UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

PJM Interconnection, L.L.C.	)	Docket No. EL19-58-000
v.	)	
PJM Interconnection, L.L.C.	)	
	)	
PJM Interconnection, L.L.C.	)	Docket No. ER19-1486-000

ANSWER AND MOTION FOR LEAVE TO ANSWER OF THE INDEPENDENT MARKET MONITOR FOR PJM

Pursuant to Rules 212 and 213 of the Commission's Rules and Regulations,[1] Monitoring Analytics, LLC, acting in its capacity as the Independent Market Monitor ("Market Monitor") for PJM Interconnection, L.L.C. ("PJM"),[2] submits this answer to the comments and protests submitted May 15, 2019.[3]

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1 18 CFR §§ 385.212 & 385.213 (2018).

2 Capitalized terms used herein and not otherwise defined have the meaning used in the PJM Open Access Transmission Tariff ("OATT"), the PJM Operating Agreement ("OA") or the PJM Reliability Assurance Agreement ("RAA").

3 Comments/protests addressed in this pleading include: Comments of the PJM Power Providers Group ("Power Providers"); Comments of Calpine Corporation and LS Power Associates, L.P. ("Calpine/LSP"); Protest of Clean Energy Advocates ("Clean Energy Advocates"); Comments of the Clean Energy Entities ("Clean Energy Entities"); Protest of the PJM Load/Customer Coalition ("Customer Coalition"); Comments of Direct Energy in Support of Reserve Markets Price Formation Revisions ("Direct Energy"); Comments of the Energy Trading Institute ("Entergy Trading Institute"); Supporting Comments of the Electric Power Supply Association ("EPSA"); Comments of Corporation ("Exelon"); Comments of the Institute for Policy Integrity at New York University School of Law ("Institute for Policy Integrity"); Maryland Public Service Commission Protest and Comments ("Maryland PSC"); Motion to Intervene and Comments of the Nuclear Energy Institute ("NEI"); Comments of Old Dominion Electric Cooperative on Reserve Price Formation Proposal ("ODEC"); Comments of the Organization of PJM States, Inc. ("OPSI"); PSEG

I. ANSWER

A. Introduction

The March 29th Filing overstates the issues with the pricing of reserves in order to support a dramatic change to the reserves markets, the energy markets and the capacity markets in PJM. The radical changes proposed by PJM are not supported by any evidence. The March 29th Filing includes no evidence supporting the conclusion that the PJM market rules are not just and reasonable and no evidence supporting the dramatic changes proposed by PJM. The comments filed on May 15th by supporters of the March 29th filing include no evidence supporting the conclusion that the PJM market rules are not just and reasonable and no evidence supporting the dramatic changes proposed by PJM.

It is reasonable to continue the Commission's efforts to improve price formation in organized wholesale power markets.[4] PJM has not fully implemented or assessed the effects of the changes to the PJM energy market resulting from the Commission's price formation proceedings. PJM cannot reasonably assert that its prices are inefficient, or unjust and unreasonable, without considering the impact of offer flexibility, five minute settlements, cost-based offers over $1,000 per MWh, transmission penalty factors, uplift transparency, and fast start pricing. But, PJM does make that unreasonable and unfounded assertion. PJM

Companies' Supporting Comments and Limited Protest to PJM Interconnection, L.L.C.'s Proposal for Enhanced Price Formation in PJM Reserve Markets ("PSEG"); Comments and Limited Protest Submitted on Behalf of the Staff of the Public Utilities Commission of Ohio ("Public Utilities Commission of Ohio"); Comments of the R Street Institute ("R Street Institute"); and Comments of Vistra Energy Corp. and Dynegy Marketing and Trade**, LLC** ("Vistra/Dynegy").

4 *See, e.g., Price Formation in Energy and Ancillary Services Markets Operated by Regional Transmission Organizations and Independent System Operators*, Order Directing Reports, 153 FERC ¶ 61,221 (2015); PJM Interconnection, L.C.C., 167 FERC ¶ 61,058 (2019) (fast start pricing); *Uplift Cost Allocation and Transparency in Markets Operated by Regional Transmission Organizations and Independent System Operators*, Order No. 844, 163 FERC ¶ 61,041 (2018); *PJM Interconnection, L.L.C.*, 162 FERC ¶ 61,139 (2018) (reduced UTC bidding points); *PJM Interconnection, L.L.C.*, 155 FERC ¶ 61,282 (2016) (offer flexibility); *PJM Interconnection, L.L.C., et al.*, 151 FERC ¶ 61,208 (2016) (capacity performance).

began its initiative to propose drastic changes to the energy and reserve markets before any of the Commission's price formation initiatives became effective.

It is reasonable to continue beyond the areas considered by the Commission and include the roles of energy and capacity markets in addressing the missing money problem and the associated issue of the optimal design of sustainable wholesale power markets. There are important questions to be asked and answered and the evolution of wholesale power markets is far from complete. But the current design of the PJM markets is sustainable. It may not be perfect, but it works very well. There is no reason to embark on a rushed process to overturn the key components of the PJM markets. Precisely because the changes would be so sweeping, neither PJM nor its members understand all the consequences, whether intended or unintended, of PJM's proposals. Contrary to assertions by PJM, this problem is not simple and no other RTO/ISO is doing what PJM proposes. The answers should not be rushed and the answers should start with manageable steps. PJM's proposed Operating Reserve Demand Curves (ORDCs) are not based on the same theory as the ERCOT ORDC. PJM's proposed ORDCs have no theoretical basis. Contrary to assertions by PJM, it is neither logical nor rational to expect to solve all market design issues once and for all in one filing. Contrary to the assertions of some, an ORDC is as administrative, if not more so, than a capacity market and the definition of the ORDC parameters is significantly more subjective than the definition of the capacity market parameters.

