

FirstEnergy's Perspective on PJM's Wholesale Electricity Markets: 2018

1 EXECUTIVE SUMMARY

This report is required by section V.C.2 of the Third Supplemental Stipulation approved with modifications by the Commission on March 31, 2016 (“the Stipulation”). Each September 1, FirstEnergy files a detailed report, and the addendum is updated the other three quarters. This report does not replace the information in the reports filed on September 1 of 2016 and 2017 and is instead meant to build upon them.

The past year has been unique in that it is the first year in recent history that PJM, FERC, and the PJM Independent Market Monitor (Market Monitor) have all publicly agreed that there are critical market flaws that need to be addressed. First, in April 2018, PJM CEO Andy Ott sent two letters to stakeholders; one stating the need to fast-track certain price formation efforts¹ and the other indicating that fuel security is a resilience risk that needs to be addressed, especially in light of increased resource retirements.² Then, in June 2018, FERC issued an order finding that PJM’s capacity market construct is unjust and unreasonable because of its failure to address the market impact of subsidized resources. Finally, in August 2018, the Market Monitor stated in the Second Quarter of 2018 State of the Market Report that the results of the May 2018 capacity market auction were not competitive, largely due to offers from market participants that the Market Monitor determined were not competitive despite being technically compliant with the existing PJM tariff Market Seller Offer Cap. These items demonstrate that there are serious problems in the PJM wholesale markets that current market rules are not designed to solve, and, therefore, market reforms are necessary.

FirstEnergy believes that FERC should evaluate PJM’s market rules from a holistic perspective, with a focus on providing long-term reliability and resilience of the electric grid for customers. FirstEnergy notes that there is a need for engagement from the States on critical market rules and policy issues around distributed energy resources, and resilience. Specifically, active State engagement in the PJM stakeholder process and participation in FERC proceedings will ensure that long-term customer concerns are addressed.

¹ <https://www.pjm.com/-/media/committees-groups/task-forces/epfstf/postings/20180412-pjm-board-letter-regarding-energy-market-price-formation.ashx?la=en>

² <https://www.pjm.com/-/media/committees-groups/committees/mrc/20180508-special/20180508-ott-fuel-security-member-letter.ashx>

2 BACKGROUND

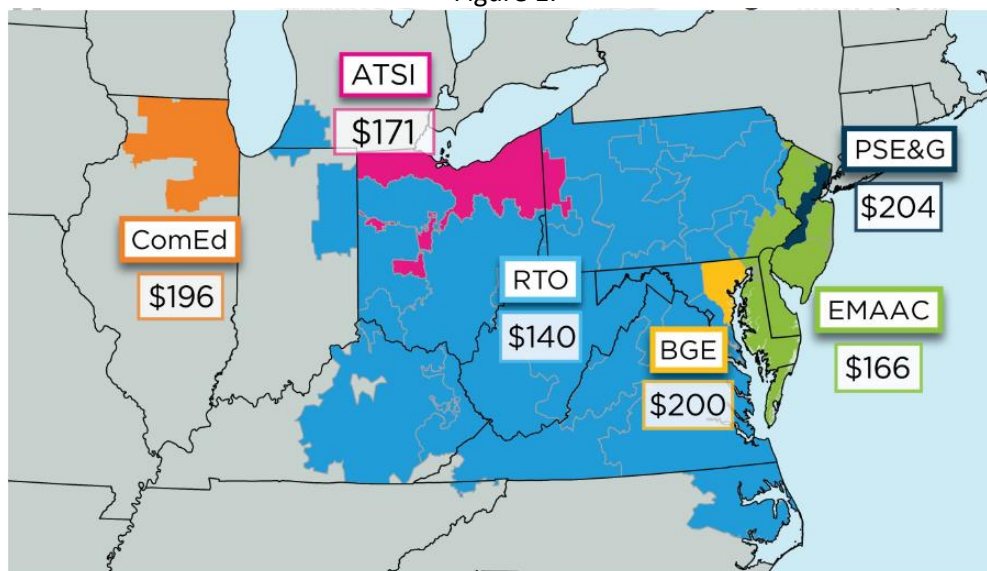
The purpose of this section is to provide a brief overview of PJM markets including pricing trends, a discussion of diversity and resilience, integrating markets and public policy, and emerging technologies.³

PJM has responsibility for organizing and administering the capacity, energy, ancillary services and Financial Transmission Rights (FTR) markets, and managing the reliability of the transmission grid. PJM provides open access to the transmission grid and ensures performance via various and varied planning processes and constraints.

