

173 FERC ¶ 61,134
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Before Commissioners: James P. Danly; Chairman
Neil Chatterjee and Richard Glick.

PJM Interconnection, L.L.C.

Docket Nos. EL19-58-002
EL19-58-003

ORDER ON COMPLIANCE

(Issued November 12, 2020)

1. On May 21, 2020, the Commission issued an order finding unjust and unreasonable provisions of PJM Interconnection, L.L.C.'s (PJM) Open Access Transmission Tariff (Tariff) and the Amended and Restated Operating Agreement of PJM Interconnection, L.L.C. (Operating Agreement) governing PJM's market for reserves, establishing the just and reasonable replacement rate, and directing PJM to make a compliance filing to implement that replacement rate.¹ The May 2020 Order also found unjust and unreasonable provisions of the Tariff governing the determination of the energy and ancillary services offset (E&AS Offset) used in PJM's capacity market, established a forward-looking E&AS Offset as the just and reasonable replacement rate, and directed PJM to make a compliance filing to implement that replacement rate.²
2. PJM submitted two filings to comply with the Commission's directives in the May 2020 Order. On July 6, 2020, PJM submitted a compliance filing containing revisions to its Tariff and Operating Agreement detailing rules for resource eligibility to provide reserves, the determination of reserve capability for certain types of resources, and the removal of caps on demand response resource participation in reserve markets, as well as

¹ *PJM Interconnection, L.L.C.*, 171 FERC ¶ 61,153, at P 2 (2020) (May 2020 Order). *PJM Interconnection, L.L.C.*, Notice of Denial of Rehearings by Operation of Law and Providing for Further Consideration, 172 FERC ¶ 62,029 (2020), issued in accordance with *Allegheny Def. Project v. FERC*, 964 F.3d 1 (D.C. Cir. 2020) (en banc). The Commission subsequently issued an order addressing arguments on rehearing in *PJM Interconnection, L.L.C.*, 173 FERC ¶ 61,123 (2020) (modifying the discussion in the May 2020 Order and reaching the same result). A number of petitions for review have been filed in the U.S. Court of Appeals for the District of Columbia Circuit relating to the Commission's prior orders in this proceeding.

² *PJM Interconnection, L.L.C.*, 171 FERC ¶ 61,153 at P 2.

proposing an implementation schedule.³ On August 5, 2020, PJM submitted a compliance filing containing revisions to its Tariff to incorporate a forward-looking E&AS Offset beginning with the Base Residual Auction (BRA) for the delivery year that commences June 1, 2022.⁴

3. In this order, we accept PJM's First Compliance Filing and establish an effective date of May 1, 2022, for PJM's reserve market reforms that were accepted in the May 2020 Order and those that are accepted herein, as discussed below. We also accept PJM's Second Compliance Filing, to be effective as of the date of this order, and require PJM to file, within 15 days of the date of this order, a revised tariff to include revisions to its methodology to model the energy revenues of nuclear resources, with resource outages based on class averages, as shown in Appendix B of this order.

I. Background

4. On March 29, 2019, PJM submitted filings pursuant to Federal Power Act (FPA) sections 205 and 206,⁵ asserting that the reserve market provisions of its Tariff and Operating Agreement are unjust and unreasonable, and proposing revisions to the Tariff

³ PJM Interconnection, L.L.C., First Compliance Transmittal, Docket No. EL19-58-002 (Jul. 6, 2020) (PJM First Compliance Transmittal or First Compliance Filing). For purposes of this filing, capitalized terms not defined herein shall have the meaning as contained in the Tariff and the Operating Agreement. All references to the Tariff provisions shall be meant to reference the identical provisions in the Operating Agreement, sched. 1.

⁴ PJM Interconnection, L.L.C., Second Compliance Transmittal, Docket No. EL19-58-003 (Aug. 5, 2020) (PJM Second Compliance Transmittal or Second Compliance Filing); *see also* PJM, Informational Filing with Indicative Values for Energy & Ancillary Serv. Offset, Transmittal, Docket No. EL19-58-003, at 1 (filed Aug. 19, 2020) (PJM Informational Transmittal).

