve Market and

¹³ OATT Attachment M § IV.D.

¹⁴ *Id.*

¹⁵ *Id.*

¹⁶ *Id.*

¹⁷ OATT Attachment M § VI.A.

the Annual, Monthly, Long Term and Balance of Planning Period Auction Markets in Financial Transmission Rights (FTRs). The MMU monitors the provision of other ancillary services including black start service and reactive service. The MMU analyzes and monitors transmission issues, including transmission outages, transmission line ratings, competition to build transmission facilities, and the impact of transmission on competition. The MMU analyzes and monitors generation and transmission planning issues, including the queue process. This ongoing market analysis and monitoring is the basis for all MMU activities.

Correctly defined cost-based offers for the energy market, the reserve markets, and the regulation market should be based on short run marginal costs. The MMU reviews units' fuel cost policies to ensure that they define, in an algorithmic, verifiable and systematic way, how the market value of fuel and environmental allowances are calculated in cost-based offers. The MMU calculates energy market opportunity costs for environmentally limited units, which include the impact of state regulations (e.g., Illinois Climate and Equitable Jobs Act (CEJA) (2021)). The MMU reviews emissions rates, heat rates, and variable operations and maintenance costs, as well as the submitted cost-based offers. If a cost-based offer does not adhere to the PJM Market Rules, the MMU recommends that PJM issue a penalty, as defined in OA Schedule 2.

For example, the MMU monitors participant development of inputs to prospective mitigation, including Avoidable Cost Rates and net revenues in RPM; unit-specific offers in the capacity market under the Minimum Offer Price Rule; offer caps for capacity resources, including unit specific offer caps and risk premia; fuel costs, maintenance costs, cost-based offers and operating parameters in the energy markets, including eligibility for Frequently Mitigated Unit (FMU) adders. In the course of this monitoring, the MMU provides feedback to participants and engages in discussions about the appropriateness of costs and cost levels. The MMU monitors compliance with the RPM and CP must offer rules and reviews exception requests to these rules. The MMU monitors compliance with the Minimum Offer Price Rule (MOPR) and reviews unit specific exception requests. The MMU verifies and confirms the results of the Three Pivotal Supplier Test in the capacity market. The MMU monitors compliance with the must offer rule for capacity resources in the day-ahead energy market. The MMU monitors costs included in black start service rates. The MMU reviews proposed deactivations to identify potential market power issues. The MMU prepares monthly notifications to PJM generation owners regarding the status of Frequently Mitigated Units per Schedule 1, Section 6.4.2 of the PJM Operating Agreement. The MMU also monitors other tariff requirements related to offers in the energy market, the capacity market and the ancillary services markets.

If the MMU determines that it has identified a significant market problem or a potential market violation by a market participant or PJM that may require further inquiry, a

referral, and/or action by the Commission, the MMU is required to notify the Commission's Office of Enforcement.¹⁸

If the MMU determines that it has sufficient credible information that PJM's or a participant's market behavior may require investigation, it is required to submit a formal confidential referral of such behavior to the Commission's Office of Enforcement.¹⁹ Such referrals typically include substantial analysis of the issue referred. After a referral, the MMU provides further assistance to FERC staff at their request.

The MMU monitors how PJM implements the market rules. For example, the MMU replicates the clearing of the capacity market and provides feedback to PJM when it identifies issues, and monitors the clearing of the energy market, including operator interventions. The MMU monitors uplift payments, especially the determination of whether a resource follows PJM's dispatch instructions and whether a resource is eligible for uplift payments. The MMU monitors PJM's application of the Three Pivotal Supplier Test in the energy, capacity and regulation markets. The MMU analyzes the causes of shortage pricing events. The MMU monitors the testing and application processes for demand response, energy efficiency, and distributed energy resources. The MMU monitors outage reporting and the outage approval process. The MMU verifies and confirms the results of PJM's application of the FTR Forfeiture Rule prior to PJM billing PJM members. The MMU provides detailed information to market participants who have questions about the application of the rule to the participant's portfolio. The MMU monitors the profitability of virtual transactions and whether the profitability is the result of false arbitrage due to modeling and operational differences between the day-ahead and real-time energy markets.

If the MMU believes that market design flaws exist that could be remedied by rule changes, the MMU is required to make a referral to the Commission's Office of Energy Market Regulation.²⁰

MMU Review of Capacity Market Base Residual Auctions

The MMU reviewed inputs to and results of the 2022/2023 and 2023/2024 RPM Base Residual Auctions:

- Unit Specific Offer Caps. Verified that the avoidable costs (ACR), including avoidable fuel availability expenses and risk adders, opportunity costs and net revenues used to calculate offer caps were reasonable and properly documented;
- Net Revenues. Calculated forward unit-specific net revenue from PJM energy and ancillary service markets for each PJM Generation Capacity Resource;^{21 22}

¹⁸ OATT Attachment M § IV.I.

