

164 FERC ¶ 61,035
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Before Commissioners: Cheryl A. LaFleur, Neil Chatterjee,
Robert F. Powelson, and Richard Glick.

Delaware Public Service Commission and Maryland
Public Service Commission v. PJM Interconnection,
L.L.C. and Certain Transmission Owners Designated
under CTOA RS FERC No. 42

Docket No. EL15-95-003

ORDER GRANTING REHEARING AND ESTABLISHING PAPER HEARING
PROCEDURES

(Issued July 19, 2018)

1. On April 22, 2016, the Commission denied a complaint filed by the Maryland Public Service Commission (Maryland Commission) and the Delaware Public Service Commission (Delaware Commission) (together, State Commissions), pursuant to section 206 of the Federal Power Act (FPA),¹ contending that the use of the solution-based distribution factor (DFAX) method to assign cost responsibility for a portion of the costs of certain transmission projects that were approved through the PJM Regional Transmission Expansion Planning (RTEP) process is unjust, unreasonable, and unduly discriminatory and preferential (State Commission Complaint).²
2. The State Commissions, together with the Delaware Division of Public Advocate, Maryland's Office of People's Counsel, Old Dominion Electric Cooperative, Easton Utilities Commission, and the Delaware Municipal Electric Corporation (State

¹ 16 U.S.C. §§ 824e (2012).

² *PJM Interconnection, L.L.C.*, 155 FERC ¶ 61,090 (2016) (April 2016 Order). In the April 2016 Order, in Docket No. ER15-2563, the Commission also accepted, pursuant to section 205 of the FPA (16 U.S.C. § 824e (2012)), proposed revisions to Schedule 12-Appendix A of the PJM Tariff in accordance with Schedule 12 of the Tariff and section 1.6 of Schedule 6 of the Amended and Restated Operating Agreement of PJM (Operating Agreement). These Tariff revisions incorporate cost responsibility assignments for transmission projects included in the RTEP approved by the PJM Board of Directors (PJM Board); specifically, the transmission project at issue in the Complaint, the Artificial Island Project. Commissioner LaFleur dissented from the April 2016 Order.

Commission Parties) filed a request for rehearing. Separately, LSP Transmission Holdings, LLC (LSP Transmission) filed a request for rehearing.

3. As discussed below, we grant rehearing. Specifically, we find that it is unjust and unreasonable to apply PJM's solution-based DFAX cost allocation method to Regional Facilities,³ Necessary Lower Voltage Facilities,⁴ and Lower Voltage Facilities⁵ (as described below) that address stability-related reliability issues, including the Artificial Island Project. To determine the just and reasonable rate to be applied, we are establishing paper hearing procedures.

I. Background

A. PJM RTEP Cost Allocation Tariff Provisions

4. PJM files cost responsibility assignments for transmission projects that the PJM Board approves as part of PJM's RTEP in accordance with Schedule 12 of the Open Access Transmission Tariff (OATT or Tariff) and Schedule 6 of the Amended and Restated Operating Agreement of PJM (Operating Agreement).⁶ Schedule 12 of the

³ Regional Facilities are defined as Required Transmission Enhancements included in the Regional Transmission Expansion Plan that are transmission facilities that: (a) are AC facilities that operate at or above 500 kV; (b) are double-circuit AC facilities that operate at or above 345 kV; (c) are AC or DC shunt reactive resources connected to a facility from (a) or (b); or (d) are DC facilities that meet the necessary criteria as described in section (b)(i)(D). PJM, Intra-PJM Tariffs, OATT, Schedule 12, section (b)(i) (Regional Facilities and Necessary Lower Voltage Facilities) (6.1.0).

⁴ Necessary Lower Voltage Facilities are defined as Required Transmission Enhancements included in the Regional Transmission Expansion Plan that are lower voltage facilities that must be constructed or reinforced to support new Regional Facilities. PJM, Intra-PJM Tariffs, OATT, Schedule 12, section (b)(i) (Regional Facilities and Necessary Lower Voltage Facilities) (6.1.0).

⁵ Lower Voltage Facilities are defined as Required Transmission Enhancements that: (a) are not Regional Facilities; and (b) are not "Necessary Lower Voltage Facilities." PJM, Intra-PJM Tariffs, OATT, Schedule 12, section (b)(ii) (Lower Voltage Facilities) (6.1.0).

⁶ In accordance with the Tariff and the Operating Agreement, PJM "shall file with FERC a report identifying the expansion or enhancement, its estimated cost, the entity or entities that will be responsible for constructing and owning or financing the project, and the market participants designated under Section 1.5.6(l) above to bear responsibility for the costs of the project." See Operating Agreement, Schedule 6, section 1.6 (b). "Within

Tariff establishes Transmission Enhancement Charges for “[o]ne or more of the Transmission Owners [that] may be designated to construct and own and/or finance Required Transmission Enhancements by (1) the RTEP periodically developed pursuant to Operating Agreement, Schedule 6 or (2) any joint planning or coordination agreement between PJM and another region or transmission planning authority set forth in Tariff, Schedule 12-Appendix B.”⁷ In developing the RTEP, PJM identifies Reliability Projects⁸ to address different criteria, including PJM planning procedures, North American Electric Reliability Corporation (NERC) Reliability Standards, Regional Entity reliability principles and standards,⁹ and individual transmission owner Form No. 715 local planning criteria.

30 days of the approval of each Regional Transmission Expansion Plan or an addition to such plan by the PJM Board pursuant to Section 1.6 of Schedule 6 of the PJM Operating Agreement, the Transmission Provider shall designate in the Schedule 12-Appendix A and in a report filed with the FERC the customers using Point-to-Point Transmission Service and/or Network Integration Transmission Service and Merchant Transmission Facility owners that will be subject to each such Transmission Enhancement Charge (“Responsible Customers”) based on the cost responsibility assignments determined pursuant to this Schedule 12.” PJM Tariff, Schedule 12, section (b)(viii).

⁷ Required Transmission Enhancements are defined as “enhancements and expansions of the Transmission System that (1) a RTEP developed pursuant to Schedule 6 of the Operating Agreement or (2) any joint planning or coordination agreement between PJM and another region or transmission planning authority set forth in Tariff, Schedule 12-Appendix B “Appendix B Agreement” designates one or more of the Transmission Owner(s) to construct and own or finance.” *See* OATT Definitions - R - S, OATT Definitions - R - S, 13.0.0. Transmission Enhancement Charges are established to recover the revenue requirement with respect to a Required Transmission Enhancement. *See* Schedule 12, section (a)(i).

