UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

PJM Interconnection, L.L.C.	)))	Docket No. ER19-383-000

COMMENTS OF THE INDEPENDENT MARKET MONITOR FOR PJM

Pursuant to Rule 211 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 these comments responding to the filing submitted by PJM Interconnection, L.L.C. ("PJM") on November 20, 2018 ("November 20th Filing"). The November 20th Filing includes proposed revisions, "designed to remove the use of minimally effective resources in the calculation of the Regulation Market Clearing Price ("RMCP")."

I. COMMENTS

PJM states (at 5) that it has recently "observed intervals in the Regulation market where a resource with a very low benefits factor (less than 0.1) cleared hour-ahead because it had a $0 Total Adjusted Offer, but in real-time the adjusted LOC was non-zero, and as a result, the resource set the clearing price and the RMCPs were significantly elevated."

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[1]   18 CFR § 385.211 (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").

In the November 20th Filing, PJM proposes (at 1) "to remove the use of minimally effective resources in the calculation of the Regulation Market Clearing Price ("RMCP")." To eliminate minimally effective resources from price calculations PJM proposes a limit on the amount of RegD that can clear in the regulation market so that the MBF of the last MW of RegD clearing in the market would be 0.1. PJM indicates (at 1–2) that "[t]his will reduce the occurrence of large spikes in clearing prices that have recently been observed in PJM's Regulation market and can be achieved by establishing a new rule under which RegD (dynamic) resources with a 'benefits factor' of less than 0.1 will not clear in the Regulation market." PJM states (at 2), "Through this proposal, the frequency of such large upward clearing price fluctuations due to aberrations in the outcomes of certain formulas in the Tariff and Operating Agreement will be reduced, thereby decreasing the likelihood of unjust and unreasonable outcomes for Market Participants."

PJM's proposal is ad hoc and will be ineffective because it does not address the simple and clear source of the issue in the regulation market design.

A. PJM's Limited Proposal Does Not Address the Underlying Market Issues Causing Price Spikes in PJM's Regulation Market

1. The Solution Is Simple

In a properly functioning market every resource should be paid the same price per unit produced. That is not true in the PJM Regulation Market. RegA and RegD resources are not paid the same price in dollars per effective MW. RegD resources are being paid more than the market clearing price. The price spikes in PJM's Regulation Market are a direct result.

Although the issue appears complex, it is actually simple. If all MW of regulation were treated the same in the clearing of the market and in paying the cleared MW, there would be no price spikes. The current PJM rules require the payment to RegD resources of up to 1,000 times the correct price! That is the simple problem. The solution is also simple.

RegA and RegD have different physical capabilities. In order to permit RegA and RegD to compete in the single PJM Regulation Market, RegD must be translated into the

same units as RegA. One MW of RegA is one effective MW. This is done using the marginal benefit factor (MBF). As more RegD is added to the market, the relative value of RegD declines. For example if the MBF is .001, a MW of RegD is worth .001 MW of RegA (or 1/1,000 MW of RegA). This is the same thing as saying that 1.0 MW of RegD is equal to .001 effective MW when the MBF is .001.

The issues in PJM's Regulation Market are all caused by the inconsistent application of the MBF. When the MBF is less than 1.0, RegD resources are paid too much. When the MBF is less than 1.0, each MW of RegD is worth less than 1.0 MW of RegA. The market design buys the correct amount of RegD, but pays RegD as if the MBF were 1.0. In the extreme case cited by PJM, when the MBF is .001, RegD are paid 1,000 times too much. If the market clearing price is $1.00 per MW of RegA, Reg D is paid $1,000 per effective MW!

The solution is to pay RegD for the same effective MW it provides in regulation. In this example, RegD would be paid $.001, which is $1.00 * .001 MW.

2. PJM's Proposed Approach is not a Solution

PJM's proposal to cap RegD MW at the point where the lowest MBF will be 0.1 would reduce the magnitude of the price spikes observed in the PJM regulation market but will not eliminate price spikes and will not eliminate overpayment of RegD when the MBF is less than 1.0. PJM's proposal will not decrease the likelihood of unjust and unreasonable outcomes for market participants. The current regulation market design causes unjust and unreasonable outcomes in every hour when RegD clears the market and the MBF is less than 1.0. Correspondingly, RegD is underpaid when the MBF is greater than 1.0.