¹⁹ *Id.*

²⁰ OATT Attachment M § IV.I.2.

- Minimum Offer Price Rule (MOPR). Reviewed requests for Unit Specific Exceptions and Resource Specific Exceptions;
- Offers of Planned Generation Capacity Resources. Reviewed sell offers for Planned Generation Capacity Resources to determine if consistent with levels specified in Tariff;
- Exported Resources. Verified that Generation Capacity Resources exported from PJM had firm external contracts or made documented and reasonable opportunity cost offers;
- RPM Must Offer Requirement. Reviewed exceptions to the RPM must offer requirement;
- CP Must Offer Requirement. Reviewed exceptions to the CP must offer requirement;
- Maximum EFORd. Verified that the sell offer EFORd levels were less than or equal to the greater of the one-year EFORd or the five-year EFORd for the relevant period, or reviewed requests for alternate maximum EFORds;
- CP Eligibility. Reviewed documentation for Intermittent Resources and Capacity Storage Resources to support CP eligibility.
- Clearing Prices. Verified that the auction clearing prices were accurate, based on submitted offers and the Variable Resource Requirement (VRR) curves;
- Market Structure Test. Verified that the market power test was properly defined using the TPS test, that offer caps were properly applied and that the TPS test results were accurate.

Discussions with Market Participants

The PJM Market Monitoring Plan provides that in addition to informing Commission staff, the MMU may “Engage in discussions regarding issues relating to the PJM Market Rules or FERC Market Rules in order to understand such issues and to attempt to resolve informally such issues or other issues.”²³ In fulfilling this role in 2022, the MMU monitored participant behavior and discussed relevant matters with market participants. In addition, the MMU received and investigated confidential complaints.

The MMU regularly discusses issues with market participants from all parts of the market. For example, the MMU engaged in discussions with market participants, including generation owners, renewable suppliers, demand side providers, industrial customers, financial participants, public power entities, transmission owners, load

²¹ Net revenue values for the 2022/2023 RPM BRA were calculated consistent with the FERC order effective at the time. See *Order on Section 206 Investigation*, 154 FERC ¶ 61,151 (2016).

²² Net revenue values for the 2023/2024 RPM BRA were calculated consistent with the PJM market rules effective at the time. See 178 FERC ¶ 61,122 (2022).

²³ OATT Attachment M, § IV.J.1.

serving entities, state public utility commissions, environmental interests, and public advocates.

Discussions with PJM

The MMU engaged in frequent discussions with PJM about, among other things, the fuel cost policy approval process, specific generator fuel cost policies, unit specific parameter limit adjustments, parameter limit exceptions, cost-based offers, and the application of penalties for incorrect cost-based offers; the calculation of variable operating and maintenance expense includable in energy offers; the definition of following dispatch; the application of uplift rules; RPM rules (e.g., market seller offer caps, MOPR offer floors; must offer exceptions; market power mitigation; the application of rules in RPM auctions); credit and default issues; FTR issues; reactive power; regulation; the real-time energy market dispatch and pricing processes; specific high price events; reserve measurement and deployment; the demand for reserves; market efficiency transmission projects; transmission constraints; transmission constraint penalty factors; distributed energy resources; gas-electric coordination; and changes to the reserve markets.

Communications with Regulators

The MMU provides information to regulators, subject to compliance with applicable rules protecting confidentiality:

The MMU communicated with FERC staff regarding current issues; provided data in response to requests from FERC staff; met with the FERC Office of Enforcement; met with state regulators; met with the Organization of PJM States, Inc. (OPSI); met with the OPSI Advisory Committee; and met with the Consumer Advocates of PJM States (CAPS) to answer questions and discuss a range of topics.

Referrals

The MMU filed confidential referrals of market violations under OATT Attachment M § IV.I.1 with FERC's Office of Enforcement.

Reporting²⁴

Reports and Analyses

Publication of four state of the market reports fulfilled the reporting requirements in the tariff and Commission regulations on market monitoring policy by providing a comprehensive analysis of PJM markets and an assessment of the competitiveness of

²⁴ Public reports by the MMU are posted at <<http://www.monitoringanalytics.com>>.

each market.²⁵ The reports also provided detailed recommendations related to market design and the details rules related to market design.²⁶

Other Reports:

- Analysis of the 2022/2023 RPM Base Residual Auction (February 22, 2022).²⁷
- Analysis of the 2023/2024 RPM Base Residual Auction (October 28, 2022).