Market Prices⁴

Capacity: As shown in Figure 1 below, RTO prices for the May 2018 Base Residual Auction (“BRA”) which procured capacity for the 2021/2022 delivery year cleared at \$140.00/MW-day for CP resources in the Rest of RTO region, an 83% increase from the 2020/2021 price of \$76.53/MW-day.⁵

Figure 1.



The downward trend in new generation continued; the most recent auction attracted only 893 MW of new combined cycle natural gas resources⁶ compared to 2,389 MW and over 5,000 MW the previous two auctions.⁷ However, imports, demand response, and energy efficiency all cleared significantly more

³ See “FirstEnergy’s Perspective on PJM’s Wholesale Electricity Markets: 2017” filed September 1, 2017 in 14-1297-EL-SSO for a discussion on the changing grid, which includes a discussion on distributed energy resources. FirstEnergy’s position has not changed since the previous report.

⁴ See FirstEnergy’s Perspective on PJM’s Wholesale Electricity Markets: 2016 filed September 1, 2016 in 14-1297-EL-SSO for a discussion on historical PJM pricing.

⁵ 2021/2022 BRA report, available at <http://www.pjm.com/-/media/committees-groups/committees/mrc/20180524/20180524-2021-2022-base-residual-auction-results.ashx>

⁶ Id.

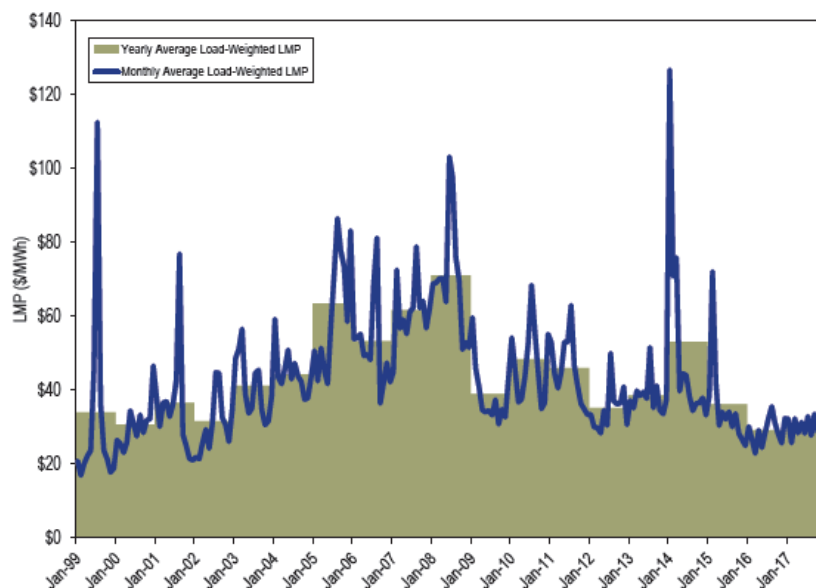
⁷ 2020/2021 BRA report, available at <http://www.pjm.com/~media/markets-ops/rpm/rpm-auction-info/2020-2021-base-residual-auction-report.ashx>

MW than the prior auction. Nuclear resources cleared 7,400 fewer MW than the previous auction.⁸ PJM attributed the reduction in the number of new generators to continuing low energy prices, an increase in Net CONE, and a decrease in cleared capacity.⁹

