

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

PJM Interconnection, L.L.C.

)

Docket No. ER21-1802-000

PROTEST OF THE PJM POWER PROVIDERS GROUP

Pursuant to Rule 211 of the Rules of Practice and Procedure of the Federal Energy Regulatory Commission (“FERC” or the “Commission”),¹ the PJM Power Providers (“P3”)² protests the filing of PJM Interconnection L.L.C. (“PJM”) in the above docketed proceeding. On April 30, 2021, PJM submitted revisions³ to the PJM Open Access Transmission Tariff (“Tariff”), Attachment K-Appendix, section 3.2.3(f) and to the corresponding provisions of the Operating Agreement (“OA”), to effectuate a single rate component of a reform package to purportedly enhance PJM’s current operational process for generation “stability limits.”

On April 30, 2021, the Federal Energy Regulatory Commission (the “Commission” or “FERC”) issued a Combined Notice of Filings #1 setting May 21, 2021, as the deadline for filing an intervention or protest regarding the PJM Filing. On May 20, 2021, P3 filed

¹ 18 C.F.R. § 385.211 (2021).

² P3 is a non-profit organization dedicated to advancing federal, state and regional policies that promote properly designed and well-functioning electricity markets in the PJM Interconnection, L.L.C. (“PJM”) region. Combined, P3 members own over 67,000 MWs of generation assets and produce enough power to supply over 50 million homes in the PJM region covering 13 states and the District of Columbia. For more information on P3, visit www.p3powergroup.com

³ *PJM Interconnection, L.L.C.*, Docket No. ER21-1802-000 (filed April 30, 2021) (“PJM Filing”).

a doc-less Motion to Intervene. P3 respectively submits this protest⁴ in the above-captioned proceeding.

I. PROTEST

P3 protests the proposed changes to the PJM Operating Agreement Schedule 1, section 3.2.3(f) and conforming language in the PJM Tariff, Attachment K – Appendix, section 3.2.3(f) that would no longer compensate generators for lost opportunity costs for reducing economic output below their economic levels for stability constraints, but yet continue to pay such lost opportunity costs for other reliability or transmission issues. Such a change is unduly discriminatory and preferential, contrary to economic and reliability principles as shown below, and for those reasons alone must be rejected by the Commission. Moreover, the PJM proposal relies on an unrepresented and unfiled and vague new “Generator Output Constraint” that affects the filed rates already approved by the Commission that renders the filing incomplete and deficient and thus, cannot reasonably be evaluated by the Commission and, therefore, should be rejected on this glaring omission as well.

A. Payment of Lost Opportunity Costs are Part of Economically Efficient Prices that Support Reliability, Are Payment for Reliability Services Provided, and Promote Provision of Accurate Information.

As a matter of reliability and economic principle, prices in the wholesale energy market, be it PJM or any other market, must be consistent with dispatch and reliability needs of the system. Prices do not only encompass Locational Marginal Pricing (“LMPs”) but also include the set of make-whole and/or lost opportunity cost payments that ensure the prices and compensation to

⁴The comments contained herein represent the position of P3 as an organization, but not necessarily the views of any particular member with respect to any issue. For more information on P3, visit www.p3powergroup.com

generators match the dispatch instructions and reliability needs of the bulk power system. Payment of lost opportunity costs have long been a recognized principle of PJM's competitive energy market as enumerated in the currently effective 3.2.3(f) of the PJM Operating Agreement ("OA") also found in the PJM Tariff, Attachment K – Appendix, section 3.2.3(f) and Operating Agreement, Schedule 1:

(f) ***A Market Seller*** of a unit not defined in subsection (f-1), (f-2), or (f-4) hereof (or self-scheduled, if operating according to Tariff, Attachment K-Appendix, section 1.10.3(c) hereof), ***the output of which is reduced or suspended*** (or, for Energy Storage Resource Model Participants, the charging of which is increased) ***at the request of the Office of the Interconnection due to a transmission constraint or other reliability issue, and for which the real-time LMP at the unit's bus is higher than the unit's offer corresponding to the level of output requested by the Office of the Interconnection*** (as indicated either by the desired MWs of output from the unit determined by PJM's unit dispatch system or as directed by the PJM dispatcher through a manual override), ***shall be credited for each Real-time Settlement Interval*** in an amount equal to the product of (A) the deviation of the generating unit's output necessary to follow the Office of the Interconnection's signals and the generating unit's expected output level if it had been dispatched in economic merit order, times (B) the Locational Marginal Price at the generation bus for the generating unit, minus (C) the Total Lost Opportunity Cost Offer, provided that the resulting outcome is greater than \$0.00. This equation is represented as $(A*B) - C$. (*emphasis added*)

The PJM Tariff defines the Total Lost Opportunity Cost Offer for the purposes of 3.2.3(f) as:

...the Total Lost Opportunity Cost Offer shall equal the Real-time Settlement Interval offer integrated under the applicable offer curve for the LOC Deviation, as determined by the offer curve associated with the greater of the Committed Offer or Final Offer for each hour in an Operating Day.⁵

From the perspective of the PJM energy and ancillary services markets, PJM requesting a generator to back down from its desired output for "a transmission constraint or other reliability issue" to ensure reliability is no different than PJM backing down a generator to provide

⁵ PJM OATT Section 1, Definitions, OATT Definitions – T, U, V. Only the relevant portion of the definition for 3.2.3(f) has been provided for brevity and clarity.

