



An AEP Company

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May 31, 2018

Asim Z. Haque  
Chairman, Public Utilities Commission of Ohio  
Public Utilities Commission of Ohio  
180 East Broad Street  
Columbus Ohio 43215-3793

Steven T. Nourse  
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Re: *In the Matter of the Application Seeking Approval of Ohio Power Company's Proposal to Enter into an Affiliate Power Purchase Agreement for Inclusion in the Power Purchase Agreement Rider, Case No. 14-1693-EL-RDR; In the Matter of the Application of Ohio Power Company for Approval of Certain Accounting Authority, Case No. 14-1694-EL-AAM*

Dear Chairman Haque:

In accordance with Section III.B.2 of the December 14, 2015 Joint Stipulation and Recommendation, I am submitting AEP Ohio's 2018 State of the Market Report for the Commission's consideration.

Thank you for your attention to this matter.

Respectfully Submitted,

//s/ Steven T. Nourse

cc: Parties of Record

# State of the PJM Capacity and Energy Market June 2018

*A whitepaper presented by  
AEP Ohio*



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## Executive Summary

Ohio Power Company (“AEP Ohio” or the “Company”) is a longtime participant in the PJM Interconnection LLC (“PJM”) markets, and recognizes the potential benefits associated with a market paradigm for both capacity and energy. However, AEP Ohio also believes that there are shortcomings in both the capacity and energy markets in PJM that fail to provide proper price signals, proper incentives for long term capital investment, and proper recognition of grid resilience risks, especially as they relate to natural gas supplies and fuel diversity.

The topics in this year’s whitepaper only partially overlap with the 2017 whitepaper. The emphasis in the 2018 whitepaper is:

**Wholesale Prices.** Wholesale prices increased over 4% from 2016 to 2017, rising from \$47.50/MWH to \$49.60/MWH for an average wholesale customer. This was largely driven by higher natural gas and transmission costs.

**Capacity.** Starting in June 2016, PJM began adopting new rules associated with the FERC-approved Capacity Performance (CP) product. In general, the new rules impose greater reliability requirements for generating units during emergency conditions, while imposing higher penalties for failure to perform during these emergency events. PJM has yet to declare an emergency event under the new CP construct. But AEP Ohio believes the potential penalties associated with non-performance greatly outweigh the benefits associated with the new paradigm.

**Energy.** PJM’s energy market design is more liquid and closer to a competitive market than the capacity construct. But it is not without challenges. Volatility in 2017 was somewhat muted because of generally mild weather and low natural gas prices. Historically, however, the energy market has been extremely volatile, correlating with the commodity price of natural gas. Volatility is also moderated because PJM fails to properly include the higher energy prices for all resources that are scheduled on higher risk days. PJM is currently working with stakeholders to address this by Winter 2018.

**Grid Resilience.** Due to a series of events related to initiatives from the Department of Energy in the Fall of 2017, PJM and the other RTOs have initiated studies and discussions on how to build more resilience into the grid of the future. PJM continues to take the position that market-based changes to the capacity and energy markets will address resilience exposures. AEP Ohio is skeptical that PJM’s market approaches can resolve the significant resilience issues that may be identified as part of the DOE/FERC effort.<sup>1</sup> AEP Ohio believes an engineering approach to addressing resilience issues is more fitting than relying on market solutions. And although specific RMR contracts for critical units may be the best approach for bridging the gap

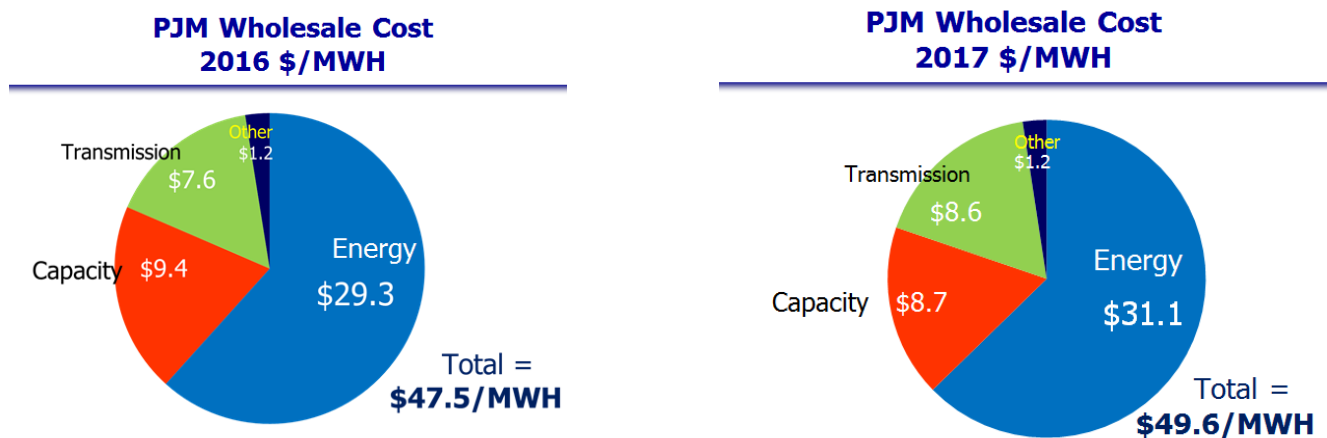
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<sup>1</sup> FERC Docket 18-7-000.