The 2018 capacity auction was notable because of the Market Monitor's belief that the results were "not competitive." Specifically, the Market Monitor stated that there were offers that exceeded what the Market Monitor believes to be the competitive level due to the way PJM sets the offer cap under Capacity Performance rules. The Market Monitor believes that the offer cap of the Net Cost of New Entry times the Balancing Ratio ($\text{Net CONE} \times B$) is not a competitive offer when the expected number of performance assessment intervals is zero or a small number, while the nonperformance charge rate is based on 30 performance assessment hours.¹⁰ PJM has since responded to the Market Monitor's determination with its own take that the 2021/2022 Base Residual Auction was conducted in accordance with all FERC-approved tariff requirements and rules, including those rules related to the application of offer caps.¹¹

Energy: Current energy market prices remain low compared to historical prices. Figure 2 below shows the volatile history of PJM's real-time load-weighted Locational Marginal Prices (LMP) for 2000 through 2017, as reported by Monitoring Analytics.¹²

Figure 2.



and 2019/2020 BRA report, available at <http://www.pjm.com/~media/markets-ops/rpm/rpm-auction-info/2019-2020-base-residual-auction-report.ashx>

⁸ 2021/2022 BRA report

⁹ <http://www.pjm.com/~media/about-pjm/newsroom/2018-releases/20180523-rpm-results-2021-2022-news-release.ashx>

¹⁰ Monitoring Analytics, LLC, 2018 Quarterly State of the Market Report: January-June (2018), available at http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2018/2018q2-som-pjm.pdf

¹¹ <https://www.pjm.com/~media/about-pjm/newsroom/2018-releases/20180810-pjm-statement-on-imm-analysis-of-2021-22-capacity-auction.ashx>

¹² Monitoring Analytics, LLC, 2017 State of the Market Report 168 (2017), available at http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2017/2017-som-pjm-sec3.pdf

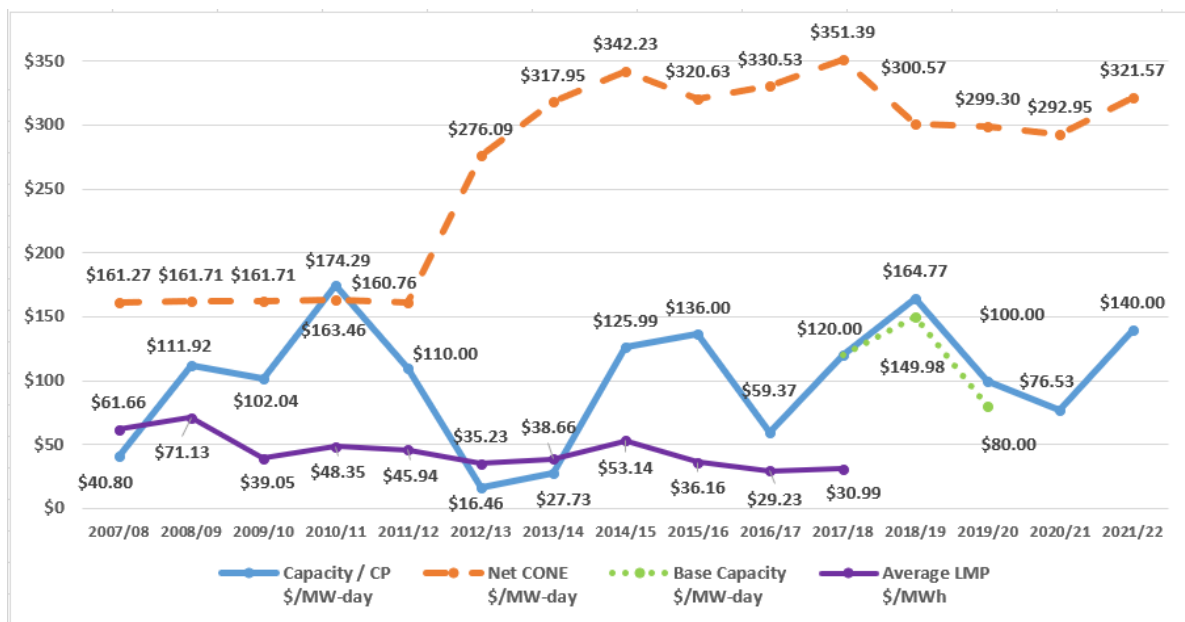
Figure 3 shows the year-over-year change in these LMPs, demonstrating a significant amount of volatility in prices.¹³ Prices have swung more than 20% in nearly half of the years examined, with a 37.4% increase in 2014 followed by a 31.9% decline in 2015.