Synchronized Reserves, or to change output away from its otherwise economic output to provide Regulation and Frequency Response. In all cases the generator is providing a reliability service, through deviating its dispatch away from its most economic energy output to PJM and the market as whole. In return the generator receives compensation for that service. From an economic incentive perspective, generators should be compensated for lost opportunity costs when the grid operator takes action that causes the generator to forgo inframarginal revenue that it would have otherwise earned. To not offer such compensation would incent the generator to ignore dispatch instructions since it would be profit maximizing to do so, and thus also jeopardize reliability of the Bulk Electric System (“BES”). The ability to earn inframarginal rents (profits earned in the energy market when the LMP is above the marginal running cost of a resource) is a key feature in making it incentive compatible with providing accurate information regarding market costs and operating conditions. Finally, ensuring that generators also receive the inframarginal rents from the energy market (price less cost) and any lost opportunity costs also provides the incentive for generators to provide accurate operating information (costs, availability, maximum output, minimum output, ramp rate, etc.) to PJM, as provision of this accurate operating information is also profit maximizing.

B. PJM’s Proposal to Amend 3.2.3(f) of the OA Runs Counter to the Reliability and Economic Principles that Have Supported PJM’s Markets Over Decades.

The main purpose of PJM’s filing is to amend the Operating Agreement to not pay Lost Opportunity Cost to generators reduced using a generator output constraint to honor a stability limit by adding the proposed language at the end of 3.2.3(f):

A Market Seller of a unit defined in subsection (f-1), (f-2), (f-3), (f-4), or (f-5) that is reduced using a generator output constraint to honor a stability limitation is not eligible for

credits under this section 3.2.3(f) for the MWh reduction associated with honoring the stability limit.⁶

Not only does this run contrary to prices that are consistent with dispatch and reliability needs, but PJM is memorializing in its proposal changes to confiscate the compensation due to the generator for providing the reliability service just for mitigating stability limits. while continuing to pay other generators for reducing output to provide reliability services to the PJM BES. This is discriminatory and preferential and clearly unjust and unreasonable. Additionally, PJM is forcing what amounts to a “taking” of the generators’ service without compensation. That also makes PJM’s proposal unjust, unreasonable, and unduly discriminatory and preferential. Further, as detailed below, PJM’s proposal actually reduces reliability by creating incentives to understate actual operating costs leading to potentially undesirable outcomes for the BES.

PJM states that the reason for amending the Operating Agreement is because “the broad phrase “other reliability issue” lacks any additional clarity which may lead some entities to mistakenly believe that payment for lost opportunity cost could be appropriate when output from generation facilities is temporarily reduced due to stability limitations.”⁷ However, PJM offers no compelling reason for this unique treatment of generators following PJM reliability directives to honor a stability limit. PJM states it is not necessary to pay lost opportunity cost for honoring stability limits because the generator already has a powerful incentive in the form of the risk of incurring catastrophic damage. PJM goes on to state that in the case of “other reliability issues” the damage would occur to the transmission system not the generator itself. This logic is absurd

⁶ PJM Filing at 6.

⁷ PJM Filing at 7.

given that PJM should want and expect generators to follow all reliability directives through price signals.

PJM is responsible for identifying and addressing stability limits, and it is unclear how PJM could know with certainty that any damage caused by not honoring a stability limit would be limited to just the single generator, or any generator at all, that did not follow PJM's directive, and would not impact other elements of the BES. Some generators are equipped with relays that will automatically disconnect the generator to protect the generator from damage such as under-frequency relays, voltage relays, and in the case of an intransient stability condition, out of phase relays. For these reasons alone, PJM's assertion is without merit. If a generator trips off-line, it changes power flows on the system and possibly overloads transmission facilities for which PJM must engage in re-dispatch so as to avoid the damage to transmission assets that PJM claims would not happen.

There could be other generators in the area that could be impacted even if they honored the stability constraint. Yet PJM does not consider or even think to demonstrate that the damage from stability issues may affect other generators, and not those subject to the output limits, and that generators subsequently tripping off-line may in fact overload transmission equipment as power flows suddenly change and transmission facilities become overloaded.

C. The Commission Must Reject PJM's Implicit Request to Approve its Past Practices That Were Explicitly Designed to Avoid Complying with 3.2.3(f) Lost Opportunity Payments and Run Contrary to Commission Regulations.