into the future, AEP Ohio does not believe it is prudent to provide a subsidy for *all* units within any single generation class.

**State Initiatives.** Multiple states in PJM have either approved or are considering subsidized payments to generators located in their states. PJM has filed two alternative recommendations with FERC to address the market effects of state subsidies.<sup>2</sup> AEP Ohio supports the rights of states to implement policy initiatives. The Company's advocacy efforts at FERC and in the stakeholder process reflect that belief.

## Comparison of Wholesale Prices – 2016 vs 2017



The pie charts above show the total average wholesale market cost for serving load in 2016 versus 2017 (excluding distribution costs).

- **Energy** comprises the largest portion of the all-in cost to serve. Although natural gas prices increased in 2017, the weather was generally mild throughout the year. The net effect was a 6% increase in energy costs in 2017 to \$31.1/MWH.
- **Capacity** prices (expressed here in \$/MWH on the charts rather than \$/MW-day) were down slightly due to the change in clearing prices from the capacity auction, discussed in more detail below.
- **Transmission** costs per MWH were up \$1/MWH due to continued investment in replacing aging infrastructure on the transmission system. However, transmission costs comprised only 17% of the overall wholesale costs in 2017.

<sup>2</sup> FERC Docket ER18-1314.

- **Other** costs include ancillary services such as black start, regulation, and spinning reserves.

## PJM Capacity Market

### Key Observations

- Units that do not perform during emergency events are subject to penalties of approximately \$3,500/MWH. But PJM has not declared any system-wide emergencies in several years.
- Long-term price signals continue to be volatile.
- Current rules do not provide an integrated plan for fuel, plant, or ancillary service diversity and resilience.

**Capacity Performance.** During the January 2014 polar vortex, PJM experienced an all-time high winter peak load combined with unprecedented generator outages.<sup>3</sup> This series of events caused PJM to revisit the capacity market rules, with the objective of providing greater reliability during peak emergency events. Ultimately, PJM created a new product – Capacity Performance (CP) – which FERC approved beginning in June 2016<sup>4</sup>.

Under the CP rules, any resource (generation or demand response) that qualifies as a capacity performance resource is expected to be available on a 24x7 basis throughout the year (except for planned maintenance). There are no force majeure exceptions, no fuel supply exceptions, and no special seasonal considerations for demand response.

The intent of the CP rules is to improve reliability within the PJM footprint. A resource that fails to perform during emergency hours will incur an assessment of approximately \$3,500 per MWh,<sup>5</sup> compared to the previous rules which only measured average performance over the course of a year. PJM has not declared any emergency events since CP was implemented.

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<sup>3</sup> Docket No. AD14-8-000 Statement of Michael Kormos, EVP-Operations PJM. April 1, 2014.  
<http://www.pjm.com/~media/documents/reports/20140331-testimony-of-michael-kormos-regarding-polar-vortex-ferc-20140401.ashx>.