⁸ Reliability Projects are included in the RTEP to address one or more reliability violation or to address operational adequacy and performance issues. *See* Schedule 12, section (b)(i)A)(2)(a).

⁹ As established by ReliabilityFirst Corporation, Southeastern Electric Reliability Council, and other applicable Regional Entities. *See* PJM, Intra-PJM Tariffs, Operating Agreement, Schedule 6, section 1.2(b) and §1.2(d) (Conformity with NERC and Other Applicable Reliability Criteria) (2.0.0).

5. PJM utilizes a hybrid cost allocation method, which the Commission found complies with Order No. 1000,¹⁰ for Regional Facilities and Necessary Lower Voltage Facilities that address a reliability need.¹¹ Under this hybrid cost allocation method, for Regional Facilities and Necessary Lower Voltage Facilities that address a reliability need, 50 percent of the costs are allocated on a load-ratio share basis and the other 50 percent of the costs are allocated using the solution-based DFAX method.¹² All of the costs of Lower Voltage Facilities are allocated using the solution-based DFAX method.¹³

¹⁰ See *Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities*, Order No. 1000, FERC Stats. & Regs. ¶ 31,323 (2011) (Order No. 1000), *order on reh'g*, Order No. 1000-A, 139 FERC ¶ 61,132, *order on reh'g and clarification*, Order No. 1000-B, 141 FERC ¶ 61,044 (2012), *aff'd sub nom. S.C. Pub. Serv. Auth. v. FERC*, 762 F.3d 41 (D.C. Cir. 2014) (*S.C. Pub. Serv. Auth. v. FERC*). See also *PJM Interconnection, L.L.C.*, 142 FERC ¶ 61,214 (2013), *order on reh'g and compliance*, 147 FERC ¶ 61,128 (2014), *order on reh'g and compliance*, 150 FERC ¶ 61,038, and *order on reh'g and compliance*, 151 FERC ¶ 61,250 (2015).

¹¹ PJM identifies reliability transmission needs and economic constraints that result from the incorporation of public policy requirements into its sensitivity analyses, and allocates the costs of the solutions to such transmission needs in accordance with the type of benefits they provide. See *PJM Interconnection, L.L.C.*, 142 FERC ¶ 61,214 at P 441. See also PJM Tariff, Schedule 12, section (b)(v) Economic Projects (assigning cost responsibility for Economic Projects).

¹² The solution-based DFAX method evaluates the projected relative use of the new transmission facility by the load of each transmission Zone or Merchant Transmission Facility and, through this power flow analysis, identifies projected beneficiaries for individual entities in relation to power flows. *PJM Interconnection, L.L.C.*, 142 FERC ¶ 61,214 at P 416. The solution-based DFAX method replaced the violation-based DFAX method that assigned cost responsibility by determining which loads contribute to the reliability violation that caused the need for the upgrade. *Id.* at PP 348, 429.

¹³ The Commission accepted a PJM Transmission Owner Tariff proposed revision to allocate 100 percent of the costs for Required Transmission Enhancements that are included in the RTEP solely to address individual transmission owner Form No. 715 local planning criteria to the Zone of the individual transmission owner whose Form No. 715 local planning criteria underlie each project. See *PJM Interconnection, L.L.C.*, 154 FERC ¶ 61,096, *order on reh'g*, 157 FERC ¶ 61,192 (2016).

B. Artificial Island Project Cost Allocation Proceedings

6. The Artificial Island Project encompasses a number of separate sub-projects to address stability limits on generation at the Salem and Hope Creek Nuclear Generating Stations in southern New Jersey,¹⁴ as well as the transmission constraints that are preventing those generators from exporting power at their full capacity under certain circumstances.

7. On August 28, 2015, PJM filed cost responsibility assignments for transmission enhancements and expansions for the Artificial Island Project. The Artificial Island Project includes Regional Facilities (i.e., 500 kV or double-circuit 345 kV and above) and Lower Voltage Facilities. The Artificial Island Project does not include any Necessary Lower Voltage Facilities. As discussed above, pursuant to PJM's Order No. 1000 regional cost allocation method, 50 percent of the costs of Regional Facilities are allocated on a load-ratio share basis, with the other 50 percent of the costs of such Regional Facilities allocated pursuant to the solution-based DFAX method. All of the costs of a project's Lower Voltage Facilities are allocated using the solution-based DFAX method.

8. On August 5, 2016, PJM suspended the Artificial Island Project to review its configuration in light of concerns over increased project cost estimates, and to outline potential means to identify beneficiaries of transmission projects that address stability issues that could be considered in addition to the beneficiaries identified through the currently effective solution-based DFAX method. In re-evaluating the Artificial Island Project, PJM stated that it would analyze project beneficiaries from alternate perspectives,¹⁵ and make such alternative analysis publicly available.

9. On August 23, 2016, the State Commission Parties requested that the Commission defer ruling on the pending requests for rehearing of proceedings regarding the allocation of the Artificial Island Project's costs, and reserved the right to file a motion to supplement or reopen the record in this docket, as necessary, to address the changed

¹⁴ Stability is the ability of a generator to operate in phase with the transmission system (within an acceptable range of angular deviation) before losing synchronism. It is a function of generator output, generator loading, generator inertia, and the strength of the transmission system from the generator to the grid. *See* State Commission Parties Rehearing Request at 18 (citing Technical Conference Transcript at 118-19).

¹⁵ PJM noted that the PJM Transmission Owners, not PJM, are responsible for filing Tariff provisions establishing a cost allocation method.

circumstances arising from PJM's suspension and further review of the Artificial Island Project.