Market Messages

- Illinois EPA Response to IMM Letter re Climate and Equitable Jobs Act (CEJA) Public Act 102-0662 (January 21, 2022).
- Data Submission Window Reopening for the 2023/2024 RPM Base Residual Auction (January 27, 2022).
- Data Submission Window Reopening for the 2023/2024 RPM Base Residual Auction - Updated (February 4, 2022).
- Generation Capacity Resources in PJM Region Subject to RPM Must Offer Obligation for 2022/2023 and 2023/2024 Delivery Years (February 25, 2022).
- IMM Determinations Posted for the PJM 2023/2024 RPM Base Residual Auction (March 2, 2022).
- IMM Determinations Posted for the PJM 2023/2024 RPM Base Residual Auction – Updated (March 7, 2022).
- Press Release - 2021 State of the Market Report for PJM (March 10, 2022).
- Members Committee Letter – 2021 State of the Market Report for PJM (March 10, 2022).
- Press Release - 2022 Quarterly State of the Market Report for PJM: January through March (May 12, 2022).
- Members Committee Letter – 2022 Quarterly State of the Market Report for PJM: January through March (May 15, 2022).
- Generation Capacity Resources in PJM Region Subject to RPM Must Offer Obligation for 2023/2024 Delivery Year (June 7, 2022).
- PA RGGI Integration Impact on Cost-Based Offers (June 29, 2022).
- Data Submission Window Opening for the 2024/2025 RPM Base Residual Auction (July 8, 2022).

²⁵ OATT Attachment M § VII.A

²⁶ See 2020 Annual State of the Market Report for PJM: Volume 2, Section 2: Recommendations, (March 11, 2021).

²⁷ A revised “Analysis of the 2022/2023 RPM Base Residual Auction,” was posted on January 13, 2023. The report is available at <http://www.monitoringanalytics.com/reports/Reports/2023/IMM_Analysis_of_the_20222023_RPM_BRA_Revised_20230113.pdf>.

- Injunction re PA RGGI Integration and Cost-Based Offers (July 11, 2022).
- PA RGGI Integration Status and Cost-Based Offers (July 13, 2022).
- IMM Letter to PA DEP re RGGI Compliance (July 21, 2022).
- PA RGGI Integration Status and Cost-Based Offers (July 25, 2022).
- Press Release - 2022 Quarterly State of the Market Report for PJM: January through June (August 11, 2022).
- Members Committee Letter – 2022 Quarterly State of the Market Report for PJM: January through June (August 11, 2022).
- IMM Determinations Posted for the PJM 2024/2025 RPM Base Residual Auction (September 8, 2022).
- Generation Capacity Resources in PJM Region Subject to RPM Must Offer Obligation for 2023/2024 and 2024/2025 Delivery Years (September 30, 2022).
- Data Submission Window Opening for the 2023/2024 RPM Third Incremental Auction (October 18, 2022).
- Press Release - 2022 Quarterly State of the Market Report for PJM: January through September (November 10, 2022).
- Members Committee Letter – 2022 Quarterly State of the Market Report for PJM: January through September (November 10, 2022).
- Request for Topics for Upcoming MMUAC Meeting (November 18, 2022).
- Generation Capacity Resources in PJM Region Subject to RPM Must Offer Obligation for 2023/2024 and 2024/2025 Delivery Years (December 6, 2022).
- Generation Capacity Resources in PJM Region Subject to RPM Must Offer Obligation for 2023/2024 and 2024/2025 Delivery Years-Revised (December 8, 2022).
- IMM Determinations Posted for the PJM 2023/2024 RPM Third Incremental Auction (December 21, 2022).

Data Postings

Marginal Fuel Postings

- 202111_Marginal_Fuel_Postings.csv (January 3, 2022).
- 202112_Marginal_Fuel_Postings.csv (March 10, 2022).
- 202201_Marginal_Fuel_Postings.csv (March 10, 2022).
- 202202_Marginal_Fuel_Postings.csv (May 12, 2022).
- 202203_Marginal_Fuel_Postings.csv (May 12, 2022).
- 202204_Marginal_Fuel_Postings.csv (August 11, 2022).
- 202205_Marginal_Fuel_Postings.csv (August 11, 2022).
- 202206_Marginal_Fuel_Postings.csv (August 11, 2022).
- 202207_Marginal_Fuel_Postings.csv (November 10, 2022).
- 202208_Marginal_Fuel_Postings.csv (November 10, 2022).

- 202209_Marginal_Fuel_Postings.csv (November 10, 2022).

Percentage of PJM Load by State

The MMU posts a spreadsheet with the share of PJM load by state on a rolling monthly basis and at the end of the year posts a single annual spreadsheet.

- PJM Load by State - 2021 (XLS) (January 10, 2022).
- PJM Load by State – 2022 (XLS) (February 10, 2022).
- PJM Load by State – 2022 (XLS) (March 10, 2022).
- PJM Load by State – 2022 (XLS) (April 10, 2022).
- PJM Load by State – 2022 (XLS) (May 10, 2022).
- PJM Load by State – 2022 (XLS) (June 10, 2022).
- PJM Load by State – 2022 (XLS) (July 10, 2022).
- PJM Load by State – 2022 (XLS) (August 10, 2022).
- PJM Load by State – 2022 (XLS) (September 10, 2022).
- PJM Load by State – 2022 (XLS) (October 10, 2022).
- PJM Load by State - 2022 (XLS) (November 10, 2022).
- PJM Load by State - 2022 (XLS) (December 10, 2022).