As an alternative to PJM's proposal, the Market Monitor recommends a defined set of steps to modify the current market design to address legitimate concerns raised by PJM and stakeholders about price formation in the energy and reserves markets. The first step is implementation of reforms already ordered by the Commission.[5] The Market Monitor supports the consolidation of the tier 1 and tier 2 synchronized markets. The Market

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[5] *See* Docket No. ER18-2401 (uplift transparency); Docket No. EL18-34 (fast start pricing).

Monitor supports an increase in the scarcity price to reflect the highest generator energy offer allowed. The Market Monitor supports the explicit pricing of defined operator actions. The Market Monitor supports increased transparency of operator actions and the implementation of clear rules governing real-time pricing through the selection of RT SCED cases and LPC cases.[6] The Market Monitor supports the consistent definition of energy and reserves products in the day-ahead and real-time markets, including recognition of the appropriate role of demand side resources. The Market Monitor also supports a defined set of improvements to PJM's technical practices that would improve price formation.

The Market Monitor also supports the ongoing evolution of market design to improve the granularity and sophistication of price signals with the goal of increased reliance on market prices and less on administrative actions. This should not be the end of the discussion but the beginning of a longer, more complete discussion which would lead to incremental steps to improve markets. If significant changes to the ORDCs are to be implemented, there should be a more complete, objective discussion about the theoretical basis for the new ORDCs and the implications of new ORDCs.

The primary difference between PJM's filing and the position of the Market Monitor is the approach to the operating reserve demand curves, or ORDCs. The Market Monitor agrees with PJM's original rationale for addressing the functioning of the ORDCs, which was to price operator actions.[7] The March 29th filing abandoned that approach and would instead create an ORDC that would substitute for the capacity market as a solution to the

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[6] Monitoring Analytics, Problem Statement and Issue Charge: Five Minute Dispatch and Pricing, presented to the Markets Implementation Committee (May 8, 2019), <*https://pjm.com/-/media/committees-groups/committees/mic/20190515/20190515-item-04a-five-minute-dispatch-and-pricing-problem-statement.ashx*>, <*https://pjm.com/-/media/committees-groups/committees/mic/20190515/20190515-item-04b-five-minute-dispatch-and-pricing-issue-charge.ashx*> .

[7] *See* PJM Board of Managers, Letter to Stakeholders (April 11, 2018), <*https://pjm.com/-/media/committees-groups/task-forces/epfstf/postings/20180412-pjm-board-letter-regarding-energy-market-price-formation.ashx?la=en*> , accessed May 30, 2019.

missing money problem. However, PJM does not derive its approach from a theoretical framework, like that suggested by Hogan and Pope and employed in ERCOT, that would employ ORDCs to support capacity investments in place of the capacity market. As the March 15th comments reveal, no one knows how to solve all the complex issues related to such a substitution, regardless of how attractive it may sound in concept. The proposed ORDC approach is no more targeted to flexible resources than the capacity market, and it appears less so based on the simulation results.[8] The comments of the Nuclear Energy Institute (NEI) demonstrate the proposed ORDCs' role in providing higher revenues to inflexible resources that do not provide reserves.[9] The proposed ORDCs do not provide a more nuanced price signal than the capacity market. The proposed ORDCs would create an almost ubiquitous wedge between LMP based on the marginal cost of generators and energy market prices based on the ORDC. The parameters of the proposed ORDCs would also have to be defined well in advance of the operating year in order to provide some certainty for market participants. While market participants may ultimately choose to evolve the market design away from the capacity market, the sudden shift proposed by PJM was not explicitly advanced by PJM in the stakeholder process and was therefore not explicitly or thoroughly discussed in the constantly rushed stakeholder process and is not supported in the March 29th Filing.

The Market Monitor supports the explicit pricing of defined operator actions through the ORDC. Operator actions to increase reserves should not suppress prices exactly when they need to increase. If operators, for example, increase the commitment of resources in the day before the operating day in anticipation of extreme weather, higher outage rates

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8 *See* Monitoring Analytics, ORDC Simulation Results Version 2, Revised (May 24, 2019), <*http://www.monitoringanalytics.com/reports/Reports/2019/IMM_ORDC_Simulation_Results_Version_2,_Revised_20190524.pdf*> .

9 *See* NEI at 1–2.

and uncertain generator performance, that increase should shift the ORDC correspondingly to the right, increase reserve price and increase the chance of scarcity conditions. The result would be to price scarcity when there is scarcity but not when there is no scarcity. The result would be efficient and competitive prices that reflect the actual economic fundamentals.