⁵ 16 U.S.C. §§ 824d-824e. PJM filed the proposed revisions to the PJM, Intra-PJM Tariffs, Operating Agreement, pursuant to section 206 of the FPA in Docket No. EL19-58-000 and filed pursuant to section 205 of the FPA to include the same revisions to the PJM, Intra-PJM Tariffs, Tariff, Attach. K-App., in Docket No. ER19-1486-000. 16 U.S.C. §§ 824d-824e. Because PJM does not have unilateral authority to file revisions to its Operating Agreement pursuant to section 205, its section 205 filing was subject to the requirements of section 206 of the FPA. 16 U.S.C. §§ 824d-824e. *See* PJM Interconnection, L.L.C., Enhanced Price Formation in Reserve Markets of PJM, Docket No. EL19-58-000 (Mar. 29, 2019) (PJM March 2019 Transmittal); *see also* PJM Interconnection, L.L.C., Enhanced Price Formation in Reserve Markets of PJM, Docket No. ER19-1486-000 (Mar. 29, 2019).

and Operating Agreement as a just and reasonable replacement rate.⁶ PJM explained that reliable electric service requires sufficient reserves to be procured to meet the minimum reserve requirements (MRR) established by the North American Electric Reliability Corporation (NERC) Reliability Standard BAL-002⁷ and to adequately prepare for real-time operational uncertainties, such as deviations of load, resource availability and performance, and interchange from forecast values.⁸ PJM provided evidence that because it is consistently and regularly unable to procure sufficient reserves within-market, its operators must procure additional reserves outside the market or bias the inputs to market software as a result of serious design flaws and shortcomings in PJM's reserve market.⁹ Although the actions of PJM's operators reduce potential threats to reliability of the bulk-power system, PJM stated that market prices do not reflect the marginal cost of providing reserves.¹⁰

5. Specifically, PJM provided record evidence that its existing reserve market design and reserve rates are unjust and unreasonable because: (1) the Synchronized Reserve product definition leads to under-compensation and poor performance as it is subdivided into Tier 1¹¹ and Tier 2¹² reserve products with disparate rules for commitment, compensation, and non-performance penalties; (2) the Operating Reserve Demand Curves (ORDCs) fail to address uncertainties around load, wind and solar forecasts, and unanticipated supply resource outages, which require PJM operators to frequently bias their scheduling of supply resources and take out-of-market actions not reflected in market prices to preserve reliability; (3) reserve market clearing prices do not reflect the

⁶ May 2020 Order, 171 FERC ¶ 61,153 at P 1.

⁷ *Id.* PP 4, 6-7 (citing PJM Transmittal, Docket No. EL19-58-000 *et al.* at 2-3). N. Am. Elec. Reliability Corp., Standard BAL-002 – Disturbance Control Performance (2019). NERC BAL-002 requires a responsible entity, such as PJM, to maintain sufficient reserves to respond to the loss of the largest single contingency on its system within 15 minutes. May 2020 Order, 171 FERC ¶ 61,153 at P 3 & n.3.

⁸ May 2020 Order, 171 FERC ¶ 61,153 at PP 3, 35.

⁹ *Id.* PP 35, 77, 79-80.

¹⁰ *Id.* P 81.

¹¹ Tier 1 reserves represent the headroom on an online resource that could be converted to energy within 10 minutes based on the resource's current dispatch point and ramp rate. *Id.* at P 4.

¹² Tier 2 reserves are provided by resources that, absent the need for additional reserves, would be dispatched to their profit-maximizing output for energy. *Id.* P 4.