Components of PJM Price

The total price of wholesale power is the total price per MWh of wholesale electricity in PJM markets. These tables are updated monthly to reflect after the fact billing adjustments made by PJM settlements. Dates shown are the last date the file was updated to reflect applicable billing adjustments.

- Monthly Total Price Table - 2020 (April 12, 2022).
- Monthly Total Price Table – 2021 (May 11, 2022).
- Monthly Total Price Table – 2022 (January 12, 2023).

Industry Briefings

As part of its reporting role, the MMU provided briefings and presentations to industry groups and the Federal Energy Regulatory Commission (FERC). In 2022, the MMU shared the results of its analyses, experience and knowledge regarding competitive markets, market monitoring and market power mitigation at various conferences and meetings, and at informal meetings with stakeholders representing different sectors.

- Speaker. “Northwestern Electricity Dialogue Webinar on Gas and Power Price Spikes: Understanding the Trend and Protecting Consumers,” Northwestern Pritzker School of Law, Webinar, January 25, 2022.
- Speaker. “Continued Consumer and Economic Benefits in a Just Transition,” Electric Power Supply Association, Washington, D.C., March 29, 2022.
- Speaker. “Capacity Market Issues,” OPSI Spring Meeting, Webinar, April 11, 2022.

- Speaker. “Role of the Market Monitor,” Regional Transmission Organization Fundamentals 2022: Background, Purpose, Future. Wisconsin Public Utility Institute. Webinar, April 19, 2022.
- Speaker. “Year in Review,” PJM Annual Meeting, May 17, 2022.
- Speaker. “Downward Sloping Demand Curve and Capacity Market Issues,” OPSI Annual Meeting, October 18, 2022.
- Speaker. Meeting of OPSI Advisory Committee for the Independent Market Monitor with PJM, OPSI Annual Meeting, October 18, 2022.

FERC Proceedings

In 2022, the MMU intervened in proceedings at the FERC, filed substantive pleadings, most of which addressed market design issues, and participated in numerous settlement and technical conferences with FERC staff.

- **Reactive Capability Compensation Filings.** The MMU intervened and actively participated in numerous proceedings involving reactive revenue requirements filed pursuant to OATT Schedule 2. Issues in these cases included: the appropriate power factor; unit specific rates, applicability of the *AEP* Method; ability of battery storage resources to deliver reactive power, deliverability of reactive to the PJM Grid; and prevention of over recovery. (Docket Nos. ER14-1400; ER21-2199; ER21-2474; EL22-84; ER22-387; ER22-907; ER22-944; ER22-965; ER22-1089; ER22-1123, and those matters separately listed below).
 - **Whitetail Solar Reactive (Docket No. ER21-936-001, et al).** Direct and Answering Testimony of Joseph E. Bowring (January 5, 2022). Motion for Summary Disposition of the Independent Market Monitor for PJM (April 5, 2022). Prehearing Brief of the Independent Market Monitor for PJM (April 14, 2022). Initial Brief of the Independent Market Monitor for PJM (May 19, 2022). Reply Brief of the Independent Market Monitor for PJM (June 9, 2022). Brief Opposing Exceptions of the Independent Market Monitor for PJM (September 6, 2022).
 - **Meyersdale Reactive (Docket No. ER21-864).** Comments in Opposition to Offer of Settlement of the Independent Market Monitor for PJM, with supporting Affidavit of Joseph E. Bowring (January 21, 2022).
 - **Mechanicsville Solar Reactive (Docket No. ER21-2091).** Direct and Answering Testimony of the Independent Market Monitor for PJM (April 25, 2022). Pre Hearing Brief of the Independent Market Monitor for PJM (August 19, 2022).
 - **Bluestone Solar Reactive (Docket No. ER21-1696).** Comments in Opposition to Offer of Settlement of the Independent Market Monitor for PJM, with supporting Affidavit of Joseph E. Bowring (April 28, 2022). Motion for Hearing of the Independent Market Monitor for PJM (June 3, 2022)
 - **Holloman Lessee Reactive (Docket No. ER20-2576-001).** Testimony of the Independent Market Monitor for PJM (May 23, 2022). Answer of the