Figure 3.

	Load-Weighted, Average LMP	Inflation Adjusted Load-Weighted, Average LMP
1998	\$24.16	\$23.94
1999	\$34.07	\$33.04
2000	\$30.72	\$28.80
2001	\$36.65	\$33.45
2002	\$31.60	\$28.35
2003	\$41.23	\$36.24
2004	\$44.34	\$37.91
2005	\$63.46	\$52.37
2006	\$53.35	\$42.73
2007	\$61.66	\$48.06
2008	\$71.13	\$53.27
2009	\$39.05	\$29.46
2010	\$48.35	\$35.83
2011	\$45.94	\$33.01
2012	\$35.23	\$24.80
2013	\$38.66	\$26.82
2014	\$53.14	\$36.37
2015	\$36.16	\$24.69
2016	\$29.23	\$19.68
2017	\$30.99	\$20.43

In summary, as shown in Figure 4 below, capacity prices remain well below Net CONE, and average energy prices continue to be suppressed.

Figure 4.¹⁴



¹³ *Id.*, p. 169.

¹⁴ Chart developed using PJM Base Residual Auction reports for 2007/2008–2020/2021 and data from Figure 3.

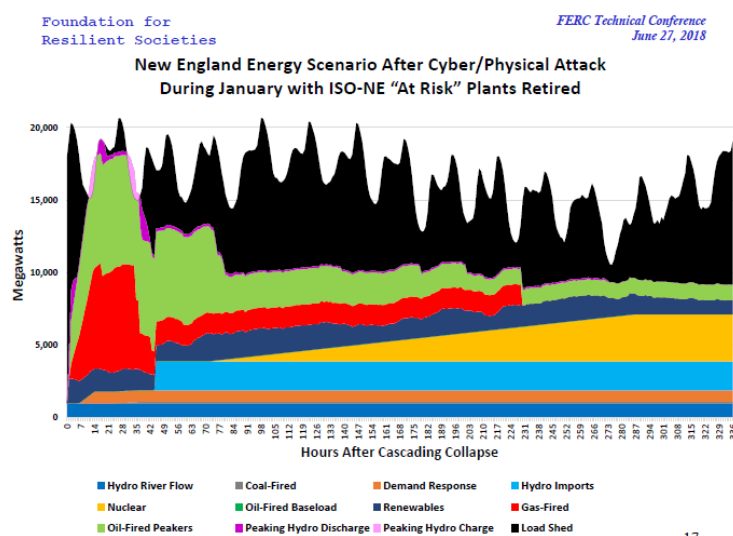
Resilience and Fuel Security

On January 8, 2018, FERC issued an order rejecting the proposed Grid Reliability and Resilience Pricing Rulemaking (RM18-1) finding that the record did not support adopting the proposed rule. The Commission, however, initiated a new proceeding (AD18-7) to holistically examine the resilience of the bulk power system, which would allow the Commission with the opportunity to remain vigilant on resilience challenges.

PJM and the other RTO/ISOs filed comments on March 9, 2018 at FERC. Generally, both NYISO and MISO believe that their markets are inherently designed to consider resilience, and that there are no major resilience issues in their regions. Whereas, CAISO and ISO-NE do have regional issues that affect resilience, but assert that they each have processes in place to handle these issues and do not believe that further actions from FERC is warranted. SPP noted that it is open to receiving more guidance from FERC on the topic. PJM provided a detailed list of actions that it would like FERC to take, including requesting that FERC issue an order clearly articulating the RTOs have a role in planning for resilience and requiring the RTO/ISOs to file tariff changes to implement resilience planning criteria.