PJM describes its current methodology for managing stability limits as "long-established" and consisting of the following process that is memorialized in Manual 3, Section 3.9,⁸ and all

⁸ PJM Filing at 3-4.

PJM is trying to do with its filing is to make more precise the “phrase “or other reliability issue” lacks any additional context or exposition, which may lead some entities *to mistakenly believe that payment for lost opportunity cost could be appropriate when output from generation facilities is temporarily reduced due to stability limitations.*” (emphasis added)⁹ What PJM is acknowledging is that it has put a process in Manual 3, Section 3.9, which has not been reviewed and approved by the Commission above the actual filed rate approved by the Commission and has been doing so in a manner, as described below, that is direct contravention to the Commission approved field rate in 3.2.3(f). And now PM approached the Commission under the guise to request a change to 3.2.3(f) based on a stakeholder process outcome that codifies current practice with a modification that also has not been filed, in the form of the “Generator Output Constraint” algorithm, with the express objective of not complying with 3.2.3(f) obligation to compensate generators for lost opportunity costs.

Under PJM’s current process, first, PJM requests a generator subject to stability limits reduce its Economic Maximum output, which is not a directive to reduce output in real-time operations as the PJM Filing tries to imply, but a request to reduce “the highest incremental MW output level, submitted to PJM market systems by a Market Participant, that a unit can achieve while following economic dispatch.”¹⁰ That is, even if the generator in question can physically achieve its Economic Maximum (“ECO MAX”), PJM is asking that generator to reduce this value to something below their true capability. PJM’s current practice is in direct violation of 18 CFR § 35.41 - Market behavior rules, subsection (b) which explicitly states:

⁹ PJM Filing at 7.

¹⁰ PJM OATT Section 1. Definitions – E – F.

A Seller must provide accurate and factual information and not submit false or misleading information, or omit material information, in any communication with the Commission, Commission-approved market monitors, Commission-approved regional transmission organizations, Commission-approved independent system operators, or jurisdictional transmission providers, unless Seller exercises due diligence to prevent such occurrences. (emphasis added).¹¹

In the alternative or in addition to the request to reduce to ECO MAX, the generator in question is also asked to report an outage, in PJM's eDart system that will not affect the Equivalent Forced Outage Rate under Demand ("EFOR_d"), and as such these outages are labelled as "Maintenance" or "Planned" outages, neither of which is accurate, again in violation of Commission regulations under the FPA.

If generator declines to provide such inaccurate information, as it should, then PJM avers in its filing that it will impose a "thermal surrogate" type of transmission constraint to reflect the stability limit identified by PJM as an attempt to send an LMP signal to the generators to back down.¹² What PJM has acknowledged during the stakeholder process, but oddly omits to state in its filing, is that as a practical matter, a thermal surrogate is a blunt and inaccurate instrument, akin to using a chainsaw to make a surgical incision when only the smallest scalpel is really needed.¹³ Because the "thermal surrogate" is often imprecise, generators will often "elect" to reduce output rather than risk suffering much greater economic harm through lower prices that do not reflect any limitations on the transmission system by being subject to a poorly constructed "thermal surrogate".¹⁴ From Sections 2.2(a) and 2.3 of Schedule 1 of the Operating Agreement regarding

¹¹ 18 CFR § 35.41(b)

¹² PJM Filing at 4.

¹³ See page 14 of PJM presentation where PJM indicates an ideal surrogate is not always available: <https://www.pjm.com/-/media/committees-groups/committees/mic/2020/20200623-special/20200623-mic-info-only-stability-limit-education.ashx>

¹⁴ To carry the surgical analogy to an absurd extreme to show the absurdity of PJM's current practice, imagine being faced with the choice of having somebody remove a small cancerous lesion on your skin. Your only choices are to have somebody who is allegedly a doctor do it with a chainsaw, a very blunt instrument that would cause much

the calculation of LMPs it is not clear a “thermal surrogate” is even permissible under the OA and Tariff since LMPs are a function of loads, generator dispatch, marginal losses, *and binding transmission constraints*.¹⁵ Also, since the stability limit is not any kind of transmission limit, as PJM has acknowledged in its filing, but related to transient instability such past practices are questionable from a OA or Tariff compliance perspective.

Regardless of the current practice chosen, each one is explicitly done to avoid the simplest and cleanest solution, and that is to pay opportunity costs under 3.2.3(f) as it is currently found in the OA. In the case of the ECO MAX reduction, it truncates the offer such that no opportunity cost is due. In the case of the “thermal surrogate,” lower prices send the signal to reduce output even though those lower prices have no connection to any binding transmission limitation as LMPs are specifically designed to reflect.