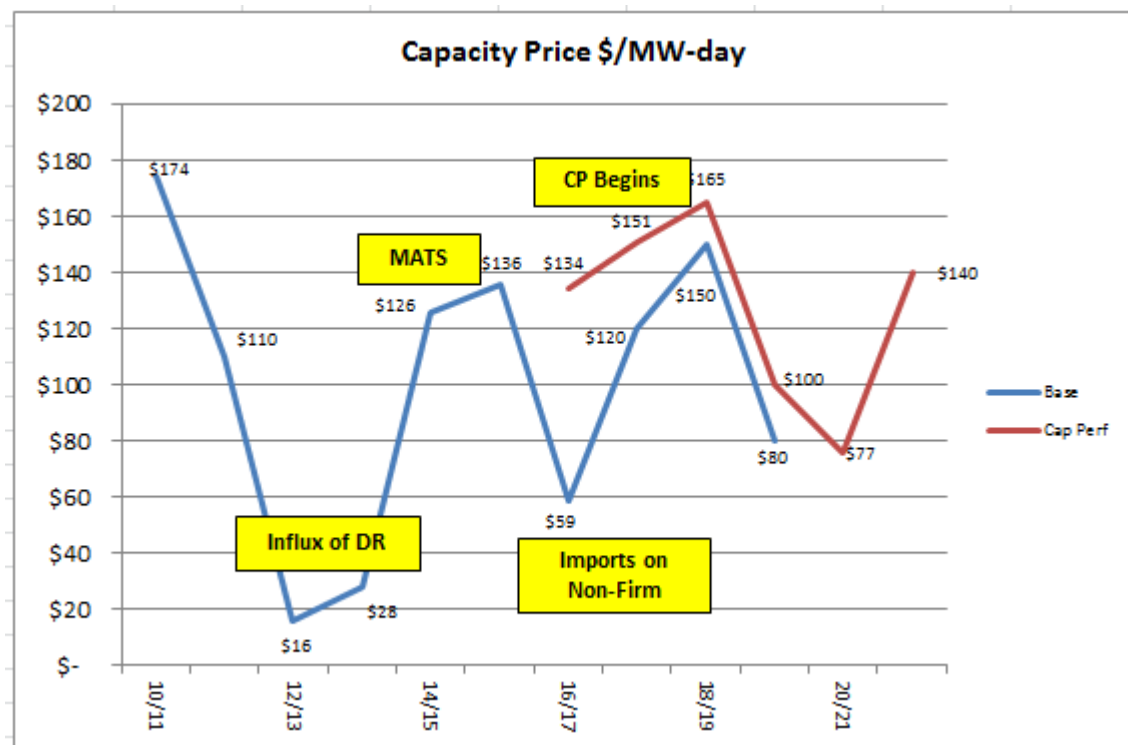
<sup>4</sup> Docket No. ER15-623. CP rules were incorporated starting June 2016, with roughly 60% of the capacity required to abide by CP criteria, ramping up to 100% by delivery year 2020/21 (in the May 2017 RPM auction).

<sup>5</sup> Non-Performance Assessment Rate for CP Resources (\$/MWh) = [LDA Net CONE (\$/MW-day) \* 365]/30. The Net Cone value for AEP is \$281.49. (\$281.49/MW-Day\*365/30 = \$3425).

<http://www.pjm.com/~media/markets-ops/rpm/rpm-auction-info/2018-2019-bra-planning-parameters.ashx>.

**History of Price Changes and Causes (Graph 1).** Although intended as an incentive to build new natural gas-fired generation resources, RPM has historically cleared at prices well below the cost of constructing a new natural gas unit (Cost of New Entry or CONE), which PJM currently posts as approximately \$300/MW-day<sup>6</sup>. The reasons for the low clearing prices range from high reserve levels within the footprint to the economics of the natural gas/electric market.

Graph 1



In May 2018 PJM held its Capacity Auction for 2021/22. The 2021/22 auction cleared at \$140/MW-day for the Rest-of-Market (AEP's) region, significantly above the \$77/MW-day price for 2020/21. There were several off-setting contributors to this year's outcome:

- **Reduction in Nuclear Generation.** Approximately 7,400 MWs of additional nuclear generation failed to clear for 2021/22 compared to last year. This was a combination of units owned by Exelon and First Energy. As a result, these two regions cleared higher than Rest-of-Market: FE at \$171/MW-day and Exelon's ComEd region at \$196/MW-day.

<sup>6</sup> PJM Planning Parameters for the 2020/21 RPM auction. <http://www.pjm.com/-/media/markets-ops/rpm/rpm-auction-info/2021-2022/2021-2022-bra-planning-period-parameters.ashx?la=en>

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- **New Capacity.** New capacity for 2021/22 decreased from 2,300 last year to 900 MWs this year.
- **High Reserve Margin.** PJM continued to clear high reserves margins. The reserve margin cleared for 2021/22 was 22%, down slightly from the 23% cleared last year.
- **Demand Response Increase Significant.** Demand response increased over 3,000 MWs, clearing over 11,000 MWs for 2021/22. AEP Ohio can only speculate that demand response providers are feeling more comfortable with the 24x7 performance requirements of the CP product.