PJM system's true demand for reserves and do not reflect the operational value of flexibility; (4) the Reserve Penalty Factor of \$850/MWh for Synchronized Reserves is below the legitimate opportunity cost some resources could face in shortage or near-shortage conditions, as a result of the \$2,000/MWh energy offer price cap; and (5) the misalignment of reserve products between the day-ahead and real-time markets leads to inadequate procurement of forward reserves and inefficient commitment and pricing outcomes.¹³

6. PJM proposed a replacement rate design that would: (1) consolidate the Tier 1 and Tier 2 reserve products into one Synchronized Reserve product with uniform commitment, compensation, and non-performance penalty structures; (2) establish Reserve Penalty Factors of \$2,000/MWh to align with the maximum price-setting energy offer cap of \$2,000/MWh to better reflect the marginal cost of providing reserves and send appropriate price signals to Market Sellers; (3) revise the shape of the ORDCs to be based on a probabilistic calculation of the risk of a reserve shortage due to operational uncertainties; and (4) align reserve procurement in the day-ahead and real-time markets by establishing two 10-minute Reserve requirements (Synchronized Reserve Requirement and Primary Reserve Requirement) and one 30-minute Reserve requirement (30-minute Reserve Requirement) in each market.¹⁴

7. In the May 2020 Order, the Commission found that PJM's existing reserve market design set forth in its Tariff and Operating Agreement is unjust and unreasonable because it is "systematically failing to acquire within-market the reserves necessary to operate its system reliably, to yield market prices that reasonably reflect the marginal cost of procuring necessary reserves, and to send appropriate price signals for efficient resource investment."¹⁵ The Commission also found that PJM also demonstrated "that the reserve products it procures in the day-ahead and real-time markets produce poor incentives for resource performance and inhibit efficient procurement of the types of reserves needed to address various operational uncertainties."¹⁶

8. The Commission accepted PJM's proposed replacement rate, subject to a compliance filing, and directed PJM to include additional language in its Tariff and Operating Agreement to provide clarity on the process by which PJM determines reserves, including how PJM will determine resource eligibility to provide reserves, provide for a process whereby Market Sellers can work with PJM to establish reserve

¹³ *Id.* P 8.

¹⁴ *Id.* P 9.

¹⁵ *Id.* P 74.

¹⁶ *Id.*

capability for resources that use different configuration types or duct burners and remove the existing cap on demand response resource participation in the reserve markets.¹⁷

9. In addition, the Commission found that an aspect of PJM's capacity market—the backward-looking E&AS Offset—was unjust and unreasonable as a result of the reforms implemented in the PJM reserve market. The Commission established a forward-looking E&AS Offset as the just and reasonable replacement rate and directed PJM to submit a compliance filing.¹⁸

10. The Commission directed PJM to propose an effective date to implement the revisions accepted in the May 2020 Order and the revisions that are the subject of this order. The Commission stated that the effective date should take into account necessary software changes, and it should be harmonized with ongoing revisions in Docket Nos. EL16-49-000, et al.¹⁹ The Commission determined it would set the effective date for the Tariff and Operating Agreement revisions in this order.²⁰

II. Notice of Filings and Responsive Pleadings

11. On June 25, 2020, PJM submitted a request for a 30-day extension until August 5, 2020, to submit a forward-looking E&AS Offset.²¹ On July 1, 2020, the Commission granted PJM's request.²²

12. On July 6, 2020, PJM submitted, in accordance with the May 2020 Order, reserve market modifications to its Tariff and Operating Agreement. PJM proposed an effective date of May 1, 2022, for both the reserve market changes accepted in the May 2020 Order and the revisions set forth in its July 6, 2020, compliance filing.²³ PJM further

¹⁷ *Id.* PP 2, 22, 272-273, 278.

¹⁸ *Id.* PP 2, 22, 308.

¹⁹ *Id.* P 2.

²⁰ *Id.*

²¹ PJM, Motion for Extension of Time and Shortened Comment Period, Docket Nos. EL19-58-000, et al. (filed Jun. 25, 2020).

²² PJM, Notice of Extension of Time, Docket Nos. EL19-58-000, et al. (Jul. 1, 2020).

²³ PJM, First Compliance Transmittal, Docket No. EL19-58-002, at 1 (filed Jul. 6, 2020).

proposed to implement the directed forward-looking E&AS Offset beginning in the BRA for the delivery year starting June 1, 2022.²⁴

13. Notice of PJM's First Compliance Filing was published in the *Federal Register*, 85 Fed. Reg. 43,577 (Jul. 17, 2020), with protests and interventions due on or before July 27, 2020.

