**UNITED STATES OF AMERICA**
**BEFORE THE**
**FEDERAL ENERGY REGULATORY COMMISSION**

| | | |
|---|---|---|
| | ) | |
| PJM Interconnection, L.L.C. | ) | Docket No. ER16-372-001 |
| | ) | |

**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 for PJM[2] ("Market Monitor"), submits these comments on the response of PJM Interconnection, L.L.C. ("PJM") filed on March 4, 2016 ("March 4th Response"), to the deficiency notice issued in this proceeding on February 3, 2016.

**I. COMMENTS**

1) **With respect to a Market Seller's ability to differentiate offers hourly and to update offers (cost-based or market-based) after the close of the Day-ahead Energy Market, PJM states that Market Sellers must specify values for several variables that comprise an offer and that the specific details and business rules governing how such values may or may not be updated by the Market Sellers under PJM's proposal will be appropriately elaborated upon in PJM's Manuals.**

   **Please provide additional details and explanation regarding the flexibility Market Sellers have to differentiate and update each offer parameter of the energy supply offer (e.g. start-up cost, no-load cost, incremental energy offer, economic minimum MW, etc.). Please indicate:**

---

[1]     18 CFR § 385.211 (2015).

[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").

a. **The frequency (e.g., daily, hourly, every six hours, etc.) of changes;**

b. **The granularity (e.g., daily, hourly, etc.) of the parameters;**

c. **Any limits on the differentiation of offer parameters (e.g. % change limit, etc.) across hours or between day-ahead and real-time, including whether the limits change depending on whether a Market Seller is raising or lowering a given offer parameter.**

IMM Response: In response to this question, PJM provided the matrix from the GOFSTF. The proposed requirements, if approved at all, should be incorporated in the Commission-approved tariff, not the participant-approved manuals. The rule of reason requires that "all practices that significantly affect rates, terms and conditions fall within the purview of section 205(c) of the Federal Power Act, and, therefore, must be included in a tariff filed with the Commission."[3]

PJM disagrees, stating (at 3):

> Market Sellers will continue to be able to look to PJM's Manuals and user guides for guidance and technical specifications for updating offer parameters. Given the additional levels of flexibility and detail provided, such explanations are appropriately included in the PJM Manuals. In particular, as part of implementing PJM's proposal, PJM Manual 11 will be updated to provide guidance regarding the submission of Real-time Offers.

---

[3]  *See, e.g., Cal. Indep. Sys. Operator Corp.,* 119 FERC ¶ 61,076, at P 656 (2007) ("Our policy is that all practices that significantly affect rates, terms and conditions fall within the purview of section 205(c) of the FPA, and, therefore, must be included in a tariff filed with the Commission. Further, we have found that our 'rule of reason' test requires a case-by-case analysis...."); *see also Prior Notice and Filing Requirements Under Part II of the Federal Power Act,* 64 FERC ¶ 61,139 (1993), citing *City of Cleveland v. FERC,* 773 F.2d 1368, 1376 (D.C. Cir. 1985) ("[There] is an infinitude of practices affecting rates and service. The statutory directive must reasonably be read to require the recitation of only those practices that affect rates and service *significantly,* that are realistically susceptible of specification, and that are not so generally understood in any contractual arrangement as to render recitation superfluous. It is obviously left to the Commission, within broad bounds of discretion, to give concrete application to this amorphous directive."); *Public Service Commission of New York, et al. v. FERC,* 813 F.2d 448, 454 (D.C. Cir. 1987) (held that the Commission properly excused utilities from filing policies or practices that dealt only with matters of "practical insignificance" to serving customers).

> Like all changes to the PJM … Requiring such operating details to be filed in the tariff would impose a substantial administrative burden, yielding diminishing returns with no clear overriding benefit.

The market rules for offer parameters are designed, in part, to prevent the exercise of market power and manipulation. Protection for the exercise of market power and manipulation provides a clear overriding benefit to the public.

The rules for parameters directly and significantly affect rates and service, they are realistically susceptible of specification, and they are not so generally understood in any contractual arrangement as to render recitation superfluous.[4] In addition, it is not appropriate to allow participants the ability to change such rules in the PJM stakeholder process with no notice and opportunity for comment from affected parties and no opportunity for Commission review.[5]

The Market Monitor has included the corresponding components of its proposal in a spreadsheet attached to this document.

2) **Proposed Section 1.10.9B of the PJM Tariff provides Market Sellers the ability to update offers in real-time.**

   a. **Subsection (b) states, among other things, that Market Sellers must update their previously submitted cost-based Real-time Offer if they submit a market-based Real-time Offer in accordance with subsection (c) of Section 1.10.9B, or such updates are required by the Market Seller's approved fuel cost policy. Please explain whether and how PJM plans to change the rules that govern the development of cost-based offers, including fuel cost guidelines, to implement this proposal. Also, please explain how changes in fuel costs will be approved in the proposed hourly offer construct.**

IMM Response: As part of compliance with the Commission's ongoing rulemaking proceeding in Docket No. RM16-5-000, the Market Monitor plans to have an ex ante

---

[4]    *Id.*

[5]    *See* 5 USC § 553(b).

verification process based on the cost-based offer input assumptions and available fuel cost policies filed by generators using estimated fuel cost data.[6] This verification process will also depend on final ex post verification and Commission defined and imposed penalties for noncompliance. The fuel cost policies will be updated to require generators to define how they calculate hourly fuel costs in the day-ahead market as well as how they update fuel costs in the real-time market.

**b. Proposed subsection (c) of 1.10.9B indicates that:**

> *If a Market Seller's available cost-based offer is not compliant with Schedule 2 of the Operating Agreement and the PJM Manuals at the time a Market Seller submits a change to a market-based Real-time Offer…and the current price of the available cost-based offer for that clock hour exceeds the Market Seller's estimation of its new cost-based offer for the hour by more than $5/MWh, the Market Seller must submit an updated cost-based Real-time Offer for that clock hour that is compliant with Schedule 2 of the Operating Agreement and the PJM Manuals.*

> i. **Please explain why the available cost-based offer cannot be made compliant with Schedule 2 on an ex-ante basis? Please provide an example of a situation where a Market Seller's available cost-based offer would not comply with Schedule 2 of the Operating Agreement and the PJM Manuals.**

IMM Response: As part of compliance with the Commission's ongoing rulemaking proceeding in Docket No. RM16-5-000, the Market Monitor plans to verify the costs ex ante based on the cost-based offer input assumptions and available fuel cost policies filed by generators using estimated fuel cost data.[7] The fuel cost policies will be updated to require generators to define how they calculate hourly fuel costs in the day-ahead market as well as

---

[6] *Offer Caps in Markets Operated by Regional Transmission Organizations and Independent System Operators*, Notice of Proposed Rulemaking, IV FERC Stats. & Regs., Proposed Regs. ¶ 32,714 (2016).

[7] *Id.*

how they update fuel costs in the real-time market. Cost-based offers can be made compliant with Schedule 2 of the Operating Agreement on an ex ante basis using the inputs provided by market sellers of generation resources and the fuel cost policy. This verification process will also depend on final ex post verification and Commission defined and imposed penalties for noncompliance. Strong incentives for compliance are essential in order to provide assurance to the market that the rules are being followed in real time.