10. On April 6, 2017, PJM lifted its suspension of the Artificial Island Project, and on April 13, 2017,¹⁶ in Docket No. ER17-1420-000, submitted revisions to the PJM Tariff to incorporate the cost responsibility assignments for the reconfigured Artificial Island Project.¹⁷ In its filing of revisions to the PJM Tariff to incorporate the cost responsibility assignments for the reconfigured Artificial Island Project, PJM acknowledged that “application of the [solution-based] DFAX methodology can result in cost allocations that seem anomalous where the engineering rationale or need for a project is not one driven by power flow.”¹⁸ PJM stated that it “is analyzing project beneficiaries from alternative perspectives, including load and the extent of service interruptions that could be expected in the case of an uncontrolled stability event at Artificial Island.”¹⁹

11. On September 6, 2017, the State Commission Parties requested that the Commission reopen the record in these proceedings and lodge two documents: (1) a PJM White Paper distributed to stakeholders titled, *Alternative Approaches to Identification of Artificial Island Project Beneficiaries* (White Paper), which identifies two alternative approaches for identifying the beneficiaries of transmission projects that address stability-related reliability issues (the Stability Interface DFAX Method and Stability Deviation

¹⁶ PJM amended its filing on April 28, 2017.

¹⁷ The total cost for the revised Artificial Island Project is approximately \$280 million, with approximately \$242 million (approximately 87 percent) of the cost responsibility assigned pursuant to the solution-based DFAX method and \$38 million assigned based on load-ratio share method. See *PJM Interconnection, L.L.C.*, 161 FERC ¶ 61,024 (2017) (accepting revised cost responsibility assignments for the reconfigured Artificial Island Project).

¹⁸ PJM April 13, 2017 Transmittal at 6 (ER17-1420-000, Artificial Island Project reconfiguration cost allocation). PJM requested that “[g]iven the extensive comments received by many stakeholders regarding the Artificial Island Project and the ongoing cost allocation issues associated with this particular case, PJM is requesting a 90-day comment period to July 10, 2017, and an effective date 180 days from the date of this filing, so that PJM can provide alternative analyses regarding the beneficiaries of the project and afford stakeholders and the Commission additional time to address such cost allocation issues.” See Notice of Extension of Time (granting a motion requesting an extension of time to and including August 25, 2017 to submit comments, August 8, 2016).

¹⁹ *Id.*

Method); and (2) a summary presentation by PJM to stakeholders entitled “Stability Project Beneficiaries Alternative Comparison” (Alternatives Comparison Paper). Further, the State Commission Parties requested that the Commission establish any additional procedural deadlines that the Commission may deem necessary in light of the receipt of this additional evidence. The PJM Transmission Owners,²⁰ as well as the New Jersey Board of Public Utilities and the New Jersey Division of Rate Counsel, submitted answers in opposition to the State Commission Parties’ motion to reopen the record and lodge.

II. State Commission Complaint

12. The April 22, 2016 Order contains a detailed summary of the Complaint, which is not repeated here. In general, the State Commissions contended that use of a solution-based DFAX method to assign responsibility for a portion of the costs of the Artificial Island Project is unjust, unreasonable, and unduly discriminatory and preferential. The State Commissions further contended that the solution-based DFAX method, as applied to the Artificial Island Project,²¹ does not produce an allocation of RTEP project costs that is roughly commensurate with the benefits. The State Commissions argued that use of solution-based DFAX method, a flow-based analysis, is not appropriate for the Artificial Island Project, which is intended to address transmission system stability and generation operation issues limiting exports out of the Artificial Island Area.²² The State Commissions also contended that the Commission has both the authority and the responsibility to correct this deficiency in the PJM Tariff, at least as it concerns the assignment of cost responsibility for the Artificial Island Project.

²⁰ The PJM Transmission Owners include those transmission owners acting through the PJM Consolidated Transmission Owners Agreement. *See* Consolidated Transmission Owners Agreement Rate Schedule FERC No. 42.

²¹ State Commissions stated that the Artificial Island Project is a PJM RTEP project that involves the construction of a new 230 kV transmission line under the Delaware River and construction and installation of certain other facilities.

²² The State Commissions provided a study conducted by PJM staff at the request of the Delaware Commission. In the study, PJM staff analyzed the Artificial Island Project’s impact on locational marginal prices (LMP) and load payments throughout PJM. Based on this analysis, the State Commissions contended that only about 10 percent (\$17.04 million) of the total projected annual load payment savings of \$169.2 million would accrue to the Delmarva Zone on an annual basis. *See* State Commission Complaint, Exhibit 1, at 3-5.

III. Technical Conference

13. In a November 24, 2015 order, the Commission found that the assignment of cost responsibility for the proposed Tariff revisions for, among others, the Artificial Island Project had not been shown to be just and reasonable and may be unjust, unreasonable, or unduly discriminatory or preferential.²³ Accordingly, the Commission accepted the proposed Tariff revisions in those proceedings for filing, suspended them for five months, to become effective on April 25, 2016, or an earlier date set forth in a subsequent order, subject to refund, and the outcome of a technical conference (Technical Conference).

14. The Commission directed staff to establish the Technical Conference “to explore both whether there is a definable category of reliability projects within PJM for which the solution-based DFAX cost allocation method may not be just and reasonable, such as projects addressing reliability violations that are not related to flow on the planned transmission facility, and whether an alternative just and reasonable *ex ante* cost allocation method could be established for any such category of projects.”²⁴

IV. April 22, 2016 Order

15. In the April 22, 2016 Order, the Commission found that the State Commissions had failed to satisfy their burden under FPA section 206 to demonstrate that the portion of cost responsibility assigned pursuant to the solution-based DFAX method is unjust, unreasonable, or unduly discriminatory or preferential. The April 22, 2016 Order noted that the Commission accepted the solution-based DFAX method as part of PJM’s Order No. 1000 compliance filing as just and reasonable.²⁵ In accepting the solution-based DFAX method as part of PJM’s Order No. 1000 compliance filing, the Commission found that, the solution-based DFAX method, “evaluates the projected relative use of a new reliability project by load in each zone and withdrawals by merchant transmission facilities, and through this power flow analysis, identifies projected benefits for

²³ *PJM Interconnection, L.L.C.*, 153 FERC ¶ 61,245 (2015) (November 2015 Order). In establishing the Technical Conference, the Commission included several proceedings in which the protests raising concerns regarding the justness and reasonableness of the solution-based DFAX method for Required Transmission Enhancements to address reliability violations that are not related to flow on the planned transmission facility. *Id.* PP 33-34 (including the assignment of cost responsibility for the Bergen-Linden Corridor Project, Docket No. ER15-2562).

²⁴ *Id.* at P 35, Ordering Paragraph (B).