14. Timely filed motions to intervene were submitted by Calpine Corporation, NRG Power Marketing LLC and Midwest Generation LLC, and the Monitoring Analytics, LLC in its capacity as the Independent Market Monitor for PJM (the IMM).²⁵ Comments and/or protests were timely filed by PJM Power Providers Group and Electric Power Supply Association (P3/EPISA); in addition, PSEG²⁶ and the IMM submitted late-filed comments and/or protests. Answers to comments and protests were filed by the Organization of PJM States, Inc. (OPSI), the PJM Load/Customer Coalition (PJM Load Coalition),²⁷ and PJM. The IMM filed an answer to PJM's answer.

15. On August 5, 2020, PJM submitted revisions to its capacity market to incorporate a forward-looking E&AS Offset, consistent with the 30-day extension granted by the Commission.²⁸

²⁴ *Id.*

²⁵ For a listing of previously granted interventions in this proceeding, *see* May 2020 Order, 171 FERC ¶ 61,153 at App. B.

²⁶ PSEG is comprised of PSEG Power LLC, PSEG Energy Resources & Trade LLC, and Public Service Electric and Gas Company.

²⁷ The PJM Load Coalition is comprised of the following: American Municipal Power, Inc., American Public Power Association, District of Columbia Office of the People's Counsel, District of Columbia Public Service Commission, Indiana Office of Utility Consumer Counsel, Kentucky Office of the Attorney General, Maryland Office of People's Counsel, New Jersey Board of Public Utilities, New Jersey Division of Rate Counsel, Pennsylvania Office of Consumer Advocate, PJM Industrial Customer Coalition, Public Power Association of New Jersey, Southern Maryland Electric Cooperative, Inc., and Delaware Division of the Public Advocate.

²⁸ PJM Second Compliance Transmittal, Docket No. EL19-58-003 (filed Aug. 5, 2020).

16. Notice of PJM's Second Compliance Filing was published in the *Federal Register*, 85 Fed. Reg. 50,018 (Aug. 17, 2020) with interventions and protests due on or before August 26, 2020.

17. On August 18, 2020, the Public Interest Organizations²⁹ filed a request for an extension of time to file comments. On August 25, 2020, the comment date was extended to and including September 2, 2020.

18. Comments and/or protests were filed in the proceeding by EPSA, Exelon Corporation (Exelon), P3, Clean Energy Associations (CEA),³⁰ the Public Interest and Customer Organizations (PICOs),³¹ PSEG, and the IMM.

19. Answers to comments and protests were filed by PJM, Exelon, jointly by PSEG and Exelon, and the IMM.

20. On August 19, 2020, PJM filed indicative E&AS Offset and Net Cost of New Entry (Net CONE) values for various resource types. According to PJM, these values are indicative based on the latest published and publicly available forward prices at that time. PJM further stated these values would be revised using updated forward prices, consistent with its proposed methodology, prior to the upcoming BRA for the 2022/2023 Delivery Year, so that the projected E&AS Offset would reflect the most up-to-date forward prices.³²

²⁹ This filing was submitted by the Sierra Club, the Natural Resources Defense Council, the Sustainable FERC Project, the Office of the People's Counsel for the District of Columbia, the Maryland Office of the People's Counsel, and the Delaware Division of the Public Advocate.

³⁰ CEA members include the American Wind Energy Association, the Solar Energy Industries Association, and the Solar Council.

³¹ PICOs' members include the Sierra Club, NRDC, the Sustainable FERC Project, the Office of the People's Counsel for the District of Columbia, the Maryland Office of the People's Counsel, the Delaware Division of the Public Advocate, the PJM Industrial Customer Coalition, the Pennsylvania Office of Consumer Advocate, and the New Jersey Division of Rate Counsel.

³² PJM Informational Transmittal at 1.

III. Discussion

A. Procedural Matters

21. Pursuant to Rule 214 of the Commission's Rules of Practice and Procedure, 18 C.F.R. § 385.214 (2020), the timely, unopposed motions to intervene serve to make the entities that filed them parties to the proceedings in which they were filed.