> **ii. Please define the term "current price" with respect to the available cost-based offer, and explain which component or components of the three-part supply offer (i.e., no-load costs, startup costs, and incremental energy offer curve) will be used in determining the "current price?"**

IMM Response: PJM's response states that it will consider only the incremental energy offer curve component of the three-part supply offer in determining the "current price" for purposes of this provision. PJM's response clarifies that only if a market seller submits a change to its real-time market-based offer *and* at the same time there is a decrease in the cost-based incremental offer curve of $5/MWh, it triggers an update to the cost-based offer (all three components including startup, no-load and incremental components). PJM proposes the following modified tariff language:

> If a Market Seller's available cost-based offer is not compliant with Schedule 2 of the Operating Agreement and the PJM Manuals at the time a Market Seller submits a market-based Real-time Offer for an applicable clock hour during the Operating Day, and the current ~~price~~ incremental energy offer portion of the available cost-based offer for that clock hour exceeds the Market Seller's estimation of its new cost-based incremental energy offer for the hour by more than $5/MWh, the Market Seller must submit an updated cost-based Real-time Offer consisting of an incremental energy offer, start-up cost and no-load cost for that clock hour that is compliant with Schedule 2 of the Operating Agreement and the PJM Manuals.

PJM's decision to focus solely on the difference in the incremental offer curve as the trigger for updating a cost-based offer is arbitrary. It is also unclear what part of the incremental curve PJM will test for a $5/MWh difference. Incremental offer curves may

change by different amounts at different MWh levels for a given change in fuel cost. In order to include the no-load costs as well as incremental cost, the Market Monitor proposes to use the operating rate at the economic maximum MW point as a trigger for updating cost-based offers. Operating rate at any MW point is defined as the sum of (no load cost and the area under the incremental curve up to the MW point) divided by the MW. Therefore, the operating rate at economic maximum MW point is defined as the sum of (no load cost and the area under the incremental curve up to economic maximum MW point) divided by the economic maximum MW.

The $5/MWh decrease in the incremental offer curve is an arbitrary trigger for a market seller to update its cost-based offer. When a market seller has enough incentive to update the market-based offer, the market seller should also be required to update the cost-based offer to be compliant with Schedule 2 of the Operating Agreement and the PJM Manuals regardless of the magnitude of change in costs. However, in order to address the compliance risk associated with small changes to costs, it is reasonable to have a threshold to require an update to cost-based offers. The Market Monitor proposes that market sellers be required to update cost-based offers when the Operating Rate at economic maximum MW level decreases by at least $1/MWh.

It is also important to note that PJM's trigger for updating cost-based offers in real time applies only when a market seller updates its market-based offers in real time. If a market seller offers hourly differentiated offers in the day-ahead market, and chooses not to update the offers in real time, they are not required to update the cost-based offers in real time. This creates a substantial and presumably unintended loophole in the rule. The Market Monitor proposes that any unit for which costs change be required to update cost-based offers to be compliant with Schedule 2 of the PJM Operating Agreement subject to the thresholds defined. If a market seller chooses to not use hourly offers, they can opt out of hourly offer flexibility provisions on a monthly basis as long as it is chosen by no later than the 15th day of the prior month. It is important that the opt out provisions apply for a long enough period so that market sellers do not try to switch on a daily basis that may lead to

operational concerns. Opting out of the hourly offer provisions will result in offering a single daily fixed offer, and will no longer require a market seller to update offers in real time. For resources whose underlying costs are not expected to change within a day, opting out of the hourly offer rules offers a more efficient offer strategy.

> **iii. Please explain how PJM intends to identify and enforce the proposed requirement that a Market Seller must submit an updated cost-based Real-time Offer for a given clock hour that "exceeds the Market Seller's estimation of its new cost-based offer by more than $5/MWh"? How will PJM verify a Market Seller's estimation of that Market Seller's new cost-based offer?**

IMM Response: Focus on the incentives to reduce offers when costs decline is central to hourly offer flexibility. Under PJM's approach, market participants have an incentive and an ability to increase offers when they wish, but do not have corresponding incentives to reduce offers when costs decline. Adoption of the Market Monitor's proposal to have a constant markup between market-based and cost-based offers would require that market participants decrease cost-based offers when market-based offers are reduced and, equally important, that market participants decrease market-based offers when cost-based offers decrease.

PJM's response ignores these incentive issues and provides further support for the elimination of the $5/MWh threshold by asserting that the threshold is unenforceable in real time. PJM states that: *"PJM does not intend to identify instances when a Market Seller must submit an updated cost-based Real-time Offer for a given clock hour. Doing so would be extremely difficult to identify and enforce."*

As part of compliance with the Commission's ongoing rulemaking proceeding in Docket No. RM16-5-000, the Market Monitor plans to verify the costs ex ante based on the cost-based offer input assumptions and available fuel cost policies filed by generators using

estimated fuel cost data.[8] The fuel cost policies will be updated to require generators to define how they calculate hourly fuel costs in the day-ahead market as well as how they update fuel costs in the real-time market. Cost-based offers can be made compliant with Schedule 2 of the Operating Agreement on an ex ante basis using the inputs provided by market sellers of generation resources and the fuel cost policy. This verification process will also depend on final ex post verification and Commission defined and imposed penalties for noncompliance. Strong incentives for compliance are essential in order to provide assurance to the market that the rules are being followed in real time.

> **iv. Please explain the basis and rationale for the $5/MWh threshold in this proposed provision.**

The Market Monitor believes that $5/MWh decrease in costs is an arbitrary trigger for a market seller to update its cost-based offer, by any metric used to represent the costs. When a market seller has enough incentive to update the market-based offer, the market seller should also be required to update the cost-based offer to be compliant with Schedule 2 of the Operating Agreement and the PJM Manuals. However, in order to address the compliance risk associated with small changes to costs, it is reasonable to have a threshold to require an update to cost-based offers. The Market Monitor proposes that market sellers be required to update cost-based offers when the Operating Rate at economic maximum MW level decreases by at least $1/MWh.

> **3) PJM indicates in its Transmittal that Market Sellers with previously committed resources will be prohibited from increasing their market-based offers relative to any market-based offer in effect at the time their resource was committed "in order to ensure that Market Sellers do not exercise market power."[footnote omitted] Please discuss whether revisions to the tariff to perform the Three Pivotal Supplier Test in every interval that a resource changes its offer is a workable alternative.**

---

[8]     *Id*.

IMM Response: The Market Monitor agrees with PJM that the TPS test does not protect against aggregate market power, since it is currently performed only to test for local market power. Even the Commission's proposed alternative solution to perform the TPS test in every interval that a resource changes its offer does not prevent the exercise of aggregate market power. The Market Monitor does not agree with PJM that its proposed rule to not allow committed resources to increase market-based offers adequately protects the market against the exercise of aggregate market power. PJM's response demonstrates the issues raised by the Market Monitor about aggregate market power in its protest ("IMM Protest") and in its answer ("IMM Answer") to PJM's answer.[9] As the Market Monitor pointed out in the IMM Answer, PJM's reliance on the Commission's market-based rates review is circular logic. The Commission's grant of market-based rate authority is based on the market power mitigation rules in place in PJM.[10] PJM's statement that "basic economic concepts guard against the potential exercise of aggregate market power" is also logically impossible. When there is aggregate market power, competitive forces cannot guard against the exercise of market power, by definition. When there is aggregate market power, sellers have the ability to set the market price above the competitive level because competitive forces are not adequate.