**AEP Ohio's view** is that the additional assessments<sup>7</sup> associated with the CP product, without changes to the underlying market design, will not reduce volatility or increase reliability in the long term. This is because the basic premise of the auction process remains: it provides a one-year price for a physical asset that is intended as a 30-year investment.<sup>8</sup> This inherent volatility has continued even after the adoption of the CP rules.

The rudimentary problem with the auction process is that once a unit is built, it cannot afford “not to clear”. So despite the higher penalties associated with the new CP product, it is difficult for an existing generator to take the risk of incorporating those higher potential penalties in the offer. The unit still has to clear or it receives no capacity payment, thereby forgoing necessary revenue. Thus, owners of existing units are incented to offer at or near zero. This is borne out historically, as over 80% of the offers in the PJM auctions have been at or near zero.

**PJM's Latest Capacity Filing.** In April 2018, after over a year of stakeholder discussions, PJM filed another proposed revision to the capacity construct. The intent of this filing was to address the potential market implications of state subsidies. This issue became more complex when Illinois awarded certain Exelon units a Zero Emissions Credit.

Since neither the PJM stakeholders nor the Board could agree on a specific filing, PJM filed two options: PJM's two-tier pricing proposal and the Independent Market Monitor (IMM) recommendation called MOPR-Ex. Below is a summary:

- **PJM's two-tier clearing proposal.** This proposal would run one auction under current rules to set quantities. And then re-run the auction a second time with all subsidized resources offered at a higher minimum offer price. This second run would set the price.

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<sup>7</sup> A 1,000 MW unit that incurred a tube leak at the beginning of a 10-hour emergency event could be penalized \$35 million for a single outage. If that same unit received capacity revenue of \$59/MW-day, its annual revenue from the capacity market would be just \$21.5M.

<sup>8</sup> The PJM Tariff actually requires new generator offers to reach a certain point in their construction and approval requirements before they are allowed to offer into the auction.



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- **IMM's MOPR-Ex proposal** which sets a minimum offer price for all subsidized offers through extension of the Minimum Offer Price Rule. The IMM's proposal contains significant exemptions for muni/coop's and renewables under RPS.

**AEP Ohio's Preference:** The FRR plan remains intact under the new proposals. So AEP's regulated operating companies have limited exposure to either. In its comments to FERC on this docket, the Company advocated for retention of the status quo (which was endorsed by over 80% of stakeholders in a PJM poll). Of the two filed proposals, AEP Ohio prefers PJM's proposal over the IMM's as it would be more supportive for any developmental activity in Ohio.

**Timing:** PJM is requesting FERC issue an Order by June 29, 2018 with an effective date of January 4, 2019. This will allow time to implement any changes for the May 2019 capacity auction (2022/2023 Delivery Year).

**Grid Resilience Comments for FERC and the RTOs.** The Department of Energy (DOE) issued a Notice of Proposed Rulemaking last Fall which started a series of events at FERC and the RTOs around the topic of grid resilience. In March, the RTOs filed with FERC their initial thoughts on how to address resilience on the grid. Comments from stakeholders on their submittals were filed in early May.

**AEP Ohio's Position.** Following are the key points submitted by AEP in the resilience docket.

- **Studies.** AEP emphasized the need for engineering studies to determine the primary resilience exposures.
- **Specific RMRs.** AEP recommended that the RTOs evaluate specific units on the system that may need RMR contracts to ensure resilience.
- **No Class Subsidies.** But AEP did not endorse a universal subsidy for all units in any certain generator class.
- **Natural Gas Risks.** AEP encouraged more coordination with the natural gas industry on market issues, and emphasized the potential resilience risks associated with the natural gas pipeline system in PJM.