22. Rule 213(a)(2) of the Commission's Rules of Practice and Procedure, 18 C.F.R. § 385.213(a)(2) (2020), prohibits an answer to a protest or answer unless otherwise ordered by the decisional authority. We accept the answers filed by OPSI, the PJM Load Coalition, PJM, and the IMM in Docket No. EL19-58-002 and the answers of Exelon, PJM, and PSEG/Exelon in Docket No. EL19-58-003 because they have provided information that assisted us in our decision-making process. We reject the answer of the IMM in Docket No. EL19-58-003.

B. Substantive Matters

23. We accept PJM's First Compliance Filing, as discussed below. We also accept PJM's Second Compliance filing, subject to a modification to the methodology to model the energy revenues of nuclear resources. In PJM's answer to the Second Compliance Filing, PJM agreed that it could revise its methodology to model the energy revenues of nuclear resources, with resource outages based on class averages. We conclude that such an approach will better reflect nuclear refueling schedules and direct PJM to make a further compliance filing within 15 days of the date of this order to effectuate this revision, as explained below.

24. We accept PJM's First Compliance Filing and establish an effective date of May 1, 2022, for PJM's reserve market reforms that were accepted in the May 2020 Order and those that are accepted herein, as discussed below. We also accept PJM's Second Compliance Filing, to be effective as of the date of this order, and require PJM to file, within 15 days of the date of this order, a revised tariff to include the changes regarding the nuclear refueling issue in Appendix B of this order.

25. We address each of the contested issues below.

1. Reserve Eligibility

a. Commission Directives

26. In accepting PJM's proposed replacement rate in the May 2020 Order, the Commission directed PJM to revise its Tariff to contain clear provisions on "(1) resource classes that PJM has designated as incapable of providing reserves, for each reserve product; (2) the exemption process PJM will use to determine reserve eligibility if a

resource is automatically deselected from providing reserves; and (3) the process by which PJM will communicate this information and determination to the Market Seller.”³³

b. Default Rule

i. PJM’s Compliance Filing

27. PJM has updated its Tariff and Operating Agreement³⁴ to describe which resources may provide Synchronized Reserves,³⁵ Non-Synchronized Reserves,³⁶ and Secondary Reserves.³⁷ PJM has established a default rule that “nuclear, wind or solar unit[s] are

³³ May 2020 Order, 171 FERC ¶ 61,153 at P 272.

³⁴ PJM First Compliance Transmittal at 3.

³⁵ *Id.*; see also Proposed Operating Agreement, sched. 1, § 1.7.19A(a) (“Synchronized Reserve can be supplied from generation resources and/or *Economic Load Response Participant resources* located within the metered boundaries of the PJM Region. A resource is not eligible to provide Synchronized Reserve if its entire output has been designated as emergency energy or if the resource is a nuclear, wind, or solar unit, unless the Market Seller of such a resource has obtained written approval from the Office of the Interconnection to provide Synchronized Reserves.”).

³⁶ PJM First Compliance Transmittal at 3; see also Proposed Operating Agreement, sched. 1, § 1.7.19A.01(a) (“Non-Synchronized Reserve shall be supplied from generation resources located within the metered boundaries of the PJM Region. A resource is not eligible to provide Non-Synchronized Reserve if Resources, the (i) its entire output of which has been designated as emergency energy, (ii) it is , and resources that are not available to provide energy, or (iii) it is a nuclear, wind, or solar unit, unless the Market Seller of such a resource has obtained written approval from the Office of the Interconnection to provide Non-Synchronized Reserves, are not eligible to provide Non-Synchronized Reserve.”).