PJM's proposal to not allow market sellers of committed resources to increase their market-based offers during the time of commitment is also inadequate to protect the market from local market power because of the shortcomings of the application of mitigation once a market seller fails the TPS test. The Market Monitor provided specific scenarios and examples of how resources can use varying markups and operating parameters to appear to

---

[9]     Protest of the Independent Market Monitor for PJM, Docket Nos. EL15-73-000 & ER16-372-000 (December 14, 2015); Answer and Motion for Leave to Answer of the Independent Market Monitor for PJM, Docket Nos. EL15-73-000 & ER16-372-000 (January 27, 2015).

[10]     IMM Answer at 16.

be more economic on the price-based schedule than on the cost-based schedule and consequently avoid mitigation.[11] The Market Monitor showed how resources that fail the TPS test can still exercise market power by avoiding the mitigation actions and proposed rules to ensure that resources that do fail the TPS test cannot avoid the mitigation actions.[12]The simple rules on markup and operating parameters proposed by the Market Monitor will ensure that market sellers face the same incentives to offer competitively as under a single daily offer rule and address the shortcomings in the mitigation step once market sellers fail the TPS test for local market power.

4) **The Market Monitor states that the PJM Tariff and Manuals do not specify how market power mitigation, specifically the Three Pivotal Supplier Test, is implemented in the Day-ahead market.[footnote omitted] Please explain how market power mitigation will be implemented in the Day-ahead market under the proposed new Tariff provisions. For example, suppose a resource submits an offer for six hours, and that offer fails the Three Pivotal Supplier Test for the first hour of its commitment. Is that resource's offer mitigated and replaced with a cost-based offer for the entire duration of its Day-ahead schedule (i.e., six hours?). If not, during which of the resource's six hour commitment would the resource be offer capped? What Tariff provisions govern the number of hours a resource is capped during its Day-ahead scheduled commitment if that resource's offer fails the Three Pivotal Supplier Test in the Day-ahead market?**

IMM Response: PJM's operational practice in the day-ahead market, as referenced but not described in detail in the response, is not specified anywhere in the PJM Tariff or Manuals. PJM's operational practice of offer capping a unit for the entire commitment if the market seller of the resource fails the TPS test for one hour for a constraint is not consistent with previous communications with the Market Monitor.

Given the actual uncertainty about PJM's actual application of the TPS test in the day-ahead market, PJM should be required to draft and submit to the Commission

---

[11]     IMM Protest at 17–21.

[12]     *Id.* at 32–36.

proposed tariff language setting out in detail PJM's application of the TPS test in the day-ahead market.

**5)** **On pages 18-19 of the IMM's Comments, the IMM provides an example, as illustrated in Figure 1, of how PJM currently applies the Three Pivotal Supplier Test. Is this example consistent with PJM's application of the current Three Pivotal Supplier application? If not, please describe how PJM currently applies the Three Pivotal Supplier Test.**

IMM Response: The basis for determining the least expensive schedule, the Dispatch Rate formula, as described by PJM in its response to Question 5, is not found anywhere in the PJM Tariff or Manuals. The use of the term "fixed cost adder" is a misnomer. Both start up and no load costs include only short run marginal costs.

PJM's response validates the Market Monitor's concerns that having the ability to offer variable markup can result in a resource circumventing mitigation of its offer, even after its owner fails the TPS test for local market power. But PJM fails to take the logical step of proposing a solution. The Market Monitor proposes a solution.

**6)** **Please provide numerical examples of how the Total Lost Opportunity Cost Offers would be calculated for pool-scheduled generating units specified in section 3.2.3(f-1) and for all other pool-scheduled generating units and self-scheduled units. With respect to the definition the Total Lost Opportunity Cost Offer on page 37 of PJM's Transmittal, how will PJM determine the MW quantity that will serve as the upper limit of the integration under the applicable offer curve for the Lost Opportunity Cost (LOC) Deviation? Will the Total Lost Opportunity Cost Offer include start-up and no-load costs or incremental energy costs alone?**

IMM Response: PJM provided three examples showing how the Total Lost Opportunity Cost Offer would be calculated under PJM's proposal. These examples were included in Attachment A.

The first and third example illustrates the LOC compensation for a pool-scheduled resource and a self-scheduled resource that is dispatched down by PJM. These examples did not capture the issue raised by the Market Monitor. The Market Monitor pointed out (page 32 of the IMM answer) that a committed resource that decreases its offer will be

undercompensated for LOC. The example provided by PJM does not illustrate the issue because the RT LMP is higher than both the Committed and Final Offer. Therefore, regardless of the offer used in the calculation, the resource will be dispatched to economic maximum and the LOC deviation will be 200 MWh regardless of the offer selected. In this example, the LOC calculation using the Committed Offer and the LOC calculation using PJM's proposed methodology result in the same outcome. As a result, PJM's example is not helpful in responding to the question.

In order to make this example reflect the issue raised by the Market Monitor, the example is redefined to set the RT LMP at $50 per MWh, as shown in Figure 1.

**Figure 1 Adjusted PJM LOC Example 1**
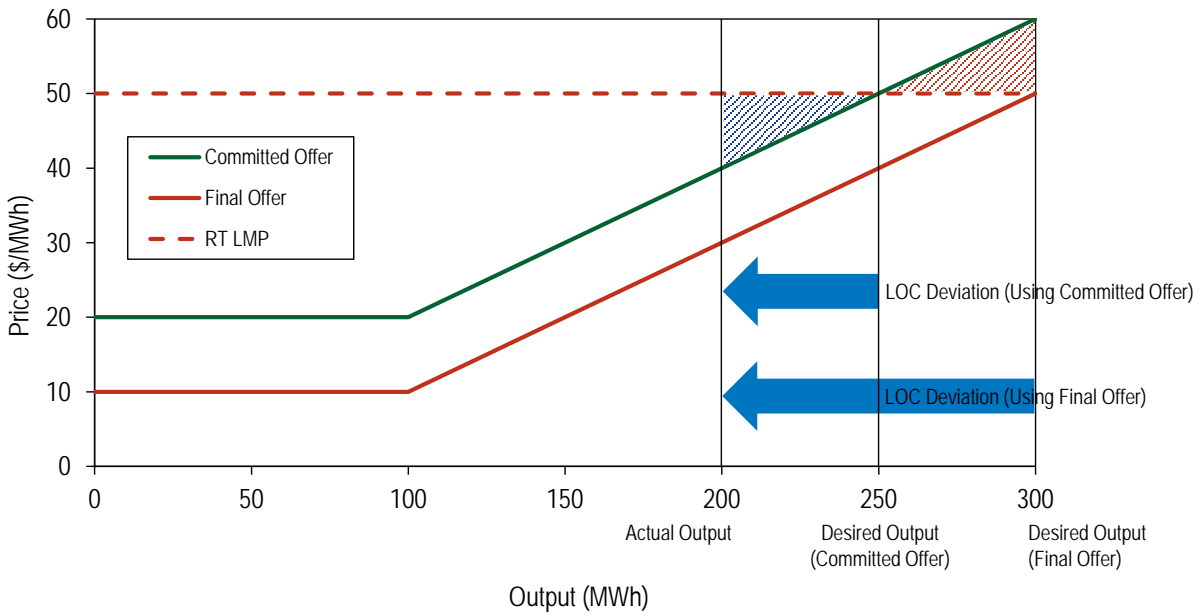


Based on PJM's proposed LOC calculation this resource will not receive an LOC payment when the RT LMP is $50 per MWh or less because, as shown in Figure 1, the LOC calculation proposed by PJM will add a positive lost opportunity cost (blue triangle) with a negative lost opportunity cost (red triangle). In PJM's proposal, the RT LMP times the LOC deviation MWh will be $5,000 ($50 per MWh times 100 MWh), the same value as the area under the Committed Offer curve between the desired output and the actual output. PJM's proposal subtract both numbers, therefore the final LOC payment is zero.