A number of commenters express amazement that PJM operators modify the load forecast and expected generator behavior using a process called biasing. The March 29th Filing focuses on biasing in IT SCED, which is the intermediate term security constrained economic dispatch tool. [10] PJM's filing makes the role of IT SCED clear and the purpose of biasing clear, although PJM's analysis of the data is incorrect and misleading. PJM misstates the meaning of its analysis of IT SCED results and actual reserves.

These commenters also misunderstand and over interpret this element of PJM's filing. Exelon treats PJM's filing as if it were revealing long held secrets that make clear that PJM's ORDC proposal is the obvious solution to a newly revealed problem. The March 29th Filing's analysis of IT SCED bias and commenters' extrapolations based on that analysis provide no basis for finding the current market rules unjust and unreasonable or for justifying the March 29th Filing's proposed ORDCs.

B. Commenters Rely on PJM's Misleading Analysis in Presenting the Extended Sloping ORDC as a Panacea for all Energy Market Price Formation Imperfections.

1. Load Bias

PJM's filing states, unsurprisingly, that load forecasts are not perfect and that generating units do not follow their submitted parameters. PJM does not reach any conclusions about whether load forecasts or generator behavior is the larger of the two issues. PJM's filing states that operators modify (bias) the load forecast in IT SCED in order

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[10] March 29th Filing, Attachment E: Affidavit of Christopher Pilong ("Pilong Affidavit").

to adjust for more current information about load and generator performance. PJM's filing points out that if the positive bias is too large, prices will be suppressed. PJM fails to point out that if the negative bias is too large, prices will be inflated. But PJM does not assert that operator bias is systematically wrong, either too high, or too low. PJM focuses solely on positive bias and does not systematically analyze operator bias overall.

None of this should surprise any market participant or observer. It would be surprising if PJM operators did not react to more current information to ensure that load is met. It would be surprising if PJM operators systematically overestimated load; the evidence does not support that conclusion. In fact, PJM operators bias the load forecast upwards only about a third of the time and bias the load downwards almost half the time, with the balance unbiased.

The commenters, and PJM, appear to assert that forecasts have magical properties and that any change to the forecasts is an inappropriate intervention in a market process. In fact, the operators' actions to address changes in load forecasts and generator behavior are part of a continuum that starts with longer term forecasts, uses updated forecasts and ultimately relies on operators' evaluation of market conditions.

What is surprising is that the March 29th Filing fails to address issues which are directly within PJM's control and which do not require PJM's proposed radical change to the pricing of reserves, energy and capacity. PJM simply accepts that operator actions are not clear, or transparent or rule driven. If PJM is concerned about this process being too unsystematic then PJM should address that issue directly.[11] PJM simply accepts that generator parameters are incorrect and appears to accept that generator parameters routinely overstate generator capabilities and that load bias is the only way to address the issue. It would be straightforward to check generators' actual responses and to require generators to use accurate parameters, including notification times, start times, maximum

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[11] *See* Pilong Affidavit, paras. 9, 11 & 20.

output, minimum output, and ramp rates that vary by output level. PJM proposes to penalize units for not providing offered reserves but simply ignores what is to PJM clearly a more critical issue, inaccurate energy market offer parameters.

PJM should propose manageable improvements to their processes that would significantly affect the need for bias, including requiring accurate parameters and improving PJM's modeling capability to address ramp rates that vary by output level. PJM should enforce unit availability based on parameters and not simply continue to permit units to submit incorrect parameters.

In addition, to the extent that operators act to increase reserves, by committing units out of merit in the Reliability Assessment Commitment (RAC) in order to provide extra supply that is not warranted by expected physical demand, PJM should create rules to shift out the existing ORDC. The result would be appropriate and targeted scarcity pricing.

The March 29th Filing never states that operator bias will end if the proposed ORDCs are introduced. Operator bias will not end. Operator bias simply describes the actions that PJM operators take to ensure that generation and load are in balance. As a result of the fact that the ORDC will overstate the need for reserves, it is likely that operators' use of negative bias will increase.

Commenters leap to the conclusion that positive bias is equivalent to creating reserves.[12] The conclusion is wrong and is not based on any facts provided in the March 29th Filing.[13] As PJM points out, the purpose of bias is to have sufficient resources to meet demand and reserve requirements.[14] Equally important, the March 29th Filing provides no

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12 For a useful admonition on jumping to conclusions and on the long cold swim back to rationality, including Rhyme and Reason, *see* Norton Juster, Epstein and Carroll Associates, 1961, *The Phantom Tollbooth*, Chapter 13, Unfortunate Conclusions at 160–169.

13 *See, e.g.*, Exelon at 5.

14 Pilong Affidavit at para. 10.

evidence that operators actually committed units based on positive bias, when it existed, or the extent to which operators actually committed units, if they did. Exelon's hyperbole is unsupported by a careful reading of the March 29th filing, let alone by a complete understanding of the facts. Exelon, following PJM's statements, fails to recognize that IT SCED bias is a recommendation and not a defined action and that Exelon's conclusions are based on a misunderstanding of the difference, among other things.

Exelon implies that operators have an accurate forecast and arbitrarily increase load above that level in order to create reserves and then commit units on that basis. That is not correct and not based on PJM's filing and not based on any evidence. Operators continuously adjust the load forecast and expectations of generator performance prior to the real-time interval to which the forecast and expectations apply. Operators are trying to be as accurate as possible. That is exactly what operators should be doing.