As noted by PJM, the observed price spikes are caused by the combination of the MBF issue and the discrepancy between the hour ahead estimated LOC and the actual realized LOC.[3] The hour ahead estimated LOC is used to determine the prospective all-in

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[3]   In the following discussion and examples all performance scores are assumed to be equal to 100 percent for all resources and the mileage of RegA and RegD resources are assumed to be 1.0 on

offer of RegD resources with an energy offer. The actual LOC is used to determine the final, actual interval specific all-in offer of RegD resources. The only reason that a RegD resource clears the regulation market with an MBF of .001 is if its offer, in dollars per marginal effective MW, is less than or equal to the price of adding .001 more marginal effective MW from the next RegA MW in the supply stack. In other words, for the RegD MW to clear with an MBF of .001, it must be cheaper than using .001 MW more of the next most expensive RegA MW available in the supply stack. A RegD offer of 1 MW with an MBF of .001 MW and a price of $1/MW of RegD, would provide 0.001 effective MW at a price of $1,000 per effective MW. So long as RegA MW are available for less than $1,000 per effective MW, this resource will not clear. Generally the only way for RegD MW to clear to the point where the MBF of the last MW is .001 is if the offer price of the relevant resource, including estimated LOC, is $0.0. If this same resource then has a positive LOC within the hour, the zero priced offer is adjusted to reflect the positive LOC, resulting in an extremely high price for regulation.

While an incorrect estimate of a potential LOC can result in an extremely high price, the resulting regulation market prices are mathematically correct for each effective MW but are not correct for RegD unless RegD is measured in effective MW. The prices in every interval reflect the marginal costs of regulation given the resources dispatched and accurately reflect the marginal offer of minimally effective resources which had unexpectedly high LOC components of their within hour offers. In other words, the prices themselves are not the source of the market failure.

The market failure in PJM's Regulation Market is caused by an inconsistent application of the MBF between market clearing and market settlement. Due to the inconsistent application of the MBF, the current market results are not consistent with a

both a historic trailing average basis and on a within hour actual mileage basis. These assumptions are made to simplify the discussion and have no material effect on the analysis or conclusions.

competitive market outcome. In any market, resources should be paid the marginal clearing price for their marginal contribution. In the regulation market, all resources should be paid the marginal clearing price per effective MW and all resources in the regulation market should be paid for each of their effective MW. PJM's Regulation Market does not do this. PJM's market applies the MBF in determining the relative and total value of RegD MW in a given market solution for purposes of market clearing and price, but does not apply the same logic in determining relative and total value of RegD for purposes of settlement. As a result, market prices do not align with payment for contributions to regulation service in market settlements. Due to the inconsistent application of the MBF, the current market results are not consistent with a competitive market outcome.

In the example above, a resource has a $0.0 offer for 1 MW of D, and a $0.0 estimated LOC. If the resource clears the market with an MBF of .001, the adjusted offer of the resources is $0.0 (offer/MBF = $0.0/.001 = $0.0). In the optimization and market clearing, the resource's 1 MW of RegD would be evaluated as 0.001 MW of regulation for a price of $0/MW. The unit would not be marginal, but would look like a zero priced incremental MW of regulation. In this circumstance a RegA resource would be setting a positive price based on its offer and the RegD resource would be inframarginal.

If, after clearing, the within operational hour LOC for the RegD resource was $1.00, the RegD's 1 MW would be evaluated as 0.001 MW of Regulation at a price of $1,000 per effective MW in the supply stack (total supply that cleared has not changed). The regulation clearing price, in terms of $/effective MW would be $1,000. This is the price of $1.00 divided by .001 effective MW.

In a properly functioning market this would result in every resource being paid $1,000 per effective MW. The RegA resource would be paid $1,000 for each of its effective MW. The marginal RegD resource should also be paid $1,000 for each of its effective MW. For this result to occur, the MBF that was used to determine the relative value of the RegD MW in the market clearing must be used to convert the RegD MW into effective MW for purposes of settlement. In this case, the marginal RegD resource provided 0.001 effective

MW (1 MW of RegD x MBF of .0001). Total payment should be $1.00 ($1,000 x 0.001), which would result in the marginal resource being paid the amount exactly equal to its marginal offer.

If the market were working properly, RegA would be paid $1,000 per MW and RegD would be paid $1 per MW. This means that both RegA and RegD would be paid the same $1,000 per effective MW. This would not be the equilibrium solution because the correct market outcome would eliminate the current incentive for RegD to underbid. That incentive is the result of the payment of 1,000 times the correct price to RegD and PJM's decision to agree to pay 1,000 times the correct price for all RegD offered into the market at an offer price of $0.00 per MW.

Under PJM's current rules, however, the MBF that is used for market clearing and setting price is not used to convert RegD MW into effective MW for settlement. As a result, the RegD MW in this example will be paid $1,000 per .001 effective MW provided, which 1,000 times more than the correct amount based on the market clearing price per effective MW, and 1,000 times more than resource's marginal offer that was the basis for the market clearing price in terms of $/effective MW. Due to the absence of the MBF in the settlement calculation, the RegD resource will be paid $1,000,000 per 1 effective MW instead of $1,000 per 1 effective MW.