Parties submitted reply comments to the RTOs/ISOs on May 9, 2018, which were largely supportive of FERC looking into this issue, and advocated a regional approach utilizing stakeholder processes rather than one-size-fits-all reforms. FERC has not taken any action in the proceeding, but stakeholders have continued to discuss resilience issues at several technical conference since then. Notably, at the June 26-28, 2018 Technical Conference regarding Increasing Market and Planning Efficiency and Enhancing Resilience through Improved Software (AD10-12-009), Mr. Thomas Popik of the Foundation for Resilient Societies presented a compelling study showing the negative effects of retirement of generation capacity with on-site fuel in New England (see Figure 5 below). It would be beneficial if PJM performed a similar analysis as part of its fuel security initiative.

Figure 5¹⁵



¹⁵ https://www.ferc.gov/CalendarFiles/20180627123728-W4B%20-%204%20-%20Resilient%20Societies%20Presentation%20on%20Cascading%20Collapse%2020180622_Final.pdf

On March 27, 2018, the Department of Energy's (DOE) National Energy Technology Laboratory (NETL) released a report, *Reliability, Resilience and the Oncoming Wave of Retiring Baseload Units*. In the report, NETL analyzed the performance of generation in the five RTOs in the Eastern Interconnection (PJM, ISO-NE, NYISO, MISO, SPP) and ERCOT during the early 2017 cold snap. The report concluded that without the resilience of coal and oil/dual-fuel units, the eastern United States would have suffered severe electricity shortages that likely would have led to widespread blackouts. NETL also found that wholesale markets do not compensate for resilience, and thus resilience is steadily diminishing as baseload plants retire prematurely.

PJM continues to work through its Resilience Roadmap¹⁶, and on April 30, 2018, PJM CEO Andy Ott announced that PJM will launch a fuel security initiative that could, among other things, establish fuel security criteria. A draft workplan was sent to stakeholders that outlined a plan to add fuel security analysis to capacity market modeling. The workplan consists of a 3-4 month initial analysis, followed by several months of modeling, and includes time for input from federal agencies, such as FERC, the Department of Energy, and the Department of Homeland Security. PJM reviewed its analysis and assumptions at a June 28, 2018 meeting, and reviewed Phase 1 updates at a July 30, 2018 meeting. If determined necessary, PJM hopes to have changes in place by the capacity auction for the 2022/2023 planning year.

Integrating markets and public policy

Multiple FERC proceedings have been initiated seeking to revise the RPM rules to address the capacity market impacts of legislation to provide certain resources with State funding pursuant to specific public policy initiatives. These include:

- A FERC technical conference docket to address how to select resources of interest to public policymakers while preserving markets (AD17-11);
- A complaint (and amended complaint) by Calpine and other IPPs requested to extend the Minimum Offer Price Rule ("MOPR") to certain subsidized resources (EL16-49);
- A second complaint by Calpine and others requesting a "clean" MOPR that applies to all new and existing resources with few exceptions (EL18-169); and
- A Section 205 filing from PJM of two proposals developed through its Capacity Construct and Public Policy Senior Task Force, PJM's Capacity Repricing and the Market Monitor's Expanded MOPR ("MOPR-Ex") proposal. PJM's repricing proposal would have accommodated state policies, while the MOPR-Ex proposal would have mitigated offers from resources receiving out of market revenues. PJM expressed that each was just and reasonable, and concluded that the state/federal jurisdictional question of integrating state public policies into wholesale markets should fall to the Commission as a federal policymaker, not the PJM Board.