Thus, PJM’s proposal seeks to memorialize and codify those past practices into the Tariff and OA. In effect, PJM is implicitly asking the Commission to approve their current practice which has operated outside the Commission-approved OA, that has avoided paying lost opportunity cost in a manner that is discriminatory, that is inconsistent with economic and reliability incentives, confiscatory with respect to services provided by generators to mitigate stability limits, and contrary to Commission regulations regarding the accurate reporting of information. If PJM’s proposal is approved, it would compensate generators responding to PJM’s

collateral damage to the body, or to do it yourself with your own tools, say a sharp razor blade, which may get the job done, but causes more harm than removing the lesion in the right way by a qualified doctor, but causes less harm than having a doctor use a chainsaw. This is the choice generators in PJM face with respect to stability limits under PJM’s current practice.

¹⁵ PJM OA Schedule 1, Section 2.2(a) and 2.3

reliability directive to honor a stability limit differently than if those generators responded to any other reliability directive by PJM due to a transmission constraint or other reliability issue.

D. Prices Must be Consistent with Reliability Needs and Dispatch Instructions.

Wholesale power markets such as PJM's Energy Market use LMP to signal to generation and load when more, or less, energy is needed to maintain reliability in real-time operations. For example, when a price signals to generators to increase output, this means that more energy is desired to serve increasing load (maintain energy balance), or to help alleviate a binding transmission constraint (transmission security). Conversely, when prices decrease, the signal to generation is to reduce output to either maintain energy balance or to alleviate a transmission constraint that their output could be exacerbating.

There are times when LMPs are not enough to provide the right price signals to generation resources. In these cases, there is a need for other "unit specific prices" in the form of make-whole or opportunity cost payments (collectively "uplift") that may also be required to ensure that pricing and compensation to generators are consistent with reliability needs. The reason this happens is that generator and power systems operation is not a simple textbook economic exercise where one can assume away operational characteristics that are "lumpy decisions" such as start-up costs, minimum run levels that are above zero that allow a generation resource to remain synchronized to the grid, constraints that only allow a unit to operate most efficiently at its maximum (minimum = maximum), or minimum run times. In all these cases, if a resource is needed by PJM to maintain reliability in operations, additional uplift payments are required to ensure that the dispatch instruction is consistent with pricing and compensation.

1. Lost Opportunity Costs under the Currently Effective 3.2.3(f) are Consistent, along with LMP, With Reliability Needs and Dispatch Instructions.

OA language in Section 3.2.3(f) pays a resource lost opportunity costs if its output needs to be backed down from its otherwise economically desirable output. Consider a simple example. Assume a generator that is flexible from 0-100 MW and has a cost of \$20/MWh but the LMP at its bus is \$50/MWh. This generator will want to run at the full 100 MW. Rather instead, PJM directs this generator in real-time to back down to 60 MW for reliability reasons, but the LMP is still \$50/MWh. Of course, the price is not consistent with the dispatch instruction because at \$50/MWh, the generator will want to run at 100 MW because it makes a margin of \$30/MWh for energy if it runs. To make the price consistent with dispatch instructions, PJM would pay the generator its lost opportunity costs, or \$30/MWh, for the additional 40 MW it could not produce but for the reliability needs of the system or \$1200. In the language of 3.2.3(f), 40 MW in this example corresponds to “(A) the deviation of the generating unit’s output necessary to follow the Office of the Interconnection’s signals and the generating unit’s expected output level if it had been dispatched in economic merit order,”¹⁶ from 3.2.3(f); \$50/MWh corresponds to “(B) the Locational Marginal Price at the generation bus for the generating unit”; and the running cost of \$20/MWh times the 40 MW is “(C) the Total Lost Opportunity Cost Offer” with the resulting lost opportunity cost “represented as $(A*B) - C$ ” equaling \$1200.

2. PJM’s Current Practice and Proposed Change is Discriminatory and Inconsistent with the Reliability, Effects the Financial Transmission Rights Markets, and Relies on PJM Requesting Generators Misrepresent Their Availability.

PJM’s filed change is by its very nature discriminatory. It discriminates by the type of reliability issue by which it is willing to pay lost opportunity costs. In this instance, PJM deems

¹⁶ PJM OATT Section 1, 3.2.3(f).

being backed down for stability issues as not worthy of being compensated, but other reliability-based directives are worthy of being compensated for lost opportunity costs. PJM has not acknowledged or addressed this discriminatory treatment other than to say they are “saving the generator from itself” in the case of stability limits since transient instability could cause damage to the generation facility, which as explained above is without merit or proof.¹⁷

Furthermore, PJM has openly admitted in the stakeholder process and to the Commission in its filing that it has actively worked to avoid complying with 3.2.3(f) of the OA through either developing a “thermal surrogate” for the stability limit as described above or by requesting the generator take an outage or reduce its ECO MAX as an attempt to solve the stability problem as also described above.