The reason for LOC compensation is to provide an incentive to resources to follow PJM's manual instruction. This incentive is based on compensating resources for their lost opportunity cost calculated using the offer submitted to PJM. This rule should be designed to consistently apply one submitted offer, either the Committed Offer or the Final Offer but not a combination of both. PJM's proposed LOC compensation is inconsistent as a result of the use of a combination of the Committed Offer and the Final Offer.

There are two approaches that result in consistent calculations. One approach uses all components based on the Committed Offer and the other approach uses all components based on the Final Offer. The Market Monitor proposed calculating this LOC with all components based on the Committed Offer.

The Market Monitor proposed using the Committed Offer and not the Final Offer because this approach will compensate resources based on the offer used by PJM in the initial commitment and because this approach does not allow resources to increase their LOC compensation by decreasing their offer after they have been committed. Using the Committed Offer results in the same LOC compensation regardless of any changes made to the offer.

The second example illustrates LOC compensation for a pool-scheduled resource that is scheduled in the Day-Ahead Energy Market and not committed by PJM in real time. In this case, the LOC deviation is not dependent on the resource's real-time offer. The LOC deviation in this calculation is currently defined as the day-ahead cleared MWh.

7) **For illustrative purposes, please provide a numerical example(s) of how the market settlement would work with three hypothetical resource offers under (i) the status quo and (ii) the new hourly-offer proposal for the Day-ahead and Real-time Market Settlements.**

IMM Response: PJM did not provide a complete response to the Commission's question. The Commission asked for three hypothetical examples of how the market settlement would work under status quo and under the new hourly offer proposal. PJM provided three examples illustrating which offer would be selected for LOC calculations,

which is only one component of the LOC settlement calculation. The LOC settlement is only one part of the final market settlement calculation. A typical settlement includes day-ahead energy revenues, balancing energy revenues or charges, regulation and other ancillary services revenues, operating reserve credits and charges among other billing line items.

**8)  In its Protest on page 37, the IMM states:**

*Regarding lost opportunity cost payments, under the current rules, a resource cannot affect PJM's decision to reduce its output or to not commit the resource. This is a result of the fact that resources cannot make themselves less economic in real time. With hourly offer flexibility, this is no longer true. If a resource's increase in its offer results in PJM reducing its output or not committing the resource, the resource should not be compensated for lost opportunity cost. The Market Monitor proposes that any resource that increases its offer will not be compensated for lost opportunity cost.*

**Under PJM's proposal, please clarify how the absence of an offer cap for Flexible Resources will affect LOC credits in a scenario where the Resources make themselves less economic in real time.**

IMM Response: PJM argued that the scenario presented by the Market Monitor only applies to resources scheduled in the Day-Ahead Energy Market on their cost-based offer. This answer is inconsistent with PJM's proposed application of the new hourly offer rules. PJM stated that:[13]

"*a resource that is committed in the Day-ahead Energy Market on a market-based offer will not be dispatched by the Office of the Interconnection at a price level above that market-based offer unless the Market Seller subsequently submits a cost-based Real-time Offer above that amount and the Market Seller requests to run on its cost-based schedule for the remainder of the day. This applies to Market Sellers of Flexible Resources and non-Flexible Resources.*"

---

[13]  PJM Compliance Filing to Implement Hourly Offers, Docket Nos. EL15-73 & ER16-372, (November 20, 2015) ("November 20 Filing") at 31–32.

This means that a resource can request to be committed on its updated cost-based offer when the updated cost-based offer is greater than its price-based offer as a result of increases in gas costs.

Under PJM's approach a PJM dispatcher may not commit a resource, scheduled in the Day-Ahead Energy Market, on its price-based offer if the resource owner requests that the resource be committed on a higher cost-based offer. The scenario presented by the Market Monitor could happen to any resource with updated cost-based offers higher than the offer on which the resource was initially scheduled.

PJM's answer seems to suggest that even if this occurs, the result is lower LOC compensation. PJM argued that if a resource (scheduled in the Day-Ahead Energy Market) increases its cost-based offer, the resulting LOC payments will be lower because the offer used in the LOC calculation is higher than the Committed Offer.[14] PJM's answer did not address the fact that a resource's decision in one hour affects PJM's decisions for subsequent hours. PJM failed to recognize that an offer increase in one hour may affect PJM's commitment decision in subsequent hours, in which the resource could have elected not to increase its offer or could have decreased it to the original value before it becomes the last Real-Time Offer. In this case, the LOC could be affected by the resource's actions after it already affected PJM's commitment decision.

Another important distinction not covered by PJM is that resources will be able to change their offers one hour before the operating hour regardless of their notification and startup times. For example, a resource may increase its cost-based offer two hours before (assuming two hours is the resource's notification plus startup time), PJM may make the decision to not commit the resource in real time and an hour before the operating hour the resource could decrease its cost-based offer to the original value. This scenario could occur because of the volatility of gas prices in the intraday market.

---

[14]    March 4th Response at 23.

For all these reasons, the Market Monitor continues to recommend that any resource that increases its offer should not be compensated for lost opportunity cost if the resource is scheduled in the Day-Ahead Energy Market and not committed in real time.

**9)    In its Transmittal at page 32, PJM states:**

*Third, Market Sellers of Flexible Resources that are committed in the Day-ahead Energy Market on a cost-based offer (meaning they were offer capped or only submitted a cost-based offer day-ahead) may be dispatched on a market-based Real-time Offer that is higher than the cost-based offer on which the resource was committed if the Market Seller of the Flexible Resource passes the TPS [Three Pivotal Supplier]Test when it is evaluated for market power during the Operating Day (emphasis added).*

**PJM also states in footnote 25 (p. 12):**

*While it is true that a marginal resource could still raise the overall market clearing price if its cost-based offer is updated to a higher value, PJM believes such a change in the market clearing price would be appropriate as it would reflect the true marginal costs of such a resource.*

**If, as stated in footnote 25, a marginal resource with a higher cost-based offer can raise the market clearing price, would it be similarly appropriate if a marginal resource with a higher market-based offer could raise the market clearing price in the absence of a binding constraint?**

IMM Response: The Market Monitor agrees with PJM that allowing a higher market based offer from a committed resource to set price in real time is inappropriate, but only under PJM's approach to the market design for hourly offer flexibility. Such a provision would allow resources to make a low offer in the day-ahead market or the real-time market in order to be committed and then arbitrarily increase the market-based offer once committed. This would permit the exercise of market power either by increasing LMP or by increasing uplift payments.

Even if the resource owner does not have aggregate market power, a resource that is committed and did not complete its minimum run time requirement but increases its offer in real time may only be dispatched down to the economic minimum in real time by the dispatch engine and not entirely decommitted. Giving the ability to increase market-based

offers by committed resources without any restrictions results in potential problems with market power as well as system control because the MW quantity cleared can change rapidly from one hour to the next with no change in costs that justify an updated offer.

The Commission's question highlights one of the many problems that result from PJM's proposal to permit hourly changes in markup. If the design included the Market Monitor's proposal to have a fixed markup for the day, any increase in the market-based offer would have to be based on an increase in costs. In that case, it would be appropriate to let the higher market-based offer set price. This would also require a review of markup behavior.