On June 29, 2018, FERC issued an order that (i) rejected PJM's Capacity Repricing/MOPR-Ex proposals; (ii) granted, in part, the original MOPR complaint filed by Calpine and other IPPs, finding that PJM's existing MOPR provisions are unjust and unreasonable; and (iii) initiated paper hearing proceedings seeking comments on proposed MOPR reforms. Notably, FERC found that PJM's existing tariff is unjust

¹⁶ <https://www.pjm.com/~media/committees-groups/committees/mc/20170619-webinar/20170619-item-02-resilience-roadmap.ashx>

and unreasonable and unduly discriminatory, stating it “fails to protect the integrity of competition in the wholesale capacity market against unreasonable price distortions and cost shifts caused by out-of-market support to keep existing uneconomic resources in operation, or to support the uneconomic entry of new resources, regardless of the generation type or quantity of the resources supported by such out-of-market support.” The Commission directed that the replacement rate include few to no exemptions, and include a Fixed Resource Requirement (FRR)-like Alternative that would allow subsidized resources to opt out of the capacity market with a commensurate amount of load. Commissioners LaFleur and Glick dissented.

On August 13, 2018, PJM filed a waiver request with the Commission in order to delay the May 2019 BRA until August 2019 to provide more time to develop and implement FERC’s MOPR and FRR Alternative rules.

Price Formation

On December 21, 2016, FERC issued an order withdrawing its previous fast start pricing rulemaking (RM17-3) and opened investigations into the pricing of fast start resources in PJM (EL18-34), NYISO, and SPP. FERC’s investigation will examine whether PJM should revise its tariff to, among other things, 1) allow relaxation of fast-start resources economic minimum operating limits by up to 100%; 2) consider fast-start resources within dispatch in a way that is consistent with minimizing production costs; and 3) modify its pricing logic to allow the commitment of fast-start resources to be reflected in prices. Parties filed comments in February and March 2017. PJM’s comments outlined proposed changes to FERC’s proposal, including using integer relaxation instead of relaxing minimum operating limits by up to 100%, and to expand the definition of fast start resources to include resources with start-up and minimum run time of two hours or less. FERC has yet to issue a final order.

PJM has used the FERC fast start pricing investigation to jump start some of its key energy price formation proposals, including a broader “integer relaxation” proposal. On April 11, 2018, PJM’s Andy Ott sent a letter to stakeholders describing the Board’s support of the PJM and IMM proposals to implement a 30-minute reserve product in real time to comport with the current Day-Ahead Scheduling Reserve product, address issues with the current implementation of the synchronized reserve market, implement a more dynamic establishment of reserve requirements so as to better capture operator actions to maintain reliability, and to enhance the Operating Reserve Demand Curves used to price reserves during shortage conditions.¹⁷ PJM has been working on these changes through its Energy Price Formation Senior Task Force.

Emerging Technologies

On February 15, 2018, FERC issued a final rule to remove barriers to participation of electric storage resources in RTO/ISO markets by requiring each grid operator to revise its tariff to establish a participation model for these resources that takes their physical and operating characteristics into account (RM16-23). PJM has held special sessions of the Markets Implementation Committee (MIC) to review its approach for complying with FERC’s order, which is due to be filed at FERC on December 3, 2018.

¹⁷ <https://www.pjm.com/-/media/committees-groups/task-forces/epfstf/postings/20180412-pjm-board-letter-regarding-energy-market-price-formation.ashx?la=en>

A technical conference was held April 10-11, 2018 to help gather additional information (RM18-9, AD18-10). Topics included RTO dispatch, pricing and settlement, operational implications on state and local regulators, participation of Distributed Energy Resources (DER) in wholesale markets, data availability, and coordination of DER aggregations. Post-technical conference comments were submitted on June 26, 2018. FERC has yet to issue an order on DER aggregation.

3 DISCUSSION

The purpose of this section is to discuss FirstEnergy's observations based on the background information provided above and FirstEnergy's experience as a PJM market participant. This section also includes an overview of key advocacy efforts for 2018.

As a matter of principal, FirstEnergy believes FERC should evaluate all market issues from a holistic perspective, with a focus on providing long-term reliability and resilience of the electric grid for customers.

FirstEnergy continues to believe that baseload generation should be compensated for resilience benefits to ensure that critical, fuel-secure nuclear and coal-fired generators are not lost. A meaningful resilience solution is necessary to protect FirstEnergy's six million customers.