²⁵ April 2016 Order, 155 FERC ¶ 61,090 at P65.

individual entities in relation to power flows.”²⁶ In addressing the argument in the Complaint that the State Commissions do not contribute to the need for the Artificial Island Project, the Commission noted that “while reliability violations may drive the need for a transmission project, the solution-based DFAX method identifies the beneficiaries through their use of a facility,” and that, “even if a stability violation is the primary driver of a transmission project, the solution-based DFAX method allocates costs of a transmission facility that address the reliability violations based on use of the facilities.”²⁷ The Commission was unpersuaded by arguments that the cost responsibility assignments calculated pursuant to the solution-based DFAX method are unjust and unreasonable because they differ significantly from the State Commissions’ analysis of the economic benefits of the Artificial Island Project.²⁸ The Commission found that the solution-based DFAX method is not unjust and unreasonable merely because the results of an economic analysis differ from the results of the solution-based DFAX analysis.²⁹

V. Rehearing Requests

16. The State Commission Parties contend that the April 22, 2016 Order contains factual findings that are not supported by substantial evidence and presents legal arguments that are not the product of reasoned decision-making, and will produce rates that are unjust, unreasonable, and unduly discriminatory.

17. The State Commission Parties contend that the April 22, 2016 Order departed from the substantive concerns identified by the Commission in establishing the Technical Conference, specifically: whether there is a definable category of reliability projects within PJM for which the solution-based DFAX cost allocation method may not be just and reasonable, and whether an alternative just and reasonable *ex ante* cost allocation method could be established for any such category of projects. The State Commission Parties assert that, despite evidence defining a limited category of RTEP projects for which the solution-based DFAX method may not be just and reasonable, the conclusions of the April 22, 2016 Order that the solution-based DFAX method is just and reasonable reveal a lack of principled, reasoned decision-making.³⁰

²⁶ *PJM Interconnection, L.L.C.*, 142 FERC ¶ 61,214 at P 416.

²⁷ April 2016 Order, 155 FERC ¶ 61,090 at P68.

²⁸ *Id.* P 70.

²⁹ *Id.* P 71.

³⁰ State Commission Parties Rehearing Request at 11-12.

18. The State Commission Parties further contend that the April 22, 2016 Order rests on an erroneous assumption that energy flows over new facilities into a Zone, as identified by the solution-based DFAX method, provide significant benefits to that Zone. They maintain that the reason the solution-based DFAX method produces acceptable results when applied to upgrades that resolve flow-based violations is because, in those cases, there is a clear nexus between the nature of the underlying problem and the use of the upgrade that is built to solve that problem. The State Commission Parties further state that stability-related reliability issues, on the other hand, present a very different set of relationships, one in which there no longer is a nexus between the underlying problem and any “use” of the upgrade that is built to resolve that problem. The State Commission Parties contend that resolution of the stability-related reliability issue is the availability of a greater amount of outlet capability, which serves to mitigate the magnitude of angular swing on a generator that would otherwise result from a disturbance elsewhere on the grid. According to the State Commission Parties, where the purpose of an upgrade is to provide additional outlet capability for clustered generation, there is no single correct terminus for the upgrade. The State Commission Parties assert that the April 22, 2016 Order should have analyzed, or directed PJM to analyze in more detail, the benefits of increased output from the generation located in the Artificial Island area, which is the primary objective of the Artificial Island Project.

19. The State Commission Parties contend that, in PJM, the cost allocation method that applies to a given transmission project is determined by the nature of that project as defined by its purpose or driver (e.g., economics, reliability, Form 715, and public policy). The State Commission Parties assert that the April 22, 2016 Order errs by finding that a generic cost allocation approach is just and reasonable for allocating the costs of the Artificial Island Project, while dismissing record evidence that the driver of the Artificial Island Project clearly places the project in a category for which no existing cost allocation method is capable of producing just and reasonable rates.

20. The State Commission Parties also contend that the Commission erred in discounting the identification of beneficiaries based on the economic analysis that PJM prepared at the State Commissions’ request. The State Commission Parties assert that PJM’s analysis demonstrated that the reduction in LMPs that results from increasing the power output from the Artificial Island area generation, and shows that such benefits are wide-spread within PJM. They state that PJM’s analysis reflects the actual benefits of the Artificial Island Project. Finally, the State Commission Parties contend that the Commission erred in failing to allocate any portion of the costs of the Artificial Island Project to the generating units that directly benefit from the project, i.e., the Hope Creek and Salem generation stations.

21. LSP Transmission contends that the Commission ignored the facts establishing that the solution-based DFAX method does not properly measure the beneficiaries of the Artificial Island Project. LSP Transmission further argues that by placing substantial

weight on the Commission's prior approval of solution-based DFAX method and failing to address the actual facts surrounding the Artificial Island Project, the Commission failed to engage in reasoned decision-making. Specifically, LSP Transmission states that the Commission failed to take into account the unique geographic circumstances surrounding the Artificial Island area generation issues.

22. LSP Transmission argues that the Commission failed to address the critical question of why, in the specific circumstances of the Artificial Island Project, measuring use is the appropriate measure for determining the project's beneficiaries, or whether ratepayers of Delaware and Maryland benefit from the Artificial Island Project. LSP Transmission contends that, for as long as the Artificial Island area generation remains, there will be no change in usage of the Artificial Island Project because the entire purpose of the project is to take flows away from the generating facilities. LSP Transmission argues that, "[f]or solution-based DFAX to be a valuable cost allocation methodology determining beneficiaries solely on use, there must be some definable basis upon which the user of the facility can curtail usage if it does not like its cost allocation."³¹ Moreover, LSP Transmission argues that the Artificial Island Project is not well represented by the solution-based DFAX method because the issues that it addresses are not related to flow and thus will not change over time.

VI. PJM's Alternative Beneficiaries Analysis

23. In the White Paper, PJM identified two alternative approaches for identifying the beneficiaries of transmission projects that address stability-related reliability issues: (1) the Stability Interface DFAX Method; and (2) the Stability Deviation Method.