PJM presents no data that supports Exelon's separate claim and Exelon cites no data to support Exelon's separate claim (at 20) that PJM's reserve targets are too low.

a. IT SCED Load Bias Does Not Directly Translate Into Reserve MW.

The March 29th Filing's IT SCED load bias argument is unrealistic and misleading. Several commenters such as Exelon, Vistra/Dynegy and others based their even more unrealistic claims on statements in the March 29th Filing and on misinterpretations of those statements.[15] Several commenters claimed that absent PJM's IT SCED bias, PJM would have been in shortage conditions 29.1 percent of the time in 2018. This claim is inaccurate because it assumes that IT SCED commitment recommendations always result in actual commitments and that those commitments exceed load requirements and that the EMS is the correct definition of shortage rather the RT SCED.

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[15] Exelon at 14; Power Providers (P3) at 10; Vistra/Dynegy at 6; EPSA, Affidavit of Paul Sotkiewicz, Ph.D. at 67–68.

Commenters appear not to understand the purpose and scope of IT SCED. IT SCED is an advisory tool. PJM operators may or may not follow IT SCED recommendations. PJM does not track which commitments are made following an IT SCED recommendation. Therefore, it is impossible to determine the impact of the IT SCED bias on unit commitment.

The March 29th Filing's IT SCED bias analysis assumes that all IT SCED recommendations result in unit commitment decisions, when that is not correct. The March 29th Filing's IT SCED bias analysis assumes a one for one causal relationship between IT SCED bias MW and reserve MW that does not exist and for which PJM provides no supporting evidence.[16]

PJM and several commenters misstate the implications of a shortage that is shown in the Energy Management System (EMS), but which is not shown in the RT SCED dispatch solution. The EMS shows instantaneous load, generation, and reserves, not the market dispatch shown in RT SCED. As PJM recognizes, shortage pricing results only if the dispatch in RT SCED shows a shortage. The EMS shortage results are not relevant to the point PJM is attempting to support.

The conclusions that commenters draw based on the March 29th Filing's IT SCED bias analysis are invalid and provide no evidence that the March 29th Filing's proposed ORDCs are just and reasonable, including comments from Exelon, Vistra/Dynegy, and others.

b. Commenters and PJM Portray an Oversimplified Role for IT SCED.

The purpose of IT SCED is to help PJM operators ensure that generation is adequate to meet load plus reserves. Primarily, operators use IT SCED to commit resources to meet the demand for energy. Even with perfect load forecasts and no need for reserves, operators would use IT SCED to recommend the commitment and decommitment of resources to

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16 Market Monitor Protest at 47.

follow the trajectory of load because PJM commits CTs in the real-time market and does not commit CTs in the day-ahead market. PJM Manual 11 (at 47) describes the IT SCED software:

> The Intermediate Term Security Constrained Economic Dispatch (IT SCED) application is used by PJM to perform various functions over a 1-2 hour look-ahead period. Historical and current system information is used to anticipate generator performance to various requests, and to provide accurate information regarding generator operating parameters under multiple scenarios. The IT SCED solves a multi-interval, time-coupled solution to perform the following functions:
>
> - Calculate energy dispatch trajectory for use in real-time dispatch
> - Resource commitment recommendations for energy and reserves
> - Resource commitment decisions for economic demand resources
> - Execution of the Three Pivotal Supplier Test for energy
> - Coordinated Transaction Scheduling[17]

As stated in Manual 11, the IT SCED functions on a one to two hour time frame. The one to two hour time frame does not match up with the uncertainty that the March 29th Filing proposes to reflect in the synchronized and primary reserve demand curves. The March 29th Filing bases the ORDCs on the uncertainty relevant to the RT SCED, which resolves in a 15 minute timeframe.[18] The IT SCED is not relevant to the determination of synchronized and primary reserve demand curves that constitute the primary market design change in the March 29th Filing. Arguments about IT SCED in the March 29th Filing and the subsequent May 15th comments are irrelevant to and do not support the March 29th Filing.

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17 PJM "Manual 11: Energy & Ancillary Services Market Operations," Section 2: Overview of the PJM Energy Markets at 47–48.

18 Market Monitor Protest at 33–37.

c. Konidena, on Behalf of the Customer Coalition, Shows That Better Options Exist.

Even under the March 29th Filing's proposal, PJM operators would continue to manually intervene in the real-time markets. As Konidena states (at paras. 10 & 13), some amount of operator intervention, including bias to the market solutions, is inevitable.[19] Konidena's description of public reporting and processes used by the MidContinent ISO (MISO) demonstrate a relative lack of transparency regarding PJM operator interventions. He also raises several cost effective measures to addresses the use of load bias.[20] The comparative discussion of MISO's experience addressing operator interventions underscores the point that the proposed ORDC does not directly address operator actions. In summary, Konidena states (at para. 20):

> While some of Mr. Pilong's high-level statements about market functionality are theoretically correct (as discussed below), the specifics of Mr. Pilong's testimony and PJM's proposed methodology for changing its reserve market is unsupported and appear to raise prices disproportionality higher than the size of the "muted" price signals that it purportedly addresses.[21]

2. Integration of Renewables

May 15th comments do not provide the evidentiary support missing from the March 29th Filing that PJM requires its proposed ORDC or any specific new product to address the integration of renewable energy resources. Commenters and PJM overstate the anticipated intermittent capacity and do not consider the size, existing flexibility, and resource diversity of the PJM generating fleet. Furthermore, by the time significantly increased levels of renewable capacity enter the PJM market, inflexible units in the PJM fleet will have retired

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19 Customer Coalition, Affidavit of Rao Konidena ("Konidena Affidavit").