**10)** **In its Transmittal at page 39-40, PJM states:**

*This creates the potential for Market Sellers of self-scheduled resources to submit or update their energy offers in a manner that is inconsistent with the cost to operate the resource but maximizes LOC payments. To eliminate this possibility, PJM proposes to use either the cost-based offer on which the resource was dispatched or the offer curve associated with the highest available offer when determining the offer that should be used to calculate LOC payments.*

    a. **Please explain why the "greater of" Committed Offer or Final Offer construct applicable to the pool-scheduled resources is not being applied to self-scheduled resources. Will PJM consider start-up and no-load costs when making this determination?**

    b. **How will PJM determine when to use either the cost-based offer on which the resource was dispatched or the offer curve associated with the highest available offer?**

IMM Response: PJM proposes the following modified tariff language in response to the Commission's question:

> For self-scheduled generating units, the Total Lost Opportunity Offer
> shall equal the hourly offer integrated under the applicable offer curve
> for the LOC Deviation, where for self-scheduled generating units (a)
> operating pursuant to a cost-based offer, the applicable offer curve
> shall be the greater of the originally submitted cost-based offer or the

cost-based offer that the generating unit was dispatched on in real-time; or (b) operating pursuant to a market-based offer, the applicable offer curve shall be determined in accordance with the following process: (1) select the greater of the cost-based day-ahead offer and updated cost-based Real-time Offer; (2) for units with multiple cost-based offers, first, for each cost-based offer select the greater of the day-ahead offer and updated Real-time Offer, and then select the lesser of the resulting cost-based offers; and (3) compare the offer selected in (1), or for units with multiple cost-based offers the offer selected in (2), with the market-based day-ahead offer and the market-based Real-time Offer and select the greatest offer. ~~as determined by the either the cost-based offer on which the resource was dispatched or the offer curve associated with the highest available offer submitted by the Market Seller for each hour in an Operating Day.~~

The proposed definition needs further clarification. PJM failed to clarify that the offer on which a self-scheduled resource is running as a "Committed Offer." Instead PJM provided an ambiguous definition that could result in different interpretations. PJM included the term "originally submitted cost-based offer." PJM should clarify that the "originally submitted cost-based offer" is the offer that was effective for the Day-Ahead Energy Market (if the resource is scheduled day ahead) or at the time the resource requested to be allowed to come on line (if the resource is not scheduled DA and decides to run in RT). Without this clarification, the "originally submitted cost-based offer" could be any offer made for the resource before it became the Final Offer.

PJM argued that startup and no load costs are not part of the LOC compensation for self-scheduled resources. The Market Monitor agrees, but any rule in which a greater or lower offer is determined, the rule must specify if it is greater or lower incremental offer curve (which does not include startup and no load costs) or if it is greater or lower total offer (which includes startup and no load costs). Without this clarification, the greater offer

could be a market-based offer if it is based on the incremental offer curve or the greater offer could be the cost-based offer if it is based on the total offer.

**11) In its Transmittal at P 43, PJM states:**

*Third, section 3.2.3(e) is being revised to state that Operating Reserve credits paid pursuant to this section (which applies to Generation Capacity Resources) will exclude quantity deviations (in megawatt output) "caused by an increase in the Market Seller's Real-time Offer."*

**Please explain how PJM proposes to ascertain deviations due to an increase in the market seller's real-time offer that would be distinct from dispatch-driven deviations.**

IMM Response: PJM proposes the following modified Manual 28 formula in response to the Commission's question. The formula will include a new component called original schedule desired MWh:

$$BV = RT\ LMP \times (max(RT\ Gen, min(max(RT\ DD, Original\ Desired), DA\ Gen) - DA\ Gen)$$

Where:

BV: Balancing value

RT LMP: Real-time LMP

RT Gen: Real-time generation MWh

RT DD: Real-time dispatch desired MWh

Original Desired: Original Schedule Desired MWh

DA Gen: Day-ahead generation in MWh

The balancing value is an important component of the balancing operating reserve credit calculation. For resources that clear the Day-Ahead Energy Market, this component is to the amount of spot energy credits or charges that the resource incurs if it operates above or below the day-ahead generation. For resources that do not clear the Day-Ahead Energy Market, this component is the amount of spot energy credits the resource makes. The following formula describes the balancing operating reserve credit calculation.

$$BOR = Total\ Offer - (DA\ Rev + BV + Reactive\ Offset + Ancillary\ Offset)$$

Where:

BOR: Balancing operating reserve credit

Total Offer: Total resource offer calculated as the applicable startup cost, no load cost and the area under the incremental offer curve at the applicable output.

DA Rev: Day-ahead revenues, calculated as day-ahead generation times the day-ahead LMP.

BV: Balancing value

Reactive Offset: Net reactive services revenues. Original Schedule Desired MWh

Ancillary Offset: Net synchronized, non-synchronized and day-ahead scheduling reserves net revenues.

PJM's clarifying language prevents resources from increasing their make whole payments due to a real-time offer increase. When a resource increases its offer in real time, PJM may dispatch the resource at a lower output when compared to the output the resource should have been dispatched based on the day-ahead offer. Without this clarifying language, under the PJM proposal, the resource could be made whole for the amount of energy that is buying back in the balancing market, not due to a PJM manual dispatch instruction but due to the resource owner decision of increasing its offer.

12) **In its Answer at P 19, PJM states:**

*Furthermore, if PJM were to require a constant markup across a resource's entire offer curve, it would remove the ability for Market Sellers to offer a zero or negative markup on one portion of their offer curve, but a higher markup on another portion of it. This practice may be used by a Market Seller today to minimize its commitment cost in order to maximize the chance of being committed in the Day-ahead Energy Market. This practice lowers the overall costs of the Market Seller's offer, thus limiting uplift costs that Market Participants may otherwise pay, and allows the Market Seller to accept some of the risk of its commitment costs.*

**Please provide an example of how commitment costs are reduced by giving the Market Sellers the ability to vary markup.**

IMM Response: In response to this question, PJM provided three scenarios with specific assumptions and calculated uplift payments in each. In the first scenario, the resource has a constant positive markup of $5 per MWh; in the second scenario, the resource has a negative markup of $5 per MWh for the first 100 MW and a positive markup of $5 per MWh for the last 100 MW; and in the third scenario (without an illustration) the generator has zero markup for the first 100 MW and a positive markup of $5/MWh for the last 100 MW. PJM assumed the same startup and no-load costs in all scenarios in order to focus on the impact of markup in incremental curves on uplift paid to the resource. In each scenario, PJM assumed that the resource is scheduled at the 100 MW level and that LMP ($30/MWh) is lower than the offers, so that the resource needs to be made whole.

PJM arrived at the not surprising conclusion that the second case with a negative markup provides savings of $1,000 compared to the first case and a savings of $500 in energy uplift when compared to the third case. The examples simply show the obvious. Lower offers at the point of commitment (100 MW) result in the lower energy uplift payments when the offers exceed LMP. The key conclusion from these examples that PJM failed to mention is how the ability to offer variable markup allows the resource to exercise market power and set price at a level higher than the competitive level even when the owner fails the TPS test and is deemed to have local market power.