A. Stability Interface DFAX Method

24. PJM states that the Stability Interface DFAX Method identifies the beneficiaries of transmission projects that address stability-related reliability issues by analyzing the power flows over the collection of lines that connect the generator(s) that is experiencing the stability-related reliability issue being addressed. Specifically, PJM states that, to implement the Stability Interface DFAX Method, it would establish a closed interface that surrounds the generator(s) with the stability-related reliability issues because stability violations typically are a function of the aggregate of all transmission facilities exiting a generator and the solution adds one more transmission element to that aggregate. PJM states that the rationale for use of an interface is based on the nature of the stability-related reliability issue requiring a solution – any additional outlet for the generator's output will help with the stability-related reliability issue regardless of where the outlet "sinks." PJM states that it would then determine the Stability Interface DFAX Method value for each transmission Zone for each transmission facility that comprises the

³¹ LSP Transmission Rehearing Request at 17-18.

interface in the same manner that it does using its existing solution-based DFAX method, and would then allocate the costs of a transmission project that addresses stability-related reliability issues based on each transmission Zone's flows over the entire closed interface. PJM states that this approach would be relatively easy to implement, given that it is consistent with the existing solution-based DFAX method.

B. Stability Deviation Method

25. PJM states that the Stability Deviation Method identifies beneficiaries of transmission projects that address stability-related reliability issues by modeling the transient voltage (angle) deviations at each PJM substation to assess the stability performance of a generator or cluster of generators to critical faults, and allocates costs based on a load-weighted deviation for each Zone. In other words, the Stability Deviation Method identifies the beneficiaries of a transmission project that addresses stability issues as the transmission Zones whose loads are affected by the stability-related reliability issues being addressed. To establish the angular deviation, PJM states that it performs a transient stability study. PJM further states that the change in the angle of the voltage is higher for substations that are more impacted by a disturbance or stability event, and the Stability Deviation Method uses this angle change as a basis to identify those most impacted by the disturbance as the beneficiaries of a transmission project that addresses stability-related reliability issues. To implement this approach, PJM states that it would establish a load-weighted angle deviation for each transmission Zone by multiplying the angle deviation at each substation by the load at the substation, summing the results for all of the substations within the Zone.³² PJM states that the total load-weighted angle deviations for each transmission zone would then represent the aggregate impact of the disturbance on the customer load in the Zone and form the basis for cost allocation. PJM explains that this approach is more analytically related to the nature of the problem than the Stability Interface DFAX Method.

VII. Comments on the PJM White Paper

26. Comments on the PJM White Paper were submitted in response to PJM's filing of the cost responsibility assignments for the reconfigured Artificial Island Project in Docket No. ER17-1420-000. The State Commission Parties³³ and Exelon³⁴ provided

³² PJM states that it would disregard substations with angle deviations of less than 25 percent of the largest deviation.

³³ The State Commission Parties included the affidavit of John J. Marczewski.

³⁴ Exelon included the affidavit of Steven T. Naumann (Naumann Affidavit).

comments on the alternative approaches identified in the PJM White Paper.³⁵ These parties generally contend that either approach represents an improvement over the cost responsibility assignments identified using the solution-based DFAX method, subject to the concerns that PJM identified in the PJM White Paper, as discussed below.

A. PJM

27. In the PJM White Paper, PJM concludes that the Stability Interface DFAX Method relies on the same analytics as the existing solution-based DFAX cost allocation method, and that it would be easy to implement and should be familiar and readily understood.³⁶ In addition, PJM states that, since the method relies on the same analytics, the cost responsibility assignments could be updated on an annual basis (as are the cost responsibility assignments for reliability projects needed to address thermal violations). PJM notes that it may be appropriate to consider weighting the use of individual facilities comprising the interface. PJM further notes that there also may be circumstances where the interface should be comprised of facilities other than the immediate interface from a particular generating station, for example, if the project were addressing stability of a cluster of generators within an area of the system. For the method to be generally applicable to future transmission projects that address stability issues, PJM contends that such questions should be discussed further.

28. PJM contends that the Stability Deviation Method is more directly linked to stability-based analytics, and may therefore provide a more representative identification of beneficiaries. PJM states that the stability of a generator is a function of a number of parameters, including the controls on the generator, the duration of the disturbance, and how well the generator connects to the rest of the system.³⁷ The Stability Deviation Method identifies beneficiaries of improved stability, i.e., improvements in the angle that load swings during and after a transient event at an individual substation, which does not depend on flows on the new Artificial Island Project. The stability of a generator is based on complex, non-linear equations (i.e., dynamic stability simulations) and, as a result, PJM notes that the Stability Deviation Method may be difficult to understand and replicate. PJM also notes that there are often multiple worst-fault conditions for a

³⁵ The PJM Transmission Owners commented that the Commission and courts have long ruled that there may be multiple just and reasonable ways to allocate the costs of transmission facilities, and the fact that a different cost allocation could also be just and reasonable is no reason to reject the filed method that the Commission has found to be just and reasonable. The PJM Transmission Owners oppose the State Commission Parties' motion to lodge. PJM Transmission Owner Answer to Motion at 6.

³⁶ PJM White Paper at 12.

³⁷ PJM White Paper at 6.

particular generator or generators (e.g., to account for various maintenance outages and critical faults). PJM states that, in these instances, the calculation could be completed for each worst-fault condition and averaged to develop the overall allocation. Further, PJM notes that the Stability Deviation Method identified in the PJM White Paper includes the identification of a threshold below which no costs are allocated.

B. State Commission Parties

29. The State Commission Parties contend that the Stability Interface DFAX Method requires further exploration because it (1) employs the one percent *de minimis* threshold also used in the solution-based DFAX method, (2) it does not consider operation under contingency conditions, (3) allows load Zones made up of distributed loads to net their usage across the interface lines, and (4) ignores distribution factor values that are in the opposite direction of the predominant hourly usage. The State Commission Parties contend that these issues must be addressed before the Stability Interface DFAX Method could be adopted.

30. The State Commission Parties contend that the Stability Deviation Method fundamentally relies on the same analytical tools and methods used to assess power system reliability (dynamic stability simulations), in contrast to the methods that use steady state power flow simulations to calculate distribution factors (including the solution-based DFAX method and the Stability Interface DFAX Method). The State Commission Parties note that the Stability Deviation Method measures angular deviation of voltage, which is the electrical quantity directly related to the mechanical measure of generator rotor angle, a fundamental quantity observed in stability studies. The State Commission Parties further contend that the Stability Deviation Method is superior to the solution-based DFAX method for transmission projects that address stability-related reliability issues because it considers contingency situations, which the State Commission Parties state is important because stability problems are related to operations under contingency conditions. The State Commission Parties also contend that the Stability Deviation Method has advantages over the Stability Interface DFAX Method because the quantity measured as changing during the contingency event is directly related to generator stability performance. Moreover, the State Commission Parties contend that because an angular deviation is measured at individual load points, weighted by the MW load at the load point, and then summed for each load Zone, there is no issue with netting. The State Commission Parties contend that with additional consideration, the Stability Deviation Method could form the basis for a just and reasonable cost allocation method for transmission projects that address stability issues that would result in an allocation of the costs of such projects that is roughly commensurate with the benefits they provide.