20 *Id.* at paras. 14–16.

21 Konidena Affidavit at para. 20.

and technology to ease the integration of intermittent resources, including better combined cycle modeling will have evolved.

P3 cites the Market Monitor's report showing that 82 percent of resources entering PJM's generation queue from 2015 through 2018 were renewable projects.[22] P3 fails to also note that only 2.0 percent of solar projects and 7.9 percent of wind projects that enter the queue go into service.[23] For comparison, 12.7 percent of combined cycle gas projects and 50.0 percent of combustion turbine natural gas projects go into service. The level of renewables in the resource mix in PJM will increase in the future, but P3 overstates that level based on the evidence in the *State of the Market Report for PJM*.

Evidence does not support assertions by the P3, the Clean Energy Entities, or others that the integration of renewable resources justifies the March 29th Filing's proposed ORDCs.[24] The March 29th Filing and the May 15th comments provide no studies assessing future intermittent resources' impact on the PJM markets or their interaction with any aspects of PJM's proposal or why PJM's proposal would be an appropriate way to address the integration of renewables at any level. Commenters fail to draw any logical link between renewables and PJM's ORDC and fail to define what problem PJM's ORDC will solve.

C. Commenters Recognize that the Proposed Extended Sloping ORDC is a Means to Eliminate the Capacity Market.

PJM's filing would result in the elimination of the capacity market and the substitution of the extended sloping ORDCs as an administrative pricing mechanism to replace the capacity market as a solution to the missing money problem. The May 15th

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22 Power Providers, Attachment B: Emma Nicholson, Ph.D. Whitepaper on RTO/ISO Market Design Changes to Increase Operational Flexibility at 18.

23 See *2019 State of the Market Report for PJM*: *January through March,* Section 12: Planning at Table 12-19.

24 *See* Power Providers at 3; Clean Energy Entities at 2.

comments, whether in support of or protesting the March 29th Filing, recognize the role of the proposed ORDCs as a substitute source of scarcity rents, replacing capacity market revenues.

1. Comments in Support of Eliminating the Capacity Market

Energy Trading Institute supports (at 7–8) elimination of the capacity market and recognizes the elimination of the capacity market is part of PJM's price formation proposal.

Clean Energy Advocates support shifting away from a capacity market and recognize that this shift is part of PJM's price formation proposal.[25]

R Street Institute supports (at 5) the elimination of the capacity market and recognizes that PJM's price formation proposal means using the ORDCs as the off ramp from and substitute for the capacity market.

2. Comments Against Eliminating the Capacity Market

Calpine/LSP (at 5, 8) support retaining the capacity market as a vital part of the PJM market design but fail to explicitly recognize that PJM's proposal would both diminish the role of the capacity market and substitute for the role of the capacity market, albeit with a lag.

The Customer Coalition supports retaining a capacity market to address the missing money issue and recognizes that the logic of PJM's price formation proposal would lead to the end of the capacity market.

D. Commenters Recognize that PJM's Failure to Address the Energy and Ancillary Offset in the Capacity Market is a Significant Flaw

The March 29th Filing's failure to address the impact of its ORDC proposal on the appropriate energy and ancillary services markets revenue offset in the capacity market would result in double recovery, over recovery and would not be just and reasonable.

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[25] Clean Energy Advocates at 2–3.

1. Comments Recognizing the Capacity Market Offset Issue

Many commenters recognize that the PJM market design incorporates the tight coordination of the energy and capacity markets but do not make a specific recommendation about how the offset should work if the March 29th Filing's proposed ORDCs were to significantly increase energy and ancillary services revenues. That tight coordination means that as energy and ancillary market revenues increase, capacity market revenues decrease.

P3 recognizes (at 23, 43) this coordination and discusses the evolution of the interaction between markets.

Clean Energy Entities recognize (at 12) the coordination.

Direct Energy recognizes (at 7) that there is a relationship.

EPSA recognizes (at 21) the role of the Energy and Ancillary Services ("EAS") offset but supports the continued use of a three year historical average offset and opposes a forward looking offset.

FE recognizes the role of the EAS offset. (FE)

R Street Institute recognizes (at 4–5) the coordination, is critical of PJM for not directly addressing the issue but does not recommend a solution.

2. Comments that PJM's Offset Mechanism Is Not Just and Reasonable

Many commenters both recognize that the PJM market design incorporates the tight coordination of the energy and capacity markets and make a specific recommendation for modifying the offset if PJM's ORDC were to significantly increase energy and ancillary services revenues.

Clean Energy Advocates support PJM's goal of a reduced role for the capacity market but also argue (at 2–3, 7–16) that the March 29th Filing is not just and reasonable because it fails to provide for an appropriate transition mechanism addressing the offset issue.

The Customer Coalition recognizes (at 47–70) the need for an offset mechanism, recognizes that PJM's proposal fails to address the shift of revenues from the capacity market to the energy market and recommends the use of a forward looking offset.