“Thermal surrogates” have been used as an attempt to force the generator to back down to avoid lower prices. PJM admits, and the PJM Independent Market Monitor (“IMM”) has pointed out that this is not a realistic or practical solution as the thermal surrogate will often hit generators that have nothing to do with the stability limit, and at times fail to affect the generator PJM is targeting to back down for stability. The thermal surrogate has very real impacts on the Financial Transmission Rights (“FTR”) market with so-called negative balancing congestion and thus is impactful across more than just the PJM energy market and affected generators. The use of “thermal surrogates” directly affects holders of FTRs in that such constraints are not known in advance, they are not published, unlike binding transmission constraints, and are not modeled in FTR auctions. The holders of FTRs range across both load, generation, and financial market participants and provide a valuable hedging function. To employ a “thermal surrogate” aside from

¹⁷ PJM Filing at 7.

being a crude instrument, erodes the value of hedges against real and verifiable transmission constraints without the benefit of that information being publicly available. At least in the case of “thermal surrogates” PJM is not requesting generators to provide inaccurate information, but instead hides valuable information from the FTR market participants that causes harm to them.

Instead, PJM has relied most heavily upon asking generators to take an outage or to reduce their economic maximums in their energy market offers, neither of which reflect the actual capabilities of the resources in question. Either of these is extremely problematic in that generators are bound by Section 35.41 of the Commission’s Rules to provide accurate information regarding their ability to provide output or be available as noted previously. Effectively, what PJM is asking of generators is to expose themselves to scrutiny from the IMM for economic or physical withholding and later, if a referral is made, potential FERC enforcement actions for actions taken at PJM’s request to solve the reliability problem related to transient instability. From a generation owners’ perspective, this is an unequivocally unacceptable position to be put in by PJM: to be faced with the possible accusation of not following a PJM instruction to mitigate a reliability issue, or to be exposed to possible enforcement action that allows PJM to avoid complying with paying lost opportunity cost under 3.2.3(f) in the context of mitigating a reliability issue. At least in this case, because there is no “thermal surrogate” that does not correspond to any real transmission limitation, there is no harm done to the FTR market. Instead, the generator faces an issue of double jeopardy...damned if I do, damned if I don’t.

The simple solution is already in place: send generators whose output may create stability problems on the transmission system a dispatch directive to back down and pay those resources lost opportunity costs as PJM would for backing down generators under any other reliability

circumstance under the current 3.2.3(f) of the OA. To do otherwise would be condoning PJM's activities to specifically request generators violate Section 35.41(b) to not provide accurate information exposing generators to potential enforcement liabilities that are easily avoidable, or creating unnecessary inefficiencies in the FTR market based on "imaginary" transmission limits that cannot be seen or verified.

E. PJM's Filing Should be Rejected as Incomplete for Failing to File OA Language Explaining the "Generator Output Constraint" Method and How it Affects Pricing And Compensation.

PJM avers that it has developed in conjunction with the IMM a new addition to the security constrained economic dispatch ("SCED") that imposes a "stability constraint" upon all generators that have an effect on the PJM-identified stability issue using the Transient Stability Application ("TSA"), known as the "Generator Output Constraint" which is barely described in the filing or even in the citation provided by PJM in its filing.¹⁸ In its filing PJM contends that this method directly reflects the constraint in LMP.¹⁹ However, the matrix citation in footnote 13 of the PJM Filing has seemingly contradictory language:

"Model as a generator output constraint on the affected generators: The limit will be determined by reliability studies using the TSA tool prior to the Day-ahead run. The Day-ahead engine will enforce the (MW) output of these resources relative to the stability limit. The Day-ahead market will not directly reflect this constraint in LMP."²⁰ (emphasis added)

¹⁸ PJM Filing at 4-5. Footnote 13 only takes the reader to the CBIR matrix which provides at most one to two sentence summaries that are insufficient to gain a full appreciation for how this would be implemented within the broader context of security constrained unit commitment ("SCUC") in the Day-ahead Energy Market or in the security constrained economic dispatch ("SCED") in the Real-time Energy Market.

¹⁹ PJM Filing at 5.

²⁰ Markets Implementation Committee, *Stability Limits in Markets and Operations*, PJM Interconnection, L.L.C. (Jan. 27, 2021), <https://www.pjm.com/-/media/committees-groups/committees/mrc/2021/20210127/20210127-item-04-1-stability-limits-in-markets-and-operations-matrix.ashx>. Open Tab 3. Matrix Package, Column F "Generator Constraint Output Package", Rows 30.

“Model as a generator output constraint on the affected generators: The limit will be determined by real time reliability studies using the TSA tool. The SCED engine will enforce the (MW) output of these resources relative to the stability limit. The real time market will not directly reflect this constraint in LMP.”²¹ (emphasis added)

Given these contradictory statements, it is not clear that PJM or the IMM really knows how this works, how it will be modeled in PJM’s system, or how this will affect energy market price formation and the determination of LMP. No formulas or examples were ever presented or explained by PJM or the IMM during the PJM Stakeholder process. Consequently, it is improbable if not impossible for PJM stakeholders to fully understand or appreciate any possible nuances or details that may or may not have been assumed but are certainly left undefined, or the effects on markets and operations. If this is true for PJM stakeholders, it will be impossible for the Commission to fully evaluate what PJM has filed in this instance.