- Independent Market Monitor for PJM (May 27, 2022). Comments of the Independent Market Monitor for PJM in Opposition to Offer of Settlement, with supporting Affidavit of Joseph E. Bowring (December 20, 2022).
- **Altavista Solar Reactive (Docket No. ER21-1937 and EL21-84)**. Comments Opposing Offer of Settlement of the Independent Market Monitor for PJM, with supporting Affidavit of Joseph E. Bowring (June 2, 2022).
 - **Albemarle Beach Solar Reactive (Docket No. ER21-2364)**. Testimony of the Independent Market Monitor for PJM (June 3, 2022). Comments of the Independent Market Monitor for PJM in Opposition to Offer of Settlement, with supporting Affidavit of Joseph E. Bowring (December 20, 2022).
 - **Pleinmont Solar Reactive (Docket No. ER20-2819, et al)**. Comments of the Independent Market Monitor for PJM in Opposition to Offer of Settlement, with supporting Affidavit of Joseph E. Bowring (June 13, 2022).
 - **Fern Solar Reactive (Docket No. ER20-2186-003 and EL20-62-001)**. Testimony and Exhibits of the Independent Market Monitor for PJM (June 15, 2022). Answer and Motion for Leave to Answer of the Independent Market Monitor for PJM (August 1, 2022). Supplemental Testimony of the Independent Market Monitor for PJM Responding to Bench Questions, Set #1 (September 15, 2022). Rebuttal Testimony of the Independent Market Monitor for PJM (November 10, 2022). Supplemental Testimony of the Independent Market Monitor for PJM Responding to Bench Questions, Set #2 (November 29, 2022).
 - **Camp Grove Wind Farm Reactive (Docket No. ER21-2919)**. Comments in Opposition to Offer of Settlement of the Independent Market Monitor for PJM, with supporting Affidavit of Joseph E. Bowring (June 27, 2022).
 - **Crescent Ridge Wind Farm (Docket No. ER22-287)**. Comments in Opposition to Offer of Settlement of the Independent Market Monitor for PJM, with supporting Affidavit of Joseph E. Bowring (June 28, 2022).
 - **PSEG Reactive Rates (Docket No. ER22-351)**. Comments in Opposition to Offer of Settlement of the Independent Market Monitor for PJM, with supporting Affidavit of Joseph E. Bowring (July 1, 2022).
 - **Grand Ridge Energy Reactive (Docket No. ER21-2925)**. Comments in Opposition to Offer of Settlement of the Independent Market Monitor for PJM, with supporting Affidavit of Joseph E. Bowring (July 7, 2022).
 - **Panda Hummel Reactive (Docket No. ER19-391-005)**. Comments in Opposition to Offer of Settlement of the Independent Market Monitor for PJM, with supporting Affidavit of Joseph E. Bowring (August 1, 2022). Brief of the Independent Market Monitor for PJM (September 9, 2022). Reply Brief of the Independent Market Monitor for PJM (September 16, 2022).
 - **Southfield Energy Reactive (Docket No. ER21-2819-003)**. Comments in Opposition to Offer of Settlement of the Independent Market Monitor for PJM, with supporting Affidavit of Joseph E. Bowring (August 8, 2022).

- **Eagle Creek Reusens Hydro and Great Falls Hydro Reactive (Docket No. ER21-2832-000, et al).** Comments in Opposition to Offer of Settlement of the Independent Market Monitor for PJM, with supporting Affidavit of Joseph E. Bowring (August 15, 2022).
- **Pinnacle Wind Reactive (Docket No. ER22-507-000,-002).** Comments in Opposition to Offer of Settlement of the Independent Market Monitor for PJM, with supporting Affidavit of Joseph E. Bowring (August 18, 2022).
- **Parkway Generation Reactive (Docket No. ER22-279, et al).** Comments in Opposition to Offer of Settlement of the Independent Market Monitor for PJM with supporting Affidavit of Joseph E. Bowring (September 14, 2022).
- **Hawtree Creek Farm Solar Reactive (Docket No. ER22-1076-001).** Comments of the Independent Market Monitor for PJM in Opposition to Offer of Settlement, with supporting Affidavit of Joseph E. Bowring (December 20, 2022).
- **Wildwood Lessee Reactive (Docket No. ER22-763).** Comments of the Independent Market Monitor for PJM in Opposition to Offer of Settlement, with supporting Affidavit of Joseph E. Bowring (December 20, 2022).
- **Red Oak Reactive (Docket No. ER22-2946).** Answer and Motion for Leave to Answer of the Independent Market Monitor for PJM (December 5, 2022).
- **NRG RMR (Docket No. ER22-1539).** Motion for Extension and for Shortened Comment Period of the Independent Market Monitor for PJM (March 7, 2022). Protest of the Independent Market Monitor for PJM (May 6, 2022). Motion for Hearing of the Independent Market Monitor for PJM (June 9, 2022). Answer and Motion for Leave to Answer of the Independent Market Monitor for PJM (July 1, 2022).
- **New MBR Filings.** The Market Monitor routinely intervenes in requests by owners of generating facilities in PJM for new market based rates authorization. (Docket Nos. ER22-784; ER22-1010; ER22-1088; ER22-1410; ER22-1544; ER22-1566; ER22-1777; ER22-1778; ER22-1779; ER22-337; ER22-414; ER22-784; ER22-867; ER22-937; ER22-938; ER22-14021; ER22-1404; ER22-2321; ER22-2483; ER22-2296; ER23-9; ER23-618).
- **Wabash Complaint (EL22-19).** Answer of the Independent Market Monitor for PJM (January 3, 2022).
- **FTR Credit Requirements (Docket No. ER22-703).** Comments of the Independent Market Monitor for PJM (January 18, 2022).
- **FTR Reform (Docket No. ER22-797).** Protest of the Independent Market Monitor for PJM (February 2, 2022). Answer and Motion for Leave to Answer of the Independent Market Monitor for PJM (February 15, 2022). Answer of the Independent Market Monitor for PJM (March 7, 2022).
- **ORDC (Docket No. EL19-58-008).** Answer and Motion for Clarification of the Independent Market Monitor for PJM (February 2, 2022). Comments of the Independent Market Monitor for PJM (March 11, 2022).