## PJM Energy Market

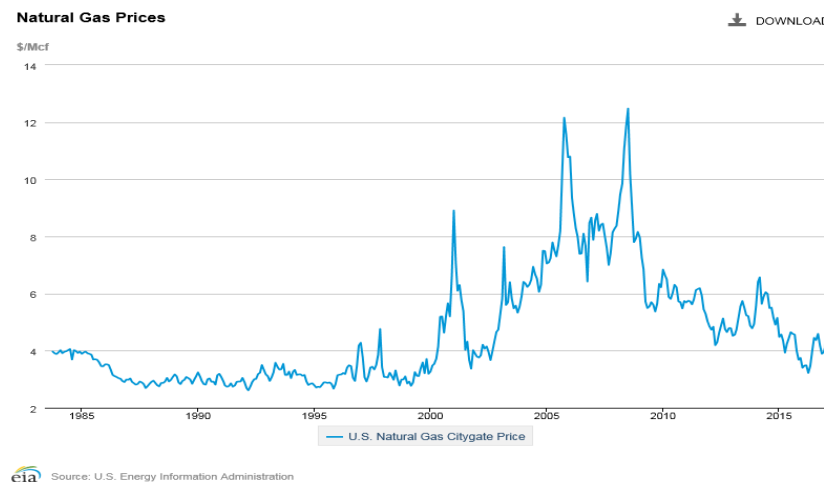
The PJM energy market is a short-term market characterized by day-ahead offers followed by real-time dispatch and settlement adjustments. Although the energy market is more mature and has fewer significant problems than the capacity market, there are still multiple complications inherent in this market.

- **Financial Participants.** PJM allows financial products to affect the clearing price of the energy market. Although these are purely financial transactions, PJM clears them as if they were real MWs of generation or load. These virtual transactions have a significant impact on the market clearing and affect both day-ahead generation commitments as

well as real-time dispatch decisions. Specifically, in both 2016 and 2017 virtual transactions averaged approximately 39,000 MWs per hour, approximately 30% of the average of all supply cleared in the day-ahead energy market.<sup>9</sup>

- **Gas/Electric Coordination.** Natural gas prices continue to have a profound effect on the energy market. Coal energy production has declined from approximately 55% in 2007 to approximately 32% in 2017.<sup>10</sup> And natural gas capacity (67,700 MWs) now exceeds coal capacity (65,100 MWs)<sup>11</sup>. Although the downward pressure on energy prices inherent from these economics has been good for the consumer in the last few years, a historic look at gas prices shows the volatility of this commodity. Graph 4 shows city-gate natural gas prices from 1985-2016.<sup>12</sup> It demonstrates the historic volatility of the natural gas industry.

Graph 4



- **Renewables.** Wind production rose to 2.6% of energy produced in PJM in 2017. Solar, biomass and hydro generation are a small (<5%) but growing part of the PJM generation footprint.<sup>13</sup> Not counted in these percentages is that increasing numbers of customers are installing solar panels and other Behind-the-meter generation. This is one of the key

<sup>9</sup> 2017 State of the Market (SOTM), prepared by PJM’s Independent Market Monitor, Table 3-16, page 118, [http://www.monitoringanalytics.com/reports/PJM\\_State\\_of\\_the\\_Market/2017.shtml](http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2017.shtml).

<sup>10</sup> 2017 SOTM at Table 3-10, page 111.

<sup>11</sup> 2017 SOTM at Table 5-3, page 245.

<sup>12</sup> U.S. Energy Information Administration.

<sup>13</sup> In 2017 renewables other than wind accounted for less than 3% of total energy production in PJM. 2017 SOTM, Table 3-10, page 111.

factors in the decline in PJM's load forecasts. The challenge facing PJM is the lack of visibility, situational awareness, or the authority to dispatch these resources. PJM is currently working on planning, operational, and market considerations for renewables that want to participate in PJM's wholesale market.

- **Price Formation.** Typically PJM dispatches units from least cost to highest cost, with the highest incremental cost unit setting the day-ahead and real-time energy prices. However, in times of high loads or outages, PJM will call on additional generating units to be running over and above the generators cleared in the market. And PJM accounts for those costs in uplift – not in energy pricing. This creates scenarios where the energy prices on high load days can actually be below energy prices on more normal days. In 2017, PJM filed certain rule changes to correct this inconsistency, and is awaiting a final FERC order before initiating rule changes, probably in December 2018. AEP Ohio generally supports this action as being necessary for proper price signals during peak times. FERC has also recently ordered RTO/ISOs to increase their transparency to market participants when taking actions that result in uplift payments.

**PJM's Other Price Formation Initiatives.** PJM has also announced efforts to change other aspects of the energy market.

- **Shortage pricing.** PJM and the stakeholders are discussing changes to pricing signals during reserve shortage conditions. The intention is to make these price signals smoother and simpler to enact. This will likely be filed in time for Summer 2019.
- **30-Minute Reserve Product.** PJM and the stakeholders are also discussing the creation of a 30-minute reserve product. Currently PJM has a 10-minute reserve product. But system operators have expressed a concern that they need more flexibility for filling potential reserve shortages than a 10-minute product can provide. This will likely be filed in time for Summer 2019.
- **Holistic Reforms for Resilience.** PJM indicated in their resilience filing at FERC that some of their price formation revisions should help address resilience. In our 2016 Ohio State of the Market Report we indicated that PJM intended to develop dispatch algorithms that would recognize the value of attributes (e.g. fuel diversity) needed for resilience on the system. But PJM has recently indicated that this phase will not be discussed until 2019.