The methodology or algorithm proposed by PJM and the IMM proposes simply that generators having an impact on the stability problems would be limited in their aggregate output. This broad concept itself in isolation, is something that P3 views as an improvement as it could alleviate concerns around asking generators to misrepresent their true capabilities regarding unneeded outages or reducing economic maximum below the true output capability, and also avoid the use of “thermal surrogates” and those associated problems. However, contrary to the contention presented to the stakeholders and cited above, this “Generator Output Constraint” will affect security constrained economic dispatch and the prices paid to generators and paid by load, and as such should be memorialized in the OA just as describing least cost dispatch or the calculation of LMP as described in the OA. Since this “Generator Output Constraint” algorithm offered by PJM

²¹ *Id.* Row 31.

does affect LMP as shown below, and also affects generator compensation, it should be included in the OA.

F. PJM’s Proposed Algorithm Indirectly Affects LMP and Does Not Solve the Reliability or Incentive Compatibility Problem Absent the Payment of Lost Opportunity Cost Under 3.2.3(f).

Since the “Generator Output Constraint” algorithm has not actually been formally presented to the PJM stakeholders mathematically or with any examples, P3 concludes that the “Generator Output Constraint” algorithm itself supports the idea that resources backed down from otherwise economic output due to the stability constraints should be paid lost opportunity costs under 3.2.3(f). The algorithm as we understand it minimizes the cost of generation from the group of generators subject to a joint output constraint to manage stability. As this is not a transmission constraint, it should not affect LMP directly through the congestion component, though the change in joint output can affect the system marginal pricing component, and marginal loss component of LMP and thus overall LMPs, but itself is not directly causing transmission constraints to bind, but may cause such constraints to bind due to a change in the dispatch.

1. Simple Example Showing How PJM’s Proposed “Generator Output Constraint” Algorithm Supports Payment for Lost Opportunity Cost and Affects LMP through the System Marginal Price portion of LMP.

A simple numerical example shows how this would work. Consider three generators contributing to a stability limit identified by the PJM TSA. The output levels of each of the three generators is 100 MW for Generators X, Y, and Z, so unconstrained by the stability limit they could jointly provide 300 MW of energy to the system. Generators X, Y, and Z each have marginal costs of \$20/MWh, \$22/MWh and \$25/MWh, respectively. There exists two other resources, Generators A and B not subject to the stability limits, but with marginal costs of \$40/MWh and

\$60/MWh, respectively, that also have 100 MW of capacity. At a load level of 380 MW, absent the Generator Output Constraint the LMP is \$40/MWh with Generator A being the marginal resource.

If the TSA identifies a stability limit that requires the joint output of Generators X, Y, and Z be backed down to 240 MW of energy, the resulting LMP at 380 MW of load is now \$60/MWh with Generator B being the marginal resources because of the stability limitation. The stability limit changes dispatch and thus must change LMPs, even if no transmission constraints bind. In general, it is not clear whether the change in dispatch will cause transmission constraints to bind, but such a result cannot be ruled out either. As a result, the “Generator Output Constraint” does get reflected in LMP, but not necessarily in the form of a binding transmission constraint.

Absent the stability limit, Generators X, Y, and Z would be running at their maximums, but would be unable to due to the stability limit of 240 MW. The Generators X and Y with marginal costs at \$20/MWh and the \$22/MWh, respectively, will still run full out at 100 MW and earn the inframarginal rents from providing energy at \$60/MWh.

The Generator Z with a marginal cost of \$25/MWh gets backed down to 40 MW. Under the current 3.2.3(f), this generator can rightfully claim lost opportunity costs of \$35/MWh for 60 MWh it could not produce and have this paid under the current OA. And this lost opportunity cost payment would be consistent with the shadow price on the joint output constraint that signifies lost opportunity cost should be paid.

2. PJM's Proposal Sends Prices Inconsistent with Dispatch Instructions and Reliability Needs and Creates Incentives to Misrepresent True Operating Costs

Unfortunately, PJM's proposal would not allow the \$25/MWh generator to be paid lost opportunity costs and the \$25/MWh generator would want to run full out creating a stability problem. That is, prices are still not consistent with dispatch instructions and PJM has not solved its reliability problem, but has in fact papered it over and changed the energy offer incentives of resources.

Therefore, what is the best response of the Generator Z with marginal cost of \$25/MWh? The answer from an incentive compatibility perspective is to reduce its offer below its true cost, and below the cost of the Generator Y with a cost of \$22/MWh to \$21/MWh which it can do in real-time under the PJM OA. PJM's proposed OA changes would then encourage generators to misrepresent their offers subject to the stability limit below their true costs of operation. So rather than asking generators to falsely report an outage they need not take or to reduce their economic maximum when they can run at the maximum, PJM's proposed solution is forcing generators to, again, misrepresent their capabilities, in this case running costs below actual costs, because it refuses to pay lost opportunity costs under the current 3.2.3(f).