The Institute for Policy Integrity argues (at 18) for an offset mechanism and that PJM's failure to include an offset means that PJM's proposal is not just and reasonable.

The Maryland PSC recognizes (at 13–14) that PJM's inclusion of an inappropriate offset mechanism will result in the distortion of capacity market entry and exit signals, and overpayment by customers.

ODEC recognizes (at 12) that there needs to be an effective offset mechanism to prevent overpayment by customers and that the failure to address the offset mechanism will result in unjust and unreasonable rates.

OPSI recognizes (at 10, 18) that there needs to be an effective offset mechanism to prevent overpayment by customers and states that the March 29th Filing's proposed offset method will result in electricity consumers unreasonably overpaying for combined capacity, energy and ancillary services.

The Public Utility Commission of Ohio recognizes (at 5) that there needs to be an effective offset mechanism to prevent overpayment by customers and that without a transition mechanism to address the offset, PJM's current proposal is not just or reasonable because it does not account for the over-recovery of capacity market revenue by generators.

E. Commenters Provide No Theoretical Justification for the Extended Sloping ORDC.

1. Commenters Assume Market Welfare Benefits That Do Not Exist.

Shanker, on behalf of PSEG, Cavicchi, on behalf of P3, and Schnitzer, on behalf on Exelon, incorrectly assert that the proposed ORDC in the March 29th Filing has a theoretical basis rooted in economic principles of welfare maximization. The commenters make the invalid assumption that the proposed ORDCs are derived from consumers' willingness to pay for reserves. The March 29th Filing makes no such assumption and is explicitly not based on any measure of consumers' willingness to pay. This distinguishes the Hogan/Pope

approach from PJM's approach. The comments provide no valid arguments that the March 29th Filing's proposed ORDC is just and reasonable.

Shanker argues that by incorporating the proposed ORDC in the day-ahead and real-time market optimizations, PJM will be, "solving the system commitment and dispatch to accurately maximize the social welfare." Shanker describes the ORDC curve as "explicit representation of the implied willingness to pay for operating reserves." Shaker included a simple depiction of demand and supply curves to illustrate the welfare maximization principle. The caption reads, "For well-behaved supply offers and demand bids, this welfare maximizing economic dispatch is also a price taking, competitive market equilibrium."[26] However, the March 29th Filing does not propose using demand bids or any other metric of consumers' valuing lost load to construct the ORDCs, so the implied consumer welfare indicated by the area under the demand curve cannot be assumed, or reasonable asserted, to be consistent with market welfare maximization.

In their comments in support of PJM's proposal, P3 argues that the current reserve market design "drives up costs and does not maximize welfare." Cavicchi, without providing any supporting economic arguments, concludes that the PJM's proposal improves the overall market efficiency in day-ahead and real-time markets.[27]

Exelon claims, without logical support, that the proposed downward sloping ORDC structure will increase the total economic welfare. Exelon states (at 25):

> Under normal system conditions, the marginal reliability value of reserves declines as the amount of reserves procured increases. A downward sloping ORDC naturally reflects this, with prices decreasing in value until they reach zero when adding another MW of reserves does not improve reliability. As discussed extensively by Drs. Hogan and Pope, this design increases total

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[26] PSEG, Affidavit of Roy J. Shanker Ph.D. at 19.

[27] Power Providers, Affidavit of A. Joseph Cavicchi at 16 ("Cavicchi Affidavit").

> economic welfare and improves the efficiency and accuracy of price signals for both energy and reserves.[28]

Downward sloping ORDCs decrease the tradeoff threshold for procuring more reserves in the dispatch co-optimization. However, downward sloping ORDCs do not reflect the willingness to pay, and therefore would not result in accurate price signals for energy and reserves.

Schnitzer asserts on behalf of Exelon that the areas under the proposed extended sloping ORDCs represent consumer surplus achieved in the PJM reserve markets. Schnitzer estimates a net benefit from the proposed ORDCs of $208 million based on this unsupported assumption. The March 29th Filing does not contend that its proposed ORDCs represent consumers' willingness to pay for reserves. Unlike the Hogan and Pope model, the March 29th Filing's proposed ORDCs do not attempt to quantify customers' willingness to pay. Customer Coalition themselves state (at 40) that "PJM's proposed ORDC design results in the procurement of excess reserves and increased costs, without any commensurate benefit." In fact, the proposed extended sloping ORDCs produce prices exceeding estimates of the value of lost used by other RTOs.[29] Schnitzer's estimates are not based on an actual demand curve and therefore can contribute nothing to a reasonable calculation of customer benefits associated with the March 29th Filing's proposed ORDCs. The March 29th Filing's proposed ORDCs would force customers to purchase reserves beyond the required levels. The benefit, if any, to customers of those additional reserves are not quantifiable in a reserve market where customers do not directly participate and cannot express their willingness to pay.

Using Schnitzer's proposed method of calculating benefits which relies on an artificial and arbitrary demand curve not based on any metric of customers' willingness to

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[28] Exelon at 25.

[29] *See* Market Monitor Protest at 30–31; Customer Coalition, Affidavit of Charles S. Griffey at para. 12.

pay, the proposed administrative ORDCs could be arbitrarily raised to higher and higher levels and using Schnitzer's logic, the higher the prices the more consumers would benefit. The result assumes its answer. Any assumed ORDCs assume a benefit to customers. If the ORDCs are not actually based on customers' willingness to pay, the benefit calculations are meaningless.