- **Transmission Constraint Penalty Factor (Docket No. EL22-26 and ER22-957).** Comments of the Independent Market Monitor for PJM (February 2, 2022). Answer and Motion for Leave to Answer of the Independent Market Monitor for PJM (February 11, 2022). Answer of the Independent Market Monitor for PJM (April 4, 2022).
- **Reactive Power Capability Compensation NOI (Docket No. RM22-2).** Comments of the Independent Market Monitor for PJM (February 24, 2022). Reply Comments of the Independent Market Monitor for PJM (March 23, 2022).
- **Funding Upgrades (Docket No. ER21-2282-000, -001).** Reply Comments of the Independent Market Monitor for PJM (February 28, 2022).
- **FTR Forfeiture Rule (Docket No. ER17-1433-004).** Answer of the Independent Market Monitor for PJM (March 18, 2022). Answer of the Independent Market Monitor for PJM (April 15, 2022).
- **Order No. 2222 Compliance (Docket No. ER22-926).** Comments of the Independent Market Monitor for PJM (April 1, 2022). Answer and Motion for Leave to Answer of the Independent Market Monitor for PJM (April 18, 2022). Comments of the Independent Market Monitor for PJM (July 28, 2022). Comments of the Independent Market Monitor for PJM (August 1, 2022).
- **IRD Proposal (Docket No. ER22-1200).** Protest of the Independent Market Monitor for PJM (March 25, 2022). Comments of the Independent Market Monitor for PJM (July 5, 2022).
- **MSOC Show Cause Order (Docket No. EL22-22).** Comments of the Independent Market Monitor for PJM (April 20, 2022).
- **Guernsey MBR (Docket No. ER22-1566).** Comments of the Independent Market Monitor for PJM (April 25, 2022).
- **FTR Credit Requirements (Docket No. ER22-2029 and EL22-32).** Comments of the Independent Market Monitor for PJM (June 24, 2022). Answer and Motion for Leave to Answer of the Independent Market Monitor for PJM (July 22, 2022). Comments of the Independent Market Monitor for PJM (October 31, 2022).
- **Regional Transmission Planning and Cost Allocation and Generator Interconnection NOPR (Docket No. RM21-17).** Comments of the Independent Market Monitor for PJM (August 17, 2022).
- **MSOC Compliance (Docket No. ER22-2886).** Answer and Motion for Leave to Answer of the Independent Market Monitor for PJM (October 26, 2022).
- **PJM Regulation Mileage Ratio (Docket No. EL21-83-001).** Comments of the Independent Market Monitor for PJM (November 8, 2022). Answer and Motion for Leave to Answer of the Independent Market Monitor for PJM (December 7, 2022).
- **Duty of Candor (Docket No. RM22-20).** Comments of the Independent Market Monitor for PJM (November 11, 2022).
- **2022 PJM Quadrennial Review (Docket No. ER22-2984).** Answer of the Independent Market Monitor for PJM (November 16, 2022).

- **Cost-Based Offer Calculations (Docket No. ER23-557).** Comments of the Independent Market Monitor for PJM (December 22, 2022).

FERC Technical Conferences

- **Grid Enhancing Technologies (RM20-10 and AD19-19).** Post Workshop Comments of the Independent Market Monitor for PJM. (January 14, 2022).

State Proceedings

In 2022, the MMU addressed market topics in proceedings at state public utility commissions and state legislatures:

New Jersey Department of Environmental Protection

DEP Docket No. 07-21-11 and Proposal Number: PRN 2021-117. The MMU filed comments on April 8, 2022, on a rule proposed by the DEP that would limit CO₂ emissions from existing and new fossil fuel-fired electric generating units in New Jersey through the application of emissions limits.