31. The State Commission Parties also request that the Commission, through appropriate processes, require the PJM Transmission Owners to select and implement a new cost allocation method for transmission projects that address stability issues based on one or both of these alternatives. The State Commission Parties add that the Commission

should direct PJM to file revised cost responsibility assignments for the Artificial Island Project that are calculated using the alternative cost allocation method that the PJM Transmission Owners select.

C. Exelon

32. Exelon questions whether it is appropriate to assign cost responsibility to address a situation where one or more circuits may be open (or the system otherwise is compromised) pursuant to the solution-based DFAX method, an analysis which assumes that all circuits are closed. Exelon posits that, while an “all circuits closed” assumption makes sense with respect to most transmission upgrades (that typically seek to address transmission flow limitations), the Artificial Island Project presents a unique situation, where the new transmission line is installed to remedy a stability limitation for existing generators. Exelon contends that the angle deviation is a parameter that is directly related to the improvements customers receive from the Artificial Island Project, and believes that the Stability Deviation Method is the appropriate metric for measuring those benefits. Exelon contends that the Stability Deviation Method identifies beneficiaries of improved stability – i.e., improvements in the angle that load swings during and after a transient event. Exelon contends that the beneficiaries determined using the Stability Deviation Method do not depend on flows on the new Artificial Island Project. Exelon contends that, unlike flow-based constraints, stability performance of generators is governed by complex non-linear equations,³⁸ and because the Stability Deviation Method solves these non-linear equations and accounts for different combinations of outages/fault conditions, it can accurately identify beneficiaries of improved transient stability. Exelon contends that using the Stability Deviation Method to identify beneficiaries of improved stability is consistent with the use of the solution-based DFAX method in that both methods determine beneficiaries by analyzing the system after new transmission facilities have been added. Moreover, Exelon argues that use of the Stability Deviation Method does not revert to an analysis of which entities may have caused the violation, but rather identifies beneficiaries.

33. Exelon contends that using a threshold under which PJM would not consider substations with angle deviations of less than 25 percent of the largest deviation is both necessary and appropriate because, without such a threshold, the Stability Deviation Method would incorrectly identify Zones as beneficiaries where the customers receive little or no benefit from the Artificial Island Project. Exelon maintains that a short circuit will cause voltage and angle changes throughout the Eastern Interconnection, but the

³⁸ Rather than having a relationship to the power flow over a new transmission facility, the ability of a generator to remain stable is dependent on multiple other factors such as pre-fault MW output of the generator, the impedance between the generator and the rest of the system, prior line outages, generator and system voltage levels, and fault clearing times. *See* Exelon Comments, Naumann Affidavit at 6.

improved stability resulting from the addition of the Artificial Island Project will have a negligible effect for those Zones remote from the fault.

34. Exelon states that the fact that the solution-based DFAX method does not correctly identify all the beneficiaries of improved transient stability following the addition of the Artificial Island Project does not negate that there are flow-based benefits that the upgrades provide to customers. Therefore, Exelon recommends that the Commission adopt a hybrid cost allocation method to account for both the flow-based benefits of transmission projects that address stability issues and their stability improvement benefits. This hybrid method would combine two measures: the solution-based DFAX method to account for the flow-based benefits and a measure that identifies beneficiaries of improved stability, as identified through the Stability Deviation Method.

35. Exelon states that the weighting factors for the two sets of beneficiaries, which is not a precise calculation, would need to be determined based on further evidence and therefore, the Commission should hold a paper hearing to (1) determine the details of calculating the stability beneficiary metric to be used as part of a hybrid method combined with the solution-based DFAX method, and (2) determine weighting factors applicable to each component of the hybrid method. Exelon also requests that the Commission direct PJM to make available to all parties to the litigation (subject to Critical Energy Infrastructure Information restrictions where appropriate) the models, methodologies, and assumptions PJM used to determine possible beneficiaries as shown in the documents presented to the Transmission Expansion Advisory Committee (TEAC) so that parties can duplicate PJM's results and/or offer their own analyses.³⁹

VIII. Discussion

A. Procedural Matters

36. We grant State Commission Parties' motion to lodge. As discussed below, we grant rehearing of the April 22, 2016 Order based on the arguments presented in the rehearing requests. As discussed below, in granting rehearing we reopen the record and seek additional information on the approaches identified in the PJM White Paper to establish the just and reasonable rate.

³⁹ Exelon Comments at 5 (referencing documents distributed to stakeholders, June 9, 2017 TEAC).

B. Commission Determination

1. Grant of Rehearing

37. The April 22, 2016 Order (1) found that the State Commissions failed to satisfy their burden under FPA section 206 to demonstrate that the solution-based DFAX method is unjust, unreasonable, unduly discriminatory or preferential and (2) did “not find that the assignment of costs for the Artificial Island Project unjust and unreasonable.”⁴⁰ On further consideration, we grant rehearing for the reasons discussed below.

38. In Order No. 1000, “the Commission required public utility transmission providers to have an *ex ante* cost allocation method on file with and approved by the Commission. This cost allocation method is required to explain how the costs of new transmission facilities selected in a regional transmission plan for purposes of cost allocation are to be allocated, consistent with the cost allocation principles set forth in Order No. 1000.”⁴¹ Regional Cost Allocation Principle 1 provides that, “[t]he cost of transmission facilities must be allocated to those within the transmission planning region that benefit from those facilities in a manner that is at least roughly commensurate with estimated benefits.”⁴² The Court of Appeals for the D.C. Circuit affirmed that “the Commission’s adoption of a beneficiary-based cost allocation method is a logical extension of the cost causation principle”⁴³ and that “costs are to be allocated to those who cause the costs to be incurred and reap the resulting benefit.”⁴⁴ We continue to find that the solution-based DFAX method allocates the costs in a manner that is at least roughly commensurate with benefits when applied to Regional Facilities, Necessary Lower Voltage Facilities, and Lower Voltage Facilities that resolve flow-based reliability violations. We find, however, that solely relying on the solution-based DFAX method to allocate all of the costs of Lower Voltage Facilities that address stability-related reliability issues, and 50 percent of the costs of Regional Facilities and Necessary Lower Voltage Facilities that address stability-related reliability issues, does not allocate the costs of such transmission projects in a manner that is at least roughly commensurate with their benefits. As PJM stated, stability is analytically unique compared to voltage or thermal overload

⁴⁰ April 2016 Order, 155 FERC ¶ 61,090 at PP 65, 73.