2. Cavicchi, on Behalf of the Power Providers, Assumes Improved Market Efficiency in Order to Claim It as a Benefit.

In claiming the market benefits of the March 29th Filing's proposal, Cavicchi provides no theoretical or empirical basis for claiming "[g]reater efficiency in day-ahead and real-time energy and ancillary services prices."[30] Cavicchi begins by asserting that higher prices are the efficient prices in the PJM energy market without defining any criteria for price efficiency. Instead, Cavicchi refers to PJM's statements that current prices are unjust and unreasonable. Cavicchi does not explain under what criteria he finds the March 29th Filing's prices to be efficient.[31] Efficient prices result from a competitive market solution, not from an arbitrary administratively defined demand curve.

All of Cavicchi's conclusions rely on this unsupported assumption, that the March 29th Filing will produce efficient prices. Cavicchi states that buyers will respond to higher prices by innovating in the area of demand response and sellers will respond to higher prices by innovating in entering the market, especially storage resources and interface transactions. However, curtailing load and supplier entry in the markets are not efficient if the higher prices are arbitrary. Increased imports into PJM are not efficient when the marginal cost of production is lower in PJM than in the exporting market. Entry of a storage resource is not efficient if the resource's revenue source is the arbitrage of administratively created price swings due to movements along the extended sloping ORDC.

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30 Cavicchi Affidavit at paras. 42–47.

31 Power Providers, Cavicchi Affidavit at para. 13.

3. Griffey, on Behalf of the Customer Coalition, Shows that the March 29th Filing's Proposed ORDCs Do Not Follow the Model Proposed by Hogan and Pope and Employed by ERCOT.

The Customer Coalition points out that ERCOT's ORDC ensures "resource adequacy" while PJM's ORDCs ensure "stable real-time operating conditions."[32] Griffey, on behalf of the Customer Coalition, articulates three fundamental differences between the ERCOT ORDC approach and the March 29th Filing: measurement of uncertainty, use of multiple reserve products, and use of scarcity pricing and the capacity market.

a. The March 29th Filing Proposes Extended Sloping ORDCs to Address Real-Time Operations, Rather than Resource Adequacy.

Griffey points out that the ERCOT ORDC is based on a probability distribution of actual changes in the operating reserves, but the March 29th Filing does not propose to develop a reserve change distribution.

b. The March 29th Filing Proposes ORDCs That Result in Prices Exceeding the Value of Lost Load.

Griffey says that ERCOT's design is such that LMP plus ORDC will not exceed the value of lost load (VOLL), but the March 29th Filing proposes no such limiting value because it has multiple types of ORDCs as well as regional and sub regional ORDCs that are additive. Griffey's assessment contradicts the March 29th Filing's claim that "the maximum prices under the PJM model fall into a reasonable range of estimates of the VOLL."[33] Griffey says that LMP plus the shadow price of the ORDC under the March 29th Filing proposal could exceed the VOLL, and he refers to the March 29th Filing, which states that energy and reserves prices can exceed $6,000 per MWh, but with the nested zonal ORDC the actual upper bound is in excess of $12,000 per MWh.[34]

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32 Customer Coalition at 28.

33 March 29th Filing, Attachment D: Affidavit of Adam Keech ("Keech Affidavit") at para. 9.

34 March 29th Filing, Keech Affidavit at para. 27.

c. The ORDC of Hogan and Pope and Employed in ERCOT Provides No Justification for the March 29th Filing Because PJM Has a Capacity Market.

ERCOT does not have a capacity market and relies on the ORDC and scarcity pricing.[35] This is an irreconcilable difference between Hogan and Pope's theoretical model and the March 29th Filing. This is an irreconcilable difference between the ERCOT approach and the March 29th Filing. The fact that the March 29th Filing does not propose any transition mechanism or offset to capacity market revenues means that PJM is ignoring its own broader market design.[36]

4. Direct Energy Raises Circumstances Under Which the Proposed ORDC Prices Threaten Reliability.

Direct Energy discusses (at 8–10) the possibility that the proposed extended sloping ORDC may produce reserve prices that are not consistent with reliability or economics in a minimum generation event. The extended reserve requirements created by the extended sloping ORDC increase the likelihood of PJM having excess online capacity such that it dispatches all resources down to their physical limits. The reserve requirements defined by the extended sloping ORDC are not necessarily satisfied in minimum generation circumstances, even if the energy prices is administratively set to zero, so the ORDCs could produce a positive reserve price. The prices would indicate that resources produce more energy or come online to produce reserves when reliability requires the opposite.

The positive effect of the extended sloping ORDC on energy prices could also mute the congestion component of LMP. The energy price could indicate that a resource should increase output or come online when reliable management of the constraint requires that the resource should decrease output, as would be indicated by the status quo LMP except during a shortage. PJM has not demonstrated that the extended sloping ORDC produces

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35 *Id.* at para. 19.

36 *Id.* at para. 24.

efficient prices when the demand for reserves signals resources to move in the opposite direction of another market constraint.

5. Fast Start Pricing and the Extended Sloping ORDC Have a Compounding Effect to Raise Energy Prices Above the Efficient Level.