Maryland Public Utility Commission

- Exelon 10 Year Report (Case No. 9271). IMM Letter re IMM/Exelon Settlement Agreement (January 27, 2022); Participated in argument at hearing (February 1, 2022).
- Control and Prohibition of Carbon Dioxide Emissions (Rule 7:27F). Comments of the Independent Market Monitor for PJM (April 8, 2022).

Court Proceedings

In 2022, the MMU addressed market topics and enforcement issues in proceedings in federal and state courts.

Department of Energy

- Information Regarding Establishment of a Civil Nuclear Credit Program (Docket No. DOE-HQ-2022-0006). In this proceeding DOE proposed eligibility requirements to receive subsidies, known as Civil Nuclear Credits (CNC), intended to prevent closure of nuclear generation due to economic factors. Response to Request for Information of the Independent Market Monitor for PJM (March 17, 2022).

United State Court of Appeals for the Third Circuit

- MOPR. IMM Brief of Intervenor for Petitioners re US Court of Appeals Third Circuit EPSA vs. FERC Docket Nos. 21-3205, et al (May 23, 2022).

United States Court of Appeals for the District of the Columbia

- *Vistra v. FERC re Market Seller Offer Cap* (Case No.21-1214 et al.). Intervenor's Brief in Support of FERC (August 26, 2022). Oral Argument (November 8, 2022).

- Citadel FNGE Ltd., vs. FERC re Transmission Constraint Penalty Factor (Case No. 22-1090). Motion of the Independent Market Monitor for PJM for Leave to Intervene. (June 10, 2022).
- XO Energy vs FERC re FTR Forfeitures (Case No. 22-1096) Motion of the Independent Market Monitor for PJM for Leave to Intervene. (June 10, 2022). Brief of the Independent Market Monitor for PJM (November 7, 2022).

Participation in Stakeholder Process

During 2022, the MMU regularly participated in meetings of all the major PJM committees and task forces, and formally presented information, analysis and recommendations to committees and task forces as needed.²⁸

Markets and Reliability Committee (MRC)

- Friendly Amendment re Service to PJM of Filings (June 29, 2022).

Members Committee/MC Webinar (MC)

- Market Monitor Report (January 24, 2022).
- Market Monitor Report (February 22, 2022).
- Market Monitor Report (March 21, 2022).
- Market Monitor Report (April 25, 2022).
- Market Monitor Report (June 27, 2022).
- Market Monitor Report (July 25, 2022).
- Market Monitor Report (September 19, 2022).
- Market Monitor Report (November 14, 2022).
- Market Monitor Report (December 19, 2022).

MC Special Session

- FTR Liquidation: Cancelling FTRs (February 2, 2022).
- Behind the Generator Load: Issues (March 9, 2022).
- MC Information Session: 2021 State of the Market Report for PJM (April 5, 2022).

Market Implementation Committee (MIC)

- Pricing Under Market Suspension (January 5, 2022).
- Following Dispatch and Uplift Eligibility (April 13, 2022).
- Following Dispatch and Deviation Charges (May 11, 2022).
- New Desired MW Metric (July 13, 2022).
- Impact of VRR Shape Proposals (July 13, 2022).
- Fuel Requirements for Black Start Resources (August 10, 2022).

²⁸ OATT Attachment M § IV.D.

- Fuel Requirements for Black Start Resources (September 7, 2022).
- Market Approach to Behind the Generator Load (September 7, 2022).
- IMM Alternative/Supplemental Language to PJM's Manual 11 Reserve Price Formation Revisions (September 7, 2022).
- M11 Reserve Price Formation (September 7, 2022).
- BOR Clarification – Negative LMPs (October 6, 2022).
- Market Approach to Behind the Generator Load (BGL) (October 13, 2022).

MIC Special Session: Quadrennial Review

- 2022 Quadrennial Review: IMM Proposals and Results (February 11, 2022).
- VRR Curve (March 25, 2022).
- IMM Gross and Net CONE Update (March 25, 2022).
- Impact of Brattle Proposed VRR Curves (April 22, 2022).
- IMM CONE Study Update (April 22, 2022).
- IMM Quadrennial Review Recommendations – Net CONE and EAS (May 20, 2022).
- Impact of VRR Shape Proposals (June 21, 2022).
- Comparison of IMM Net CONE to PJM Net CONE (August 24, 2022).

MIC/OC – Fuel Requirements for Black Start Resources

- Fuel Requirements for Black Start Resources (July 14, 2022).
- Fuel Assurance for Black Start Resources (August 25, 2022).

Operating Committee (OC)

- Opportunity Cost Calculation (April 14, 2022). Fuel Requirements for Black Start Resources (August 11, 2022).
- Max Emergency Proposal (August 11, 2022).
- IROL-CIP Cost Recovery Issue Charge – IMM Redline (November 3, 2022).