⁴¹ Order No. 1000-A, 139 FERC ¶ 61,132 at P 286.

⁴² Order No. 1000, FERC Stats. & Regs. ¶ 31,323 at P 622.

⁴³ See *S.C. Pub. Serv. Auth. v. FERC*, 762 F.3d 41, 85 (D.C. Cir. 2014).

⁴⁴ *Id.* (citing *Nat’l Ass’n of Regulatory Util. Comms. v. FERC*, 475 F. 3d. 1277, 1285 (D.C. Cir. 2007)).

problems.⁴⁵ PJM made the same point when it “acknowledged that applying the solution-based DFAX method can result in cost responsibility assignments that seem anomalous where the engineering rationale or need for a transmission project is not driven by power flow.”⁴⁶

39. PJM notes that the use of the flow-based solution-based DFAX method is a reasonable method for identifying beneficiaries of thermal overload and voltage related reliability issues.⁴⁷ As PJM stated, “[i]n the overwhelming majority of cases where the solution-based DFAX methodology is applied to assess cost allocation relating to a specified reliability violation, the change in power flows are consistent with the intended solution and the beneficiaries of that solution are readily identified based upon those power flows. For example, a project which fixes a transmission overload in a given region will allow greater flows into that constrained region. Thus, the change in flows will illustrate the positive benefits of that project for constrained load behind the transmission overload.”⁴⁸

40. In contrast, the flows on a transmission project to resolve a stability-related reliability issue do not necessarily resolve a constraint by bringing power to load.⁴⁹ Instead, stability events result from an imbalance of generation and load caused by a sudden event on the transmission system where the rotational inertia of the generator could cause the generator to lose synchronism with the rest of the transmission system.⁵⁰ Following such an event, generating units exhibit an oscillatory behavior to reestablish balance, and the severity of the oscillation is dependent on the strength of the

⁴⁵ Technical Conference Transcript at 116-17. PJM further stated, that, other than two very small stability related problems that were resolved by control devices within the generating station, all other stability-related problems have been identified during the generator interconnection process, and that the Artificial Island issue was a “unique situation.” *Id.* at 118-20.

⁴⁶ PJM April 13, 2017 Transmittal at 6, ER17-1420-000 (Artificial Island Project reconfiguration cost allocation).

⁴⁷ *See* PJM Answer to Complaint at 3, PJM White Paper at 4, Technical Conference Transcript at 8, 115-16.

⁴⁸ PJM Answer to Complaint at 8 (footnote omitted).

⁴⁹ *Id.*, Technical Conference Transcript at 116.

⁵⁰ *See* State Commission Parties Rehearing Request at 18 (referring to Technical Conference Transcript at 116, 130).

transmission system.⁵¹ A weaker transmission system will cause the oscillatory behavior to last longer and be more severe, which could ultimately result in damage to the generator and cause additional outages of other system elements.⁵² Having noted the analytically unique nature of stability-related reliability issues,⁵³ PJM states, the extent of a stability-related reliability issue depends on the nature of the problem that initiates the stability event, and it could be either a very local event or spread into a more substantial problem.⁵⁴ Depending on the severity of the disturbance and the actions of power system controls, the system may remain stable or experience a large separation of generator rotor angles and eventually lose synchronism.⁵⁵ Transmission projects providing additional outlets for generation to address stability-related reliability issues, therefore, will benefit the reliability of the affected Zones differently because the effect of a stability-related reliability issue differs between those Zones.

41. We find that the beneficiaries of Regional Facilities, Necessary Lower Voltage Facilities and Lower Voltage Facilities that are solutions to these stability-related reliability issues are not necessarily captured by the solution-based DFAX method, which primarily determines the beneficiaries of flow-based reliability violations. In particular, the record has demonstrated that, given the analytically unique nature of stability-related reliability issues, further analysis of the identification of the beneficiaries is required. In granting rehearing, we find that using the solution-based DFAX method to allocate all of the costs of Lower Voltage Facilities that address stability-related reliability issues, and 50 percent of the costs of Regional Facilities and Necessary Lower Voltage Facilities that address stability-related reliability issues, does not allocate the costs of such transmission projects in a manner that is at least roughly commensurate with their benefits. Thus, the Commission finds on rehearing that it is unjust and unreasonable for PJM to rely solely on the solution-based DFAX method to allocate all of the costs of Lower Voltage Facilities that address stability-related reliability issues, and 50 percent of the costs of

⁵¹ See State Commission Parties Protest, Docket No. ER17-1420-000, Affidavit of John J. Marczewski at 7.

⁵² *Id.* See Technical Conference Transcript at 130 (with stability problems, “the generator that becomes unstable can swing and can cause other lines to trip,” noting that local stability problems “could cascade into a much more severe event.”).

⁵³ PJM also notes that the Artificial Island issue was a “unique situation.” *Id.* at 116-17.

⁵⁴ Technical Conference Transcript at 131 (noting that the likelihood of the stability event propagating out and affecting customers “meaning load” depends on the circumstances of the stability event).

⁵⁵ Technical Conference Transcript at 116.

Regional Facilities and Necessary Lower Voltage Facilities that address stability-related reliability issues, including the costs of the Artificial Island Project.