The Commission recently issued an order directing the implementation of fast start pricing in the PJM energy market.[37] PJM has not yet analyzed the impact of the fast start proposal on its ORDC proposal or the combined impact of fast start pricing and the ORDC on total energy market revenues or the capacity market through the offset. The stated purpose of fast start pricing is to increase prices to reflect the commitment costs that result when operators commit fast start resources in real time to meet load and reserve requirements. The fast start order was issued after the March 29th Filing. PJM needs to address the interaction between fast start pricing in its ORDC filing. Without explicit recognition of the overlap and interactive effects between fast start pricing and the extended sloped ORDC, the PJM filing is not just and reasonable.[38]

The March 29th Filing adds three additional ancillary service markets (day-ahead synchronized reserves, day-ahead nonsynchronized reserves and real-time secondary reserves) to the existing (day-ahead secondary reserves, real-time frequency regulation, real-time synchronized reserves and real-time nonsynchronized reserves). Currently, PJM calculates four sets of prices for its ancillary services and two sets of prices for the energy market (day-ahead and real-time). The March 29th Filing proposes to increase the number of market prices from six to nine. The interaction with the fast start pricing order creates a dispatch run with dispatch pricing signals and a pricing run with the final settled prices.

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37 *PJM Interconnection, L.L.C.*, 167 FERC ¶ 61,058 (April 18, 2019), Docket No. EL18-34.

38 *See* Monitoring Analytics, Reserve Market Design and Energy Market Price Formation, presentation to the Energy Price Formation Senior Task Force (November 1, 2018) at 22-23, <http://www.monitoringanalytics.com/reports/Presentations/2018/IMM_EPFSTF_Reserve_Market_Design_and_Price_Formation_20181101.pdf>.

This increases the number of prices to 18. PJM has not addressed the settlement implications of the different uplift calculations. For example, PJM has not explained how the lost opportunity cost credit calculations will be affected by the implementation of the fast start pricing order.

Exelon argues that the extended sloping ORDC addresses situations where operators commit units to meet load and reserves by starting a block loaded combustion turbine that requires a steam unit to reduce output.[39] This is the situation that fast-start pricing is meant to address. If fast start pricing addresses this issue, the extended sloping ORDC is a redundant price formation tool, unnecessarily increasing costs to customers.

In the fast start docket, the Market Monitor stated:

> The underlying problem that fast start pricing and even PJM's broader modified convex hull pricing approach are attempting to address is actually scarcity pricing including the impact of operator actions on the definition of scarcity. More specifically, the problem is that prices do not reflect market conditions when the market is tight. A key cause of the problem is that conservative operators take actions that mean that PJM needs additional reserves even these extra reserves are not included in reserve targets when defining scarcity. Conservative operator actions are not directly priced and suppress prices at times when prices should be higher. Rather than undercutting the basic LMP logic that is core to market efficiency, it would make more sense to directly address scarcity pricing, operator actions and the design of reserve markets. Specifically, PJM should ensure that all real-time resource commitments beyond stated reserve requirements create an expansion of the reserve requirement so that prices reflect the commitment. Scarcity pricing, done correctly and comprehensively, would be fully consistent with efficient market outcomes and fully consistent with appropriate incentives for generators and for load.[40]

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[39] Exelon at 11-12.

[40] Initial Brief of the Independent Market Monitor for PJM, Docket No. El 18-34 (February 12, 2018) at 2.

There is no evidence about the combined effects of the fast start pricing order and the March 29th filing's proposed ORDCs. Given that the price increases associated with the proposed ORDCs are demonstrably not just and reasonable, the compounded price increases above short run marginal cost that would result from the combination of fast start pricing and the ORDCs are not just and reasonable.

II. MOTION FOR LEAVE TO ANSWER

The Commission's Rules of Practice and Procedure, 18 CFR § 385.213(a)(2), do not permit answers to answers or protests unless otherwise ordered by the decisional authority. The Commission has made exceptions, however, where an answer clarifies the issues or assists in creating a complete record.[41] In this answer, the Market Monitor provides the Commission with information useful to the Commission's decision-making process and which provides a more complete record. Accordingly, the Market Monitor respectfully requests that this answer be permitted.

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[41] *See, e.g., PJM Interconnection, L.L.C., 119 FERC ¶61,318 at P 36 (2007) (*accepted answer to answer that "provided information that assisted … decision-making process*"); California Independent System Operator Corporation*, 110 FERC ¶ 61,007 (2005) (answer to answer permitted to assist Commission in decision-making process); *New Power Company v. PJM Interconnection, L.L.C.*, 98 FERC ¶ 61,208 (2002) (answer accepted to provide new factual and legal material to assist the Commission in decision-making process); *N.Y. Independent System Operator, Inc.*, 121 FERC ¶61,112 at P 4 (2007) (answer to protest accepted because it provided information that assisted the Commission in its decision-making process).

III. CONCLUSION

The Market Monitor respectfully requests that the Commission afford due consideration to this answer as the Commission resolves the issues raised in this proceeding.

Respectfully submitted,

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Dated: May 30, 2019

CERTIFICATE OF SERVICE

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

Dated at Eagleville, Pennsylvania,
this 30th day of May, 2019.

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