**Ongoing Stakeholder Processes.** Within PJM, the stakeholder process moves at a deliberate pace. Stakeholder initiatives often take many months to reach a definitive conclusion. In addition, the stakeholder process is controlled by sector-weighted voting, which gives several smaller interest groups significant voting power. The AEP operating companies (including AEP Ohio) own 10-15% of load, generation, and transmission facilities in PJM. Yet because of the governance rules, AEP has a cumulative voting impact of less than 2% in sector-weighted

voting. AEP's voting power is equal to that of smaller companies in AEP's sector that do not own generation or transmission assets.

## **Conclusion**

AEP Ohio has divested, or is seeking to divest, all its de-regulated generation in Ohio. The Company takes the position that cost-of-service regulation inherently takes a long-term view of investments necessary to maintain proper fuel diversity, plant type diversity, transmission needs, and reliability. This results in reduced market volatility and consumer benefits in the longer run. In the experience of AEP Ohio, state utility commissions have successfully considered the inherent risks, costs and benefits accruing to retail customers as a result of long term planning.

## **Appendix**

### **Characteristics of Capacity Market Design**

The PJM Reliability Pricing Model Capacity Market (RPM) was approved by the Federal Energy Regulatory Commission (FERC) in 2007. Within the RPM, the Base Residual Auction (BRA) is an annual capacity auction that sets prices and quantities for a single-year product, three years in advance. Although the intent of the construct is to provide incentives for continued investment,

- It does not provide multi-year revenue stability.
- It does not offer any protection from price volatility.

The basic auction design involves both an administrative demand curve and a partially-mitigated supply curve. The demand curve was negotiated in the original 2006 FERC settlement and re-negotiated in a stakeholder process in 2015. The curve is based on a PJM load forecast and target reserve margins. The curve is steep, such that a small change in the supply curve causes a significant change in clearing prices.<sup>14</sup>

The entire demand curve is constructed around the cost of constructing a new natural gas combustion turbine. And it is designed around the promotion of a single fuel source: natural gas. There are no rules to ensure a diversity of capacity resources or diversity of fuel.

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<sup>14</sup> In its 2014 review of the capacity market, the Brattle Group recommended a change in the curve shape to be consistent with a more gradual decline in reliability value at higher reserve margins. AEP supported the recommendations, which were largely adopted by PJM.

<http://www.pjm.com/~media/documents/reports/20140515-brattle-2014-pjm-vrr-curve-report.ashx>

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The supply curve for the BRA is based on offers submitted during the annual auction. These offers are submitted only once at the beginning of the auction (in contrast to a descending clock auction where suppliers can make decisions on whether to participate as prices decline). However, suppliers that submit offers above a certain price<sup>15</sup> must submit their offer to the PJM Market Monitor for review to determine if it is cost-based. Historically this happened infrequently. But an increasing number of older units have been offering above the trigger point, as they determine they will have to retire if they do not receive sufficient revenues from the capacity market clearing price.

Once a generation unit is cleared in the BRA, there is no guarantee for clearing at the same price in future auctions. Therefore, an offer into the capacity performance construct means a commitment to construct a real physical asset with a useful life of 20-30+ years, but with only a one-year price guarantee.

Vertically integrated utilities that have both load obligations and generating assets can opt out of the RPM auction as long as they meet the reserve margin set by PJM. This alternative is called a Fixed Resource Requirement (FRR). Even though FRR entities do not have to participate in the BRA, they are held to the same operating requirements and non-performance assessments as the entities participating in the BRA. AEP's regulated operating companies in PJM and Duke Energy Kentucky currently are the only entities choosing to meet their load and reserve obligations under an FRR capacity plan.

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<sup>15</sup> For the 2020/21 BRA, this level was approximately \$250/MW-day.

**This foregoing document was electronically filed with the Public Utilities**

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**in**

**Case No(s). 14-1693-EL-RDR, 14-1694-EL-AAM**

Summary: Report - AEP OH submits its 2018 State of the Market Report electronically filed by Mr. Steven T Nourse on behalf of Ohio Power Company