However, the story is not finished there. Generator Y with a cost of \$22/MWh, may then, if the stability constraint continues, want to lower its offer to below the cost of Generator X at \$20/MWh generator, to \$18/MWh, again misrepresenting its true costs because it now is losing out on energy market margins and is not being paid lost opportunity costs. A stability limit with multiple generators creates a cycle where there is a "race to the bottom" to a series of \$0/MWh price offers would be reached until PJM would then have to allocate the output across these generators and without any guarantee they would get the least-cost set of resources. Further it still

does not solve the problem of any one of these generators wanting to violate the joint output constraint because of PJM's refusal to pay lost opportunity costs for resources being backed down for reliability.

If anything, PJM's proposal to not allow payment under 3.2.3(f) for lost opportunity costs due to stability constraints creates a bigger potential reliability problem with its ill-defined "Generator Output Constraint," because the resulting prices would not be consistent with dispatch needs and could make it harder to control as shown with this example above.

G. PJM's Rationale for the Proposed OA Changes Ignores Basic Economic Principles, PJM Planning Practices, and the PJM Interconnection Process.

PJM states that paying lost opportunity costs to generators would be a disincentive to generators to invest in upgrades to equipment such as power system stabilizers and automatic voltage regulators, as well as financial hedging techniques.²² Such a statement ignores basic economic incentives, availability of information, and PJM's own planning and interconnection processes.

1. The Generator Interconnection Process Rarely Evaluates N-1-1 Transient Stability Limits Precluding the Option to Elect to Upgrade the Network.

When generators go through the interconnection process, they already pay for network upgrades to make them deliverable to the system if they choose to be a Generator Capacity Resource. This means that the generator in question has already paid for network upgrades associated with transmission system overloads, voltage related problems, and N-1 transient stability problems. The transient instability at question here is for those generators who have

²² PJM Filing at 9-10.

already been studied for N-1 stability problems, but not the N-1-1 stability problems that are associated with transmission outages for maintenance, construction, or other issues, stating:

“N-1-1 analysis is not performed with load flow...N-1-1 analysis performed in targeted areas for stability.”²³

In general, generators during the interconnection process are not given the option of paying for upgrades for addressing N-1-1 stability problem, and thus, have no knowledge of any future exposure to transient stability issues. Even in the few instances where PJM does study N-1-1 transient stability in the generator interconnection process, PJM states:

“Similar to the RTEP, network upgrades are only needed if redispatch cannot alleviate the violation.”²⁴

In effect, PJM Planning is making clear that re-dispatch is preferable and implies that it is lower cost than the upgrade. In such a case in the interconnection process, at least the interconnecting generator can make an informed decision about how to proceed, and if it accepts such terms that it will dispatch downward in lieu of additional upgrades, that can be memorialized in the Interconnection Service Agreement (“ISA”). However, that is not the case at issue in this proceeding with 3.2.3(f). The issue in front of the Commission is one where there is no provision in the ISA for a generator to reduce output for transient stability.

Finally, PJM has stated plainly that to conduct the N-1-1 transient stability analyses in the generator interconnection process that would lead to “increased time to process studies”,²⁵ and it

²³ See PJM presentation on planning criteria for N-1-1 analysis available here: <https://www.pjm.com/-/media/committees-groups/committees/mic/2020/20200623-special/20200623-item-02-planning-criteria-for-n-1-1-analysis.ashx>, at 4.

²⁴ *Id.*

²⁵ *Id.* at 5.

is already well known that the PJM Interconnection Queue is already lengthy, backlogged, and increasing delayed.

2. The PJM RTEP Process is Responsible for Evaluating and Addressing N-1-1 Transient Stability Issues and Determining the Need for Network Upgrades.

PJM's Filing gives the false impression that it is the generators who bear the responsibility of curing transient stability issues, but as shown above, these issues are not addressed in the interconnection process. However, long before it becomes the responsibility of PJM operations and the generator to address the stability limit through redispatch in real time, PJM's Regional Transmission Expansion Plan ("RTEP") process already examines transient stability issues associated with N-1-1 conditions. If such conditions are identified, it is decided within the RTEP process not to address the stability problem with facility upgrades and to rely on redispatch, and will only initiate upgrades if redispatch options are not available:

- “• All analysis performed on a 5-year out case
- N-1-1 analysis performed for system. Redispatch evaluated as a potential solution.
- Redispatch solutions provided to PJM Operations for new or revised operating procedures
- ***Baseline upgrades required only for violations that cannot be solved with redispatch as well as other allowed system adjustments such as PAR adjustments and switching of transmission facilities.***²⁶ (emphasis added)

²⁶ See PJM presentation on planning criteria for N-1-1 analysis available here: <https://www.pjm.com/-/media/committees-groups/committees/mic/2020/20200623-special/20200623-item-02-planning-criteria-for-n-1-1-analysis.ashx>, at 2

Clearly, when PJM studies N-1-1 stability conditions, it assumes that the lowest cost solution is to redispatch generation. In this case, PJM is asking the generator, through its redispatch, to provide transmission service that would otherwise be more expensive if PJM implement network upgrades. Yet, PJM insists in its filing that generators should not be paid for this service and instead should have the incentive to pay for such upgrades themselves.