2. Establishing a Just and Reasonable Cost Allocation Method

42. In finding the portion of cost responsibility assigned pursuant to the solution-based DFAX method unjust and unreasonable for stability-related reliability projects, pursuant to FPA section 206, we are required to establish the just and reasonable replacement rate. We are establishing paper hearing procedures to develop additional information to help us determine a just and reasonable *ex ante* cost allocation method for Regional Facilities, Necessary Lower Voltage Facilities, and Lower Voltage Facilities in PJM that address stability-related reliability issues. While the PJM White Paper has set forth two alternative methods for identifying the beneficiaries of transmission projects that address stability-related reliability issues, and Exelon has submitted comments on a hybrid method combining the solution-based DFAX method to account for the flow-based benefits and a measure that identifies beneficiaries of improved stability, as identified through the Stability Deviation Method, we find that additional information is necessary to further understand and decide among the methods. We are providing parties, including PJM, 60 days from the date of this order to provide the information discussed below to address a just and reasonable *ex ante* cost allocation method to allocate all of the costs of Lower Voltage Facilities that address stability-related reliability issues, and 50 percent of the costs of Regional Facilities and Necessary Lower Voltage Facilities that address stability-related reliability issues.

43. Since PJM provided two potential approaches to establishing a just and reasonable *ex ante* cost allocation method for such facilities in PJM that address stability-related reliability issues, we ask parties to provide their views on both approaches, including answers to the questions below. We also request information on Exelon's proposed hybrid cost allocation method for the portion of cost responsibility assigned pursuant to the solution-based DFAX method of such facilities that address stability-related reliability issues.

a. Stability Interface DFAX Method

44. As discussed above, under the Stability Interface DFAX method, the costs of transmission projects in PJM that address stability-related reliability issues would be allocated to each transmission Zone based on its contribution to flows over a closed interface around the generator(s) experiencing the stability issue being addressed. PJM states that this is similar to the solution-based DFAX method in that beneficiaries are determined based on use of a new transmission facility, with the exception that the flows are modeled based on a closed interface that represents multiple transmission lines comprising the interface. To implement the Stability Interface DFAX method, we request that respondents provide the following information:

1. Define the approach for identifying the stability interface for particular Regional Facilities, Necessary Lower Voltage Facilities, and Lower Voltage Facilities that address stability-related reliability issues.
2. Describe the process through which PJM will determine how to weigh individual facilities that make up a stability interface.
3. Describe the process for determining whether facilities other than the immediate outlets for a particular generating station should comprise the stability interface.
4. Describe whether PJM could update cost responsibility assignments on an annual basis using the Stability Interface DFAX method, and if so, how and whether PJM should update the choice and weighting of individual facilities comprising the stability interface.
5. Explain if and how the Stability Interface DFAX method can account for fault conditions (e.g., faults on lines connected to the Artificial Island generators under maintenance conditions, i.e., a prior line outage) as part of measuring beneficiaries.
6. Describe the *de minimis* stability interface threshold, if any, for PJM to allocate costs to a particular transmission Zone under the Stability Interface DFAX method. Additionally, please describe how the costs that would have been allocated but for the threshold would be reallocated among those beneficiaries whose benefits exceed the threshold.
7. Explain whether and, if so, how the solution-based DFAX analysis that PJM would perform for an interface under its Stability Interface DFAX method would differ from the solution-based DFAX that it performs under its current tariff.
8. The Stability Interface DFAX method uses a closed interface that surrounds the generators with stability issues. Explain whether and, if so, how application of the stability interface DFAX method will net flows for zones made up of distributed loads, and whether, and if so, how this differs from netting under the solution-based DFAX method.

9. Provide *pro forma* tariff provisions to implement the Stability Interface DFAX method.

b. Stability Deviation Method

45. As discussed above, the Stability Deviation method identifies the beneficiaries of transmission projects that address stability-related reliability issues by determining which loads are most impacted by the stability issue being addressed. This is in contrast to the solution-based DFAX method, which only accounts for flows on a transmission facility, flows that may not correlate with the beneficiaries of reduced voltage deviations (i.e., reduced impacts from a stability event). To implement the Stability Deviation method, we request that respondents provide the following information:

1. Describe the process for determining the “worst-fault conditions” (e.g., faults on lines connected to the Artificial Island generators under maintenance conditions, i.e., a prior line outage) that PJM will consider for a particular generator or cluster of generators.
2. Describe how PJM will weigh each “worst-fault condition” if there are multiple “worst-fault conditions” for a particular generator or cluster of generators.
3. Describe whether PJM could update cost responsibility assignments made pursuant to the Stability Deviation method on an annual basis and, if so, how.
4. Describe the threshold, if any, under which the load behind a particular substation would not be allocated costs. Additionally, describe how the costs that would have been allocated to such loads but for the threshold would be reallocated among the remaining beneficiaries.
5. Provide *pro forma* tariff provisions to implement the Stability Deviation method.

c. Hybrid Method

46. Because there may be flows on transmission projects that address stability-related reliability issues, this alternative could assign some portion of cost responsibility for benefits identified by those flows in proportion with the benefits identified by the approaches included in the PJM White Paper. We seek to determine whether a hybrid cost allocation method for the portion of cost responsibility assigned pursuant to the solution-based DFAX method for Regional Facilities, Necessary Lower Voltage Facilities, and Lower Voltage Facilities should include either a Stability Interface DFAX

method or Stability Deviation method component.⁵⁶ To implement the Hybrid method, we request that respondents provide the following information:

1. Please describe a new hybrid cost allocation method for Regional Facilities, Necessary Lower Voltage Facilities, and Lower Voltage Facilities. In addition, please describe how to determine the weighting percentages between the portion of costs assigned pursuant to the solution-based DFAX method, and the portion of costs assigned pursuant to the other component of the hybrid cost allocation method.
2. Describe whether PJM could update cost responsibility assignments made pursuant to this new hybrid cost allocation method on an annual basis and, if so, how.
3. Please provide *pro forma* tariff provisions to implement this new hybrid cost allocation method.

The Commission orders:

(A) Rehearing of the April 22, 2016 Order is hereby granted, as discussed in the body of this order.

(B) A paper hearing procedure is established, as discussed in the body of this order. Responses are due 60 days from the date of this order.

By the Commission. Chairman McIntyre is not participating.

(S E A L)

Nathaniel J. Davis, Sr.,
Deputy Secretary.

⁵⁶ For transmission facilities whose costs are currently allocated both using the solution-based DFAX method and the load-ratio share method (i.e., Regional Facilities and Necessary Lower Voltage Facilities), the adoption of a hybrid cost allocation method for transmission projects that address stability-related reliability issues could result in the use of three separate analyses for allocating the costs of a single project: the Stability Interface DFAX method or Stability Deviation method, the solution-based DFAX method, and the load-ratio share method.