The example with variable markups (the second scenario) provided by PJM does illustrate how a unit with variable markup can exercise market power, even when the resource owner fails the TPS test. Using the Dispatch cost formula that PJM provided in response to question 5 to determine the least expensive schedule, and assuming the same Minimum Run Time of 2 hours for both the price and cost offers, the dispatch cost for price and cost-based offers under the variable markup case (negative markup of $5/MWh for the first 100 MW) is calculated as (following PJM's definition):

*Dispatch cost = Marginal cost @ Economic minimum output + Fixed cost adder*

*where Fixed cost adder = Startup cost/(Economic maximum output\*Minimum run hours) + No-load cost/Economic maximum output*

Using PJM's assumptions, fixed cost adder = $1000/(200*2) +$500/200 = $5/MWh.

Dispatch cost of price offer = $45/MWh + Fixed cost adder = $50/MWh

Dispatch cost of cost offer = $50/MWh + Fixed cost adder = $55/MWh

Since the dispatch cost is lower on the price-based offer, the unit is committed on the price-based offer. However, if the resource is marginal and can set price at any MW level above the economic minimum, the price is set at a level that is $5/MWh over the competitive level. Figure 2 shows how the unit with variable markup, as described in PJM's second scenario can set price at $60/MWh if dispatched up to 120 MW, which includes a markup of $5/MWh above its short run marginal cost of $55/MWh.

**Figure 2 Exercise of market power by a marginal resource under variable markup (PJM case)**
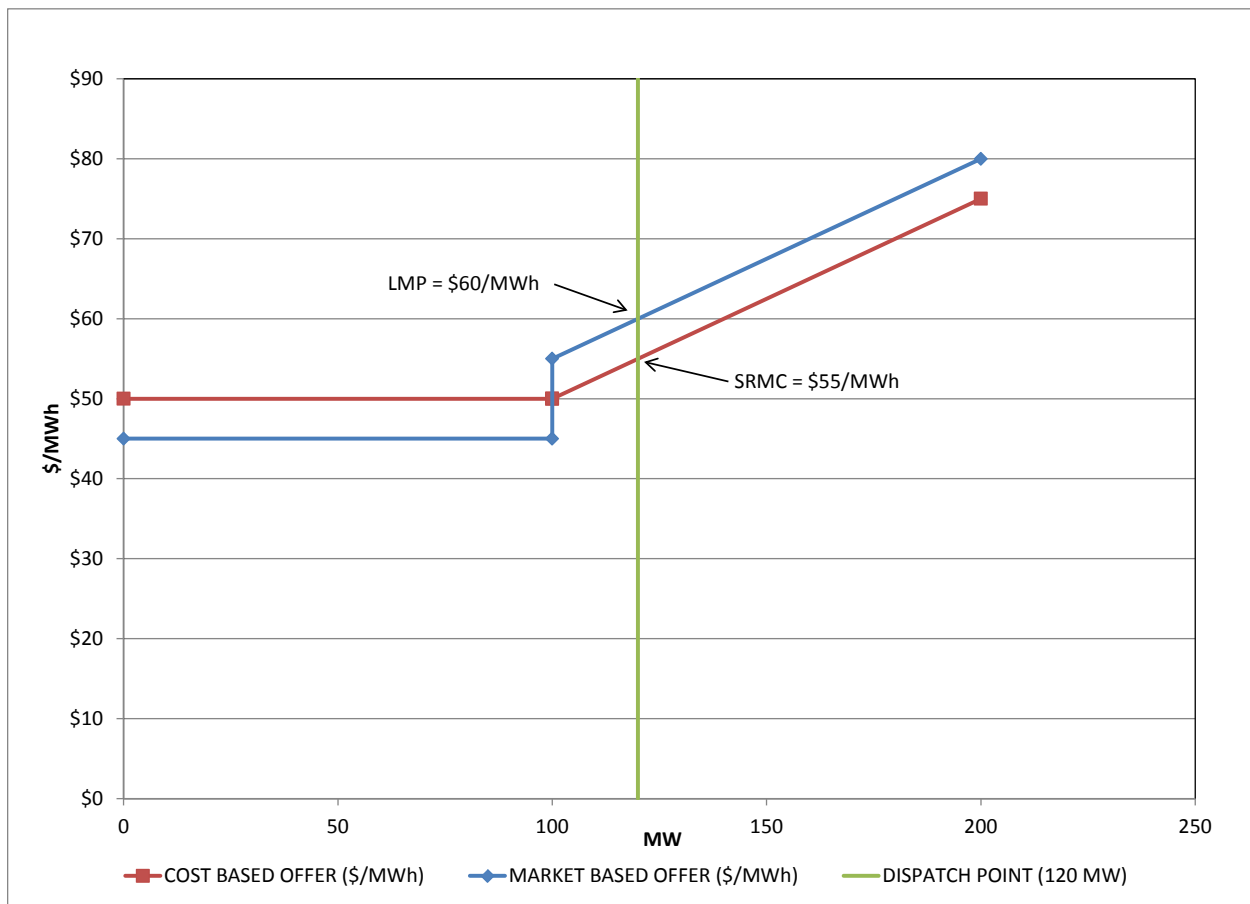


This is a serious flaw that needs to be addressed because if the resource offers a negative markup at the economic minimum and a positive markup of $70 for the remaining

MW, the commitment result remains the same. Figure 3 illustrates the same unit as in PJM's variable markup example, with one change – the positive markup from 100 MW to 200 MW is $70/MWh instead of $5/MWh. In this scenario, if the owner of the resource fails the TPS test for local market power, the unit is committed on its market-based offer because the dispatch cost as calculated by PJM's formula is lower on the market-based offer. This is because the markup at 100 MW is negative $5/MWh. However, it can set price at a level that is $70 above the competitive level at any MW point above economic minimum. Using variable markup, the unit can successfully exercise market power, set price at greater than competitive level and inflated the price paid to all the other units in the system.