While PJM initially stated that compensating resources that satisfy an on-site storage criterion would yield "few if any" reliability or resilience benefits,¹⁸ PJM now believes that the most effective way to address fuel security is to define and establish fuel security criteria.¹⁹

The following principles should be applied and analyzed as PJM develops its solution to identified fuel security issues:

- PJM should pursue a holistic approach that takes into account all resilience risks, not just fuel security;
- PJM should ensure that the proposed fuel security solution does not allow one fuel type to dominate the solution, as doing so inherently will increase the risk of common mode of failure and economic risk due to commodity price fluctuations;
- PJM should take a broad view of whether there will be timely new entry of new pipeline capacity in light of state opposition to halt or delay construction of new natural gas pipeline capacity or expansions;
- PJM should factor in historical issues, such as extreme weather events or gas pipeline outages;
- PJM's analysis of fuel supply security should also take into account multiple contingencies or "unknown unknowns"; and
- PJM should avoid blanket assumptions about fuel availability or fuel security of specific plants should be avoided (e.g., it should not assume that units near or adjacent to fuel sources cannot suffer supply disruptions).

¹⁸ <http://www.pjm.com/-/media/documents/ferc/filings/2017/20171023-rm-18-1-000.ashx>, page 18

¹⁹ <http://www.pjm.com/-/media/library/reports-notice/special-reports/2018/20180430-valuing-fuel-security.ashx?la=en>

FirstEnergy has also advocated for PJM to take a holistic approach related to market rule changes around DER to avoid unintended interference with state/local jurisdictional requirements, distribution system operations, and settlements. PJM must recognize and respect state retail jurisdiction and the distribution system's role in preserving local reliability and safety. Storage participating from the distribution system will add complexity to distribution planning, protection and operations. Grid modernization and careful integration is required as the existing Distribution System was not designed for bidirectional power flows or wholesale ancillary market. Integration must be sequenced and coordinated with the EDU and state regulatory commissions to preserve safety, reliability and equitable treatment across customers.

FirstEnergy supports customers' desires to introduce technologies to the grid and participate in wholesale markets, but extreme care must be taken. The need to adhere to standards and protocols related to access to the transmission *and* state-regulated distribution systems is extremely important. We encourage states within PJM, including Ohio, to remain engaged at the PJM/FERC level as stakeholders continue these important discussions.

4 CONCLUSION

FirstEnergy continues to believe that the current market design is not adequate to provide the sustainable system customers require, and it seems that FERC, PJM, and the Market Monitor are beginning to agree, based on actions they have taken over the past year.

FERC and PJM have yet to decide which attributes should be valued in PJM's market design, how PJM can best ensure a resilient system, and how legitimate state policy actions can be incorporated into markets. These are critical items which can't be delayed any further. FirstEnergy urges the PUCO to continue engaging in the PJM stakeholder process and in FERC proceedings to ensure that market outcomes are favorable for customers.

ADDENDUM: Q3 2018 ISSUES

This section will be updated on a quarterly basis (December 1, March 1, June 1, and September 1), whereas the main body of the report will be updated annually on September 1. The purpose of this section is to provide an overview of key FERC and PJM initiatives active in each quarter.

Capacity Market Initiatives

Capacity Market Reform: See the main body of the report for detailed discussion on various MOPR initiatives.

Capacity Market Delay: On August 13, PJM submitted a request for waiver of several dates related regarding the 2019 Reliability Pricing Model (RPM) Base Residual Auction (BRA) for the 2022/2023 Delivery Year. Specifically, PJM seeks waiver of (1) the May 2019 BRA to commence on August 14, 2019; (2) the February 1, 2019 date for posting planning parameters to May 1, 2019; and (3) the September 1, 2018 pre-notification date of deactivation for the RPM must-offer exception to March 17, 2019. This request would allow time to comply with FERC's June order on the Minimum Offer Price Rule. (Noewer)

Quadrennial Review: On April 20, The Brattle Group, a consultant hired by PJM, released its review of PJM's Cost of New Entry (CONE) and Variable Resource Requirement (VRR) Curve. The analysis, required by PJM's tariff, updates cost components used in estimating CONE and suggests changes to the VRR Curve. In the report, Brattle suggests switching the reference unit from a combustion turbine (CT) to a combined cycle (CC) unit, which would dramatically decrease the Net CONE value used by PJM and consequently lower the VRR curve. PJM has begun a stakeholder review, and has noted its opposition to the change from a CT to a CC among other changes. The stakeholder process will continue through August, and PJM will ultimately file any proposed changes with FERC in the fall.