PC Special Session – CIRs for ELCC Resources

- Intermittent Output and CIRs (February 23, 2022).

Finance Committee (FC)

- Monitoring Analytics Preliminary Budget for 2023 (August 16, 2022).
- Monitoring Analytics (MA) 2023 Budget Questions (September 15, 2022).
- MA Proposed Budget for 2023 (September 15, 2022).

Risk Management Committee (RMC)

- PJM FTR Bilaterals (June 28, 2022).

Clean Attribute Procurement Senior Task Force (CAPSTF)

- Clean Energy Market (CEM) (September 13, 2022).
- Modeling Request in CAPSTF (October 12, 2022).

Electric Gas Coordination Senior Task Force (EGCSTF)

- Electric and Gas Coordination Issues (April 20, 2022).
- IMM Edits to PJM Options & Packages Matrix (April 20, 2022).
- Gas Electric Coordination Issues (September 13, 2022).

Energy Price Formation Senior Task Force (EPSTF)

- Transmission Constraint Penalty Factor Circuit Breaker (July 19, 2022).
- Circuit Breaker (July 19, 2022).
- Circuit Breaker (August 15, 2022).

Resource Adequacy Senior Task Force (RASTF)

- MSOC Issues (January 5, 2022).
- Clean Procurement (February 4, 2022).
- CPQR (March 24, 2022).
- MSOC (April 11, 2022).
- RASTF MSOC Presentation (May 4, 2022).
- Capacity Definition (May 26, 2022).
- CPQR Simulation Approach (June 10, 2022).
- IMM MSOC Package Executive Summary (June 23, 2022).
- RASTF Key Work Activities Overview (September 22, 2022).

Regulation Market Design Senior Task Force

- Regulation Market Issues (May 24, 2022).
- Regulation Market Strawman Proposal(s) (October 19, 2022).

Reactive Power Compensation Senior Task Force (RPCTF)

- Reactive Power Compensation and the Capacity Market (January 7, 2022).
- Reactive Issues (July 8, 2022).
- Estimated Impact of Reactive Offset on Capacity Market Results (September 28, 2022).

Cost Development Subcommittee (CDS)

- Cost-Based Offers and Renewable Energy Credits (March 7, 2022).

DER and Inverter Based Resources Subcommittee (DIRS)

The MMU participated in discussions concerning public distribution microgrids, solar/battery hybrid resources, and FERC Order No. 2222, concerning the integration of distributed energy resources in the PJM markets.

Other Activities

OPSI Advisory Committee

The OPSI Advisory Committee is established pursuant to Section III.G of Attachment M of the OATT, which provides:

“There shall be an OPSI Advisory Committee comprised of five (5) representatives appointed by the Organization of PJM States, Inc. The OPSI Advisory Committee shall meet with the Market Monitoring Unit on a regular basis and as otherwise necessary to receive and discuss information relevant to this Plan. In addition to the specific responsibilities regarding budget and termination set forth in Sections III.E and III.F, the OPSI Advisory Committee may provide advice to the Commission, Market Monitor, the PJM Board, stakeholder committees, and stakeholder working groups regarding any matter concerning the Market Monitor, Market Monitoring Unit or Market Monitoring Plan. Any formal advice shall be in writing and, subject to confidentiality provisions, shall be made publicly available.”

The MMU met with the OPSI Advisory Committee on October 25, 2022. The OPSI Advisory Committee Meeting with Dr. Joseph Bowring (President, Monitoring Analytics, LLC), the Independent Market Monitor for PJM, is a separate meeting and not a part of the OPSI Annual Meeting. This meeting is open to the public.

Market Monitoring Unit Advisory Committee

The Market Monitoring Unit Advisory Committee (“MMUAC”) is established pursuant to Section III.H of Attachment M of the OATT, which provides:

“There shall be an MMU Advisory Committee, chaired by the Market Monitor that is open to all stakeholders and representatives of Authorized Government Agencies. The MMU Advisory Committee shall act as a liaison between stakeholders and the MMU and shall provide advice from time to time on matters relevant to the MMU's responsibilities under this Plan. The MMU Advisory Committee shall have no authority to direct, supervise, review, or otherwise interfere with the functions of the MMU under this Plan, nor any authority to terminate or propose to terminate the Market Monitor.”

The MMU convened a meeting of the MMUAC on December 2, 2022. The MMU requested comments from stakeholders concerning the MMU's implementation of the

PJM Market Monitoring Plan. The MMU discussed: the MMUAC Charter; MMU provisions related to state entities; uplift issues/ICAP must offer compliance; energy market issues (high LMPs) and Regulation Market design.

Presentations:

- Congestion. MMUAC. December 2, 2022.
- MMUAC Charter. MMUAC. December 2, 2022.