**Figure 3 Exercise of market power by a marginal resource under variable markup (IMM case)**
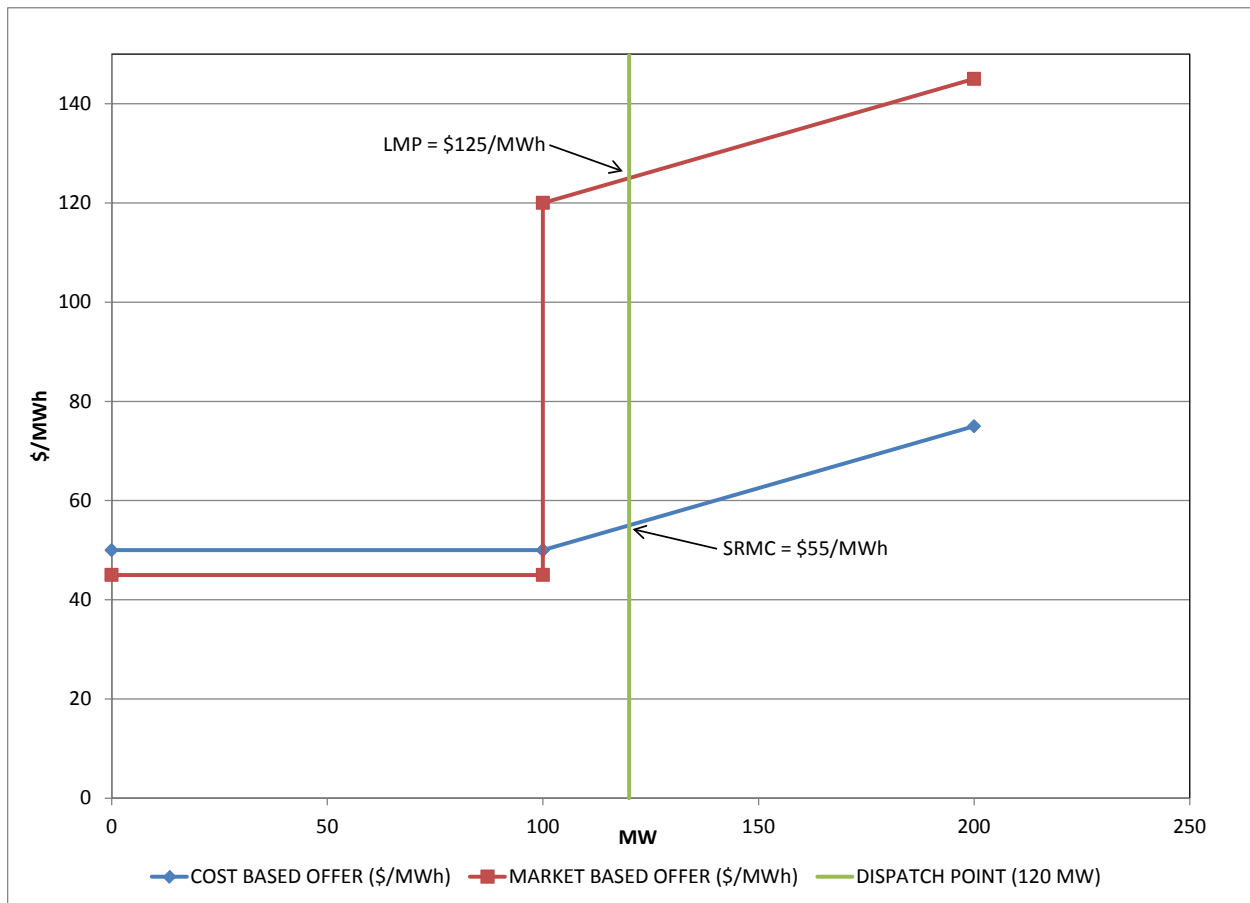


This example also illustrates how Minimum Run Time can be used to circumvent mitigation after the resource owner fails the TPS test. If a resource owner has a positive

markup throughout the incremental offer curve but a Minimum Run Time of 4 hours on the price-based offer compared to 2 hours on the cost-based offer, the price-based offer will have a lower dispatch cost compared to the cost-based offer, and the unit would be committed on the price-based offer. In this case, if the unit is marginal it can set price at a level higher than the competitive level no matter what MW level it is scheduled at despite the owner of the resource failing the TPS test.

PJM also did not explain how commitment costs are reduced by allowing Market Sellers to have variable markup within the incremental curve and from one hour to another hour within the same day. For example, under PJM's proposal, in the Day-Ahead Energy Market, a market seller can offer a unit as shown in PJM's second case for one hour, with a negative markup for the first 100 MW, and offer the unit as shown in PJM's first case with a positive markup throughout the incremental curve for the rest of the day. If the market seller fails the TPS test for the first hour, and PJM determines the schedule with the lower commitment cost based on the negative markup offered during that particular hour, the unit can exercise market power during the rest of the commitment period because it has a positive markup for the rest of the day.

13) **In its Answer at P 21, PJM states:**

> *For example, if PJM determines the Market Seller of a dual-fuel resource with two cost-based offers and two market-based offers (one for each fuel type) does not have structural market power and therefore does not offer cap the resource, PJM must choose the market-based offer on which to commit the resource. Because the markups on these market-based offers may be different relative to their underlying costs, the two market-based offers may "cross" each other such that the selection of the market-based offer on which to commit the resource is dependent on the point at which the resource will be dispatched. While PJM can confidently determine which of the offers it should select manually today in order to minimize bid production cost, the IMM's intended goal to simplify this determination is not achieved despite the added complexity of its proposal.*

> **Please provide an example as how, under this proposal, PJM would economically dispatch a dual-fueled resource that has two available cost-based offers and two available market-based offers that cross each other, has**

**constant markup for each fuel type, and passed the Three Pivotal Supplier Test.**

IMM Response: PJM's response to this question illustrates how, in the case of dual fuel units, crossing market-based offers on two fuels that have constant markup over the respective cost-based offers can lead to a different determination of which schedule is least expensive. PJM states:[15]

> PJM's understanding is that the IMM proposal suggests that resources should be offer capped more frequently based on the offer resulting in the lowest marginal cost.

PJM's further analysis and determination of which is the cheaper schedule is based on this erroneous understanding. PJM's determination of the least expensive offer varies with the MW point because PJM uses either the bid production cost or marginal cost at each MW point to arrive at a cheaper schedule. The Market Monitor proposes that the offer with the lower value of the area under the entire incremental curve can be chosen to commit the resource. This ensures that the determination of the least expensive offer does not change with the MW level where the determination is made. It is important to note that crossing of offers that PJM illustrated is only possible in the case of a dual fuel unit where the incremental heat rate curves under the two fuels have different slopes and can intersect within the dispatchable range. The subset of units for which this scenario can arise is very small. It requires that a resource be a dual fuel resource, and the difference in the cost of fuel be offset with the difference in the incremental heat rate, for the curves to intersect. This is because even if the incremental heat rates under different fuels have different slopes, if one of the fuels is more expensive compared to the fuel by a certain level, the offer curves will not intersect within the dispatchable range (between economic minimum and economic maximum). For resources where the curves do not cross, using the metric proposed by the

---

[15]    March 4th Response at 37

Market Monitor will still result in an accurate determination of the least expensive schedule.

**14)  In its Answer at P 22, PJM states:**

*Therefore, in order to actually enforce the constant markup rule as the IMM proposes, changes would need to be made to PJM's rules requiring Market Sellers to offer their true estimated cost and not be able to underbid such costs, as they are permitted to do today.*

**What are the risks and benefits to Market Sellers who underbid their true estimated costs and do not include a 10% adder in their cost-based offers? What are the risks and benefits to the Market of allowing Market Sellers to underbid their true estimated costs?**

IMM Response: There is no evidence to support PJM's statement that a market seller offering a resource without the ten percent adder risks operating the unit at a loss. Market sellers are free to offer consistent with their own evaluation of their short run marginal costs. The actual evidence from PJM markets is that offers excluding the ten percent adder are routine for a large number of units. The ten percent adder does not represent an out of pocket cost, but was added prior to the creation of PJM markets to account for the uncertainty in the costs of operating a CT during a day. That uncertainty does not apply, for example to coal units and is excluded from the actual market-based offers of about two thirds of all coal units. Moreover, with the introduction of hourly offers, the need for the ten percent adder for any units is questionable because unit owners will be able to manage hourly changes in cost.

The Market Monitor's proposal has no impact on the incentives to make cost-based offers at less than the maximum permitted cost-based offer. Units may submit cost-based offers at any level up to the actual short run marginal cost. There is no reason to change that rule. If units want to have a substantial markup over that cost for their market-based offer, that is an option, but the markup should remain constant for the day. The markup would also be subject to review for market power and manipulation issues.