The market flaw creates an opportunity and an incentive for participants to manipulate the market results by bidding noncompetitively. The overpayment of RegD resources when the MBF is less than 1.0 creates a perverse incentive for RegD resources to bid zero, or significantly below their actual costs, in order to guarantee that they clear the market and benefit from possible price spikes caused by RegD resources with a within hour non-zero LOC. This incentive extends to those RegD resources, such as hydro or CTs, that have energy offers that can generate a within hour LOC component for their price offer and cause price spikes well in excess of their offers. For example, a hydro unit could offer in 1 MW as a RegA resource with a price of zero, and no expected LOC. If the LOC for the unit within the operational hour was $100 and the RegA unit set the clearing price, the

$/effective MW would be $100. The RegA resource would be paid $100 for its 1 effective MW. If this same resource offered in as RegD with a zero price and the MBF was .01, the resulting within hour LOC would cause a clearing price of $10,000 per effective MW. RegA resources would all be paid $10,000 per effective MW and, without the MBF in settlement, RegD resources, including the hydro unit, would be paid $1,000,000 per effective MW. The hydro unit would be paid a total of $10,000 for its .01 effective MW.

So, under the current market rules in this example, the hydro unit has a choice of offering in as a RegA resource, setting the price at $100 per effective MW and being paid $100 for its 1 RegA MW (which is 1 effective MW) or offering in as a RegD resource, setting the price at $10,000 and being paid $10,000 for its 1 RegD MW (which is .01 effective MW). If it chooses to offer as a RegD resource it will only contribute .01 effective MW to the total supply, but if it chooses to offer as RegA it will contribute 1.0 MW effective MW to total supply. Without the MBF in settlement, the clear incentive is for the hydro unit to bid in as a RegD resource with a zero offer, even though it would be more valuable in the market solution, in terms of effective MW, as a RegA resource.

With the MBF in settlement, the hydro unit has a choice of offering in as a RegA resource, setting the price at $100 per effective MW and being paid $100 for its 1 RegA MW (which is 1 effective MW) or offering in as a RegD resource, setting the price at $10,000 and being paid $100 for its 1 RegD MW (which is .01 effective MW), which is equivalent of $100 per effective MW.

The inconsistent application of the MBF in PJM's regulation market design is generating perverse incentives and perverse market results. The price spikes identified by PJM are merely a symptom of the problem, not the problem itself.

Under PJM's current regulation market rules, whenever the MBF is less than 1.0, RegD resources are paid significantly in excess of their market value and regulation customers are overcharged for regulation service. PJM's proposal to cap RegD MW at the point where the MBF is 0.1 will reduce, but not eliminate, the size of the overpayment to RegD resources. PJM's proposal to limit cap RegD MW at the point where the MBF is 0.1

will reduce, but not eliminate, the perverse incentives for RegD resources to bid below cost to force low MBF and the potential for price spikes. PJM's proposal to limit cap RegD MW at the point where the MBF is 0.1 will reduce, but not eliminate, the market inefficiencies caused by PJM current market design. Resolution of the identified issues with PJM's energy market would require a consistent application of the MBF throughout PJM's market construct, not a cap on the MBF.

B. PJM Has Already Filed A Proposed Solution to PJM's Regulation Market Design Issues with the Commission

PJM's current regulation market design is severely flawed. The market results do not represent the least cost solution for the defined level of regulation service. Resolution of the identified issues with PJM's regulation market would require a consistent application of the MBF throughout, not a cap on the MBF.

To address the identified market flaws, the Market Monitor and PJM developed a joint proposal which was approved by the PJM Members Committee on July 27, 2017, and PJM filed with the FERC on October 17, 2017.[4] The PJM/IMM joint proposal addresses issues with the inconsistent application of the marginal benefit factor throughout the optimization and settlement process in the PJM Regulation Market. On March 30, 2018, FERC rejected the proposal, finding it inconsistent with Order No. 755.[5] Both PJM and the MMU have filed requests for rehearing.[6]

C. Any Proposed Settlement Cannot Address the Identified Regulation Market Flaws Based on the Stated Scope of the Settlement

On May 30th, the Commission issued an order establishing settlement procedures to address issues associated with complaints made by ESA and Renewable Energy Systems

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[4]   *See* Docket No. ER18-87-002.

[5]   162 FERC ¶ 61,295 (2018).

[6]   *See* Docket No. ER18-87-002.

Americas and Invenergy Storage Development LLC regarding PJM's December 2016 changes to its MBF curve that capped RegD participation and PJM's January 2017 changes to the RegD signal.[7] The settlement proceedings are not intended, and should not be used, to address the fundamental market design issues raised in the PJM proposal filed on October 17, 2017, and rejected by order issued March 30, 2018 ("March 30th Order").[8] The settlement proceeding was put in place to address the issues raised in the complaints: the documentation of the determination of the MBF curve and the signal design in the tariff and operating agreement. Given the limited scope of the settlement proceedings, there is no reason to wait for resolution of those proceedings before the Commission considers PJM's and the Market Monitor's request for rehearing of March 30th Order. Only rehearing of the March 30th Order can address the fundamental issues preventing efficient operation of the PJM Regulation Market.

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[7]   163 FERC ¶ 61,157

[8]   *PJM Interconnection, L.L.C.*, 162 FERC ¶ 61,295.

II. CONCLUSION

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

Respectfully submitted,

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Dated: December 12, 2018

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 12th day of December, 2018.

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