Energy Market Issues

Energy Market Price Formation: See main body of report.

Transmission Constraint Penalty Factors: The transmission constraint penalty factors used by PJM in the market clearing software for day ahead and real time markets affect market prices. The current practice is to modify the market clearing so that the transmission constraint penalty factors do not directly set the constraint shadow price. The resulting clearing prices are inefficient and do not accurately reflect market conditions. Additionally, transmission constraint penalty factors and the process used by PJM in applying transmission constraint penalty factors are not included in the PJM Tariff or Manuals. This issue is currently being worked on through special sessions of PJM's MIC.

Ancillary Services Market Initiatives

Regulation Market: At the August 8 MIC Meeting, PJM asked stakeholders whether it should put forth a new problem statement and issue charge to address a regulation market calculation flaw that recently spiked prices as high as \$1,327.97/MWh on July 23 (compared to the July average of \$17.53/MWh). Over a six to eight week period, regulation market clearing prices spikes have occurred in about 75 five-minute intervals. It is possible that under stressed winter conditions, these spikes could get as high as \$6,000-\$7000/MWh. Ancillary services such as regulation are a very small part of the PJM bill; the first

half of the 2018 was only 0.3% of the total MWh charge in PJM. However, stakeholders agreed that this issue was worth investigating, so PJM will present a problem statement and issue charge at the September MIC.

Other

GreenHat Default: Greenhat Energy held a large position of Financial Transmission Rights (FTRs) through 2021 that were at one time favorable, however due to transmission work the paths have flipped and the FTRs are losing money. As of June 21, GreenHat has been in default. PJM began the liquidation in accordance with its Operating Agreement but found that prices were significantly higher than the pre-default clearing prices. PJM wanted time to engage stakeholders in the liquidation process, so on July 26 PJM filed a waiver request at FERC asking that PJM only offer for liquidation these FTR positions for one month forward in the FTR auctions through October 2018.

Financial Transmission Rights (FTR) Rules: There has been a lot of discussion at PJM regarding FTRs due to the Greenhat Energy default. There are currently four separate proceedings at FERC regarding FTR rules:

- ER18-2090 (FTR Minimum Credit Requirements): PJM filed a proposal to establish minimum credit requirements for FTR holders (they had projected this filing in their Protest to the DC Energy Complaint listed below). Comments were filed on August 17, 2018.
- ER18-2068 (PJM waiver request): PJM filed a request to waive existing Tariff provisions to ensure an orderly and efficient liquidation of Greenhat Energy's FTR portfolio on a month-to-month basis. Comments were filed August 16, 2018.
- ER18-1968 (Long Term FTR auctions): On July 5, 2018, PJM filed to modify rules for long-term FTR auctions to enhance the modeling of residual system capability and to modify the long-term auction biddable periods to improve software performance. FirstEnergy Service Company filed joint comments with EKPC and ODEC in support of PJM's proposal on July 26, 2018.
- EL18-170 (DC Energy Complaint): On June 4, 2018, DC Energy filed a Section 206 Complaint against PJM in response to the then-pending Greenhat Energy FTR default. DC Energy requested that the Commission find that PJM's collateral and minimum capitalization requirements for FTR holders are unjust and unreasonable because they fail to adequately protect the FTR market; and direct PJM to implement collateral and minimum capitalization requirements for FTR holders.

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Case No(s). 14-1297-EL-SSO

Summary: Notice of Quarterly Update Pursuant to Section V.C.2. of the Third Supplemental Stipulation and Recommendation electronically filed by Mr. Scott J Casto on behalf of The Cleveland Electric Illuminating Company and The Toledo Edison Company and The Ohio Edison Company