## 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,

Jeffrey W. Mayes

Joseph E. Bowring
Independent Market Monitor for PJM
President
Monitoring Analytics, LLC
2621 Van Buren Avenue, Suite 160
Valley Forge Corporate Center
Eagleville, Pennsylvania 19403
(610) 271-8051
*joseph.bowring@monitoringanalytics.com*

Jeffrey W. Mayes

General Counsel
Monitoring Analytics, LLC
2621 Van Buren Avenue, Suite 160
Valley Forge Corporate Center
Eagleville, Pennsylvania 19403
(610) 271-8053
*jeffrey.mayes@monitoringanalytics.com*

Joel Romero Luna
Analyst
Monitoring Analytics, LLC
2621 Van Buren Avenue, Suite 160
Valley Forge Corporate Center
Eagleville, Pennsylvania 19403
(610) 271-8050
*joel.luna@monitoringanalytics.com*

Siva Josyula
Analyst
Monitoring Analytics, LLC
2621 Van Buren Avenue, Suite 160
Valley Forge Corporate Center
Eagleville, Pennsylvania 19403
(610) 271-8050
*siva.josyula@monitoringanalytics.com*

Dated: March 28, 2016

## 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 28th day of March, 2016.

Jeffrey W. Mayes
General Counsel
Monitoring Analytics, LLC
2621 Van Buren Avenue, Suite 160
Valley Forge Corporate Center
Eagleville, Pennsylvania 19403
(610) 271-8053
*jeffrey.mayes@monitoringanalytics.com*

# Attachment

| Offer Component | Status Quo | | Updated PJM Proposal | | | IMM Long Term | | |
|---|---|---|---|---|---|---|---|---|
| | Granularity | Frequency | Granularity | Frequency | PJM Proposed Limits | Granularity | Frequency | IMM Proposed Limits |
| Availability Status of Schedules | Hourly - RT Only | Hourly | Daily | RT Hourly/ DA Daily | N/A | Daily | Hourly | N/A |
| Incremental Offer (Price/MW pairs) | Daily by schedule | Daily by schedule | Hourly | Hourly | Cost based offers may be increased or decreased for both previously committed and uncommitted hours. Increase in cost based offer is limited by change in expected cost, in accordance with fuel cost policy. Market based offers can be increased or decreased in uncommitted hours; however, they may only be decreased in committed hours (no increase relative to the committed value). | Hourly | Hourly | Markup in market based offers is constant through out the curve as well as throughout the operating day. Cost based and market based offers can be increased or decreased for any unit only to the extent that fuel costs change. In all cases, if offer update does not comply with the fuel cost policy on changes in actual cost, unit is limited to offer only cost-based offers for 6 months with no offer flexibility. |
| MW blocks | Daily by schedule | Daily by schedule | Hourly | During Rebid Period: MW blocks may be updated for uncommitted hours only<br><br>After rebid period: MW blocks may not be updated for committed or uncommitted hours | N/A | Hourly | Hourly | Physically Based; Same MW blocks for Price and Cost Offers by fuel type |
| No-Load Fee | Daily by schedule | Daily by schedule | Hourly | Hourly | Participants will be able to either increase or decrease the value of this parameter for a cost-based schedule only. No-load for a cost-based schedule can differ for each hour within the schedule and can be updated on an hourly basis. No-load for a market-based schedule, regardless of whether the no-load value is cost or market–based, cannot be updated in committed hours. No-load for a market-based schedule for uncommitted hours can differ for each hour of the schedule and can be updated on an hourly basis when the no-load value is cost-based. No-load for a market-based schedule for uncommitted hours cannot differ for each hour or be updated on an hourly basis when the no-load value is market-based. | Hourly | Hourly | Participants will be able to either increase or decrease the value of this parameter for a cost-based schedule only. No-load for a cost-based schedule can differ for each hour within the schedule and can be updated on an hourly basis. No-load for a market-based schedule, regardless of whether the no-load value is cost or market–based, cannot be updated in committed hours. No-load for a market-based schedule for uncommitted hours can differ for each hour of the schedule and can be updated on an hourly basis when the no-load value is cost-based. No-load for a market-based schedule for uncommitted hours cannot differ for each hour or be updated on an hourly basis when the no-load value is market-based. |

| Offer Component | Status Quo | | Updated PJM Proposal | | | IMM Long Term | | |
|---|---|---|---|---|---|---|---|---|
| | Granularity | Frequency | Granularity | Frequency | PJM Proposed Limits | Granularity | Frequency | IMM Proposed Limits |
| Cold, Intermediate, Hot Start-Up Fee | Daily by schedule | Daily by schedule | Hourly | Hourly | Participants will be able to either increase or decrease the value of this parameter for a cost-based schedule only. Cold startup for a cost-based schedule can differ for each hour within the schedule and can be updated on an hourly basis. Cold startup for a market-based schedule, regardless of whether the startup fee is cost or market–based, cannot be updated in committed hours. Cold startup for a market-based schedule for uncommitted hours can differ for each hour of the schedule and can be updated on an hourly basis when the startup is cost-based. Cold startup for a market-based schedule for uncommitted hours cannot differ for each hour or be updated on an hourly basis when the startup fee is market-based. | Hourly | Hourly | Participants will be able to either increase or decrease the value of this parameter for a cost-based schedule only. Cold startup for a cost-based schedule can differ for each hour within the schedule and can be updated on an hourly basis. Cold startup for a market-based schedule, regardless of whether the startup fee is cost or market–based, cannot be updated in committed hours. Cold startup for a market-based schedule for uncommitted hours can differ for each hour of the schedule and can be updated on an hourly basis when the startup is cost-based. Cold startup for a market-based schedule for uncommitted hours cannot differ for each hour or be updated on an hourly basis when the startup fee is market-based. |
| Use Offer Slope | Daily by schedule | Daily by schedule | Status Quo | Status Quo | N/A | Status Quo | Status Quo | N/A |
| Cold, Intermediate, Hot Notification Time | Daily by schedule with unit-level hourly overrides | Daily by schedule with unit-level hourly overrides | Status Quo | Status Quo | N/A | Status Quo | Status Quo | N/A |
| Cold, Intermediate, Hot Start-Up Time | Daily by schedule | Daily by schedule | Status Quo | Status Quo | N/A | Status Quo | Status Quo | N/A |
| Minimum Run Time | Daily by schedule | Daily by schedule | Status Quo | Hourly | N/A | DA - daily; RT - Balance of Day/by  Fuel type | Hourly | N/A |
| Maximum Run Time | Daily by schedule | Daily by schedule | Status Quo | Status Quo | N/A | Status Quo | Status Quo | N/A |
| Ramp Rate | Daily by unit | Daily by unit | Status Quo | Status Quo | N/A | Status Quo | Status Quo | N/A |
| Day-Ahead Scheduling Reserve Offer and MWs | Daily by unit | Daily by unit | Status Quo | Status Quo | N/A | Daily/Fuel Switch | Daily | N/A |
| SR Offer Price and MWs | $-Daily, MW-Hourly | $-Daily, MW-Hourly | Hourly | Hourly | N/A | Daily | Daily | N/A |
| REG Offer Price and MWs | $-Daily, MW-Hourly | $-Daily, MW-Hourly | Hourly | Hourly | N/A | Daily | Daily | N/A |
| Resource Status<br> - Must Run<br> - Economic<br> - Unavailable | Hourly by unit | Hourly by unit | Status Quo | Status Quo | N/A | Status Quo | Status Quo | N/A |
| Resource Limits<br> - Emergency Min<br> - Economic Min<br> - Ecomonic Max<br> - Emergency Max | Hourly by unit | Hourly by unit | Status Quo | Status Quo | N/A | Status Quo | Status Quo | N/A |
| Resource Characteristics<br> - Hot to Cold<br> - Hot to Intermediate<br> - Minimum Down Time | Daily by schedule | Daily by schedule | Status Quo | Status Quo | N/A | Status Quo | Status Quo | N/A |