When PJM operations directs a generator to reduce output to honor a stability constraint, and the generator follows that reliability directive, PJM operations is merely playing the hand they were dealt by PJM planning. PJM planning has stated that the least cost remedy to N-1-1 outage violations is for new generators under study to curtail during the event. If PJM planning thought the costs power system stabilizers or other equipment were competitive with redispatch, they should provide that option to the interconnecting generator, which they do not. But, if PJM planning routinely assumes the least cost way to address stability limits created by N-1-1 situations is for the generator to redispatch, and does not present the generator with the option to invest in upgrades because they are much more expensive, then there is no disincentive for the generation owner to pursue upgrades created by paying lost opportunity cost for honoring a stability constraint. However, not paying lost opportunity cost does create an incentive for PJM to continue to handle stability limits associated with N-1-1 outage violations the way they do,²⁷

When a generator follows a reliability directive to reduce output to honor a stability limit, it is resolving a reliability issue that is difficult and costly for PJM planning to resolve any other

²⁷ See PJM presentation on planning criteria for N-1-1 analysis available here: <https://www.pjm.com/-/media/committees-groups/committees/mic/2020/20200623-special/20200623-item-02-planning-criteria-for-n-1-1-analysis.ashx> Here PJM explains on page 4 that “N-1-1 analysis is not performed with load flow. A solution to the violation would be to trip the generator under study.” And that “network upgrades are only needed if redispatch cannot alleviate the violation.” PJM goes on to state on pages 5 and 6 that to plan to resolve the N-1-1 through reinforcements would be costly and would be a large burden on top of an already challenged interconnection process.

way. By not providing a lost opportunity cost payment to the generator, PJM is failing to compensate the generator for relying on that generator to resolve the issue. Further, PJM has an incentive not to pay lost opportunity costs because it covers up the fact that the generator is providing a valuable service. PJM planning recognizes the value of allowing the N-1-1 stability constraints to be handled through redispatch, but then PJM wants to put the entire financial burden on the generator, and without paying lost opportunity cost, no one will ever know the magnitude and severity of the problem PJM commits to resolve through dispatch because no lost opportunity cost is paid. If the lost opportunity cost payments were large enough, it might be an incentive for PJM to address the N-1-1 problem prospectively in the planning process. Since PJM makes the initial decision that redispatch is preferred to reinforcements, if the actual cost of redispatch is allowed to be silently born by generators, the market will have no way of recognizing the value that is being provided to the grid. In essence, the generator is being asked to forgo revenue for an N-1-1 contingency which PJM does not plan for. Instead of pricing such a decision into the market, PJM is proposing to simply not pay the generator. No one will ever know, or even care how the cost of resolving N-1-1 contingencies prospectively compares to the cost of redispatch if no lost opportunity cost is paid. Resolution of the problem is effectively free for PJM because the cost of the resolution is born by individual generators and no one else is aware. Such a result is not only inequitable, but it also is confiscatory by not paying for transmission service provided and is inconsistent with efficient pricing in the market.

H. The Commission Must Reject the PJM Proposal.

The Commission must reject the PJM proposed changes to explicitly eliminate lost opportunity cost payments for units being backed down for stability reasons, and yet continue to be paid to be backed down for other reliability reasons as unjust, unreasonable, and unduly

discriminatory and preferential. PJM's current practice and "Generator Output Constraint" proposal must also be rejected as both are contrary to the maintenance of reliability in real-time operations as shown below. Moreover, PJM is encouraging through the market design the continuing misrepresentation of generator operating conditions and costs, in contravention of FPA Section 35.41(b), but through incentives to understate true cost as shown below, rather than through inaccurate ECO MAX values and outages as is the current practice. PJM's proposal is simply another means to actively avoid paying lost opportunity costs rightfully due to resources for services rendered by mitigating stability limits under 3.2.3(f) rather than simply paying lost opportunity costs.

II. CONCLUSION

For the foregoing reasons, P3 protests the proposed revisions set forth by PJM in its April 30, 2021 filing. P3 urges the Commission to reject the PJM filing.

Respectfully submitted,

On behalf of the PJM Power Providers Group

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Dated: May 21, 2021

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 Washington, D.C., this 21st day of May, 2021.

On behalf of the PJM Power Providers Group

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