³⁷ PJM First Compliance Transmittal at 3; see also Proposed Operating Agreement, sched. 1, § 1.7.19A.02(a) (“*Secondary Reserve can be supplied from synchronized and non-synchronized generation resources and/or Economic Load Response Participant resources located within the metered boundaries of the PJM Region, as specified in the PJM Manuals. A resource is not eligible to provide Secondary Reserve if (i) its entire output has been designated as emergency energy, (ii) or if the resource it is not available to provide energy, or (iii) it is a nuclear, wind, or solar unit, unless the Market Seller of such a resource has obtained written approval from the Office of the Interconnection to provide Secondary Reserves.*”).

ineligible to provide these reserve products.”³⁸ According to PJM, these resources typically do not include a dispatchable range in their energy offers due to their inherent operating characteristics; as a result, PJM’s market engines do not see any reserve capability present. PJM states that these resources sometimes include a dispatchable range, but the resources cannot or do not intend to follow PJM’s dispatch instruction. As a result of the default categorical exclusion, PJM’s market clearing engines will not consider these nuclear, wind, or solar resource offers with a dispatchable range.³⁹

ii. Comments, Protests, and Answers

28. The IMM argues that PJM’s First Compliance Filing does not adequately define Synchronized Reserve capability. The IMM states that, currently, some resources are either automatically or manually deselected from providing Tier 1 reserves while they are testing, released by PJM for shutdown, or providing Regulation. The IMM argues that PJM’s First Compliance Filing does not provide Tariff language for these situations, which, according to the IMM, should be documented in the rules. The IMM also argues that PJM should explain whether these reasons for deselection will remain after the consolidation of the Tier 1 and Tier 2 reserve products.⁴⁰

29. In its answer to the IMM, PJM counters the IMM’s argument that rules governing when resources may be deemed ineligible for providing reserves during transient operational events must be included in the Tariff. PJM argues that because resources providing Regulation or shutting down are incapable of providing reserves, no ineligibility rules are required for such transient, operational events. PJM states that the Commission has long recognized that there are “innumerable, reliability-related reasons to deselect a generating resource [from providing reserves] for any given hour, and all of those specific, reliability-related reasons are not ‘realistically susceptible of specification’

³⁸ PJM First Compliance Transmittal at 3.

³⁹ *Id.* at 3-4.

⁴⁰ PJM Interconnection, L.L.C., Comments of the Independent Market Monitor for PJM, Docket No. EL19-58-002, at 6-7 (filed Jul. 28, 2020) (IMM Protest of First Compliance Filing).

in a tariff.”⁴¹ PJM argues that the IMM’s request to include these reasons in the Tariff falls into this category.⁴²

30. In its answer to PJM, the IMM reiterates that under PJM’s new rules, reserve eligibility and ineligibility should be clearly defined in the Operating Agreement to ensure accurate pricing and compliance.⁴³ According to the IMM, neither the PJM March 2019 Transmittal nor the First Compliance Filing includes or references any additional rules for defining exceptions to the must-offer rule for reserves. The IMM also clarifies its position with respect to the Commission’s holding in *Big Sandy*. The IMM counters that although it supported PJM’s position in the cited case, PJM’s citation of that order misses the point relevant to the instant proceeding.⁴⁴ The IMM contends that while the cited case relates to specifying a large number of rules addressing specific circumstances of individual units, the instant proceeding involves issues related to the must-offer rule, exemption from the must-offer rule, and PJM’s discretion to treat resources in an “inconsistent and arbitrary” manner for the purpose of defining reserves.⁴⁵ The IMM urges the Commission to require PJM to establish clear and transparent rules in the Tariff rather than in the PJM Manuals.⁴⁶

iii. Commission Determination

31. The question before the Commission in reviewing PJM’s compliance filing is whether PJM justly and reasonably implements the determinations in the May 2020 Order.⁴⁷ We find that PJM has justly and reasonably complied with the directives of the

⁴¹ PJM Interconnection, L.L.C., Motion for Leave to Answer and Answer of PJM, Docket No. EL19-58-002, at 6-7 (Aug. 21, 2020) (PJM Answer to First Compliance Filing) (quoting *Big Sandy Peaker Plant, LLC v. PJM Interconnection, L.L.C.*, 154 FERC ¶ 61,216, at P 50 (2016) (*Big Sandy*)).

⁴² PJM Answer to First Compliance Filing at 7.

⁴³ PJM Interconnection, L.L.C., Answer and Motion for Leave to Answer the Independent Market Monitor for PJM, Docket No. EL19-58-002, at 2 (Sept. 8, 2020) (IMM Answer to First Compliance Filing).

⁴⁴ IMM Answer to First Compliance Filing at 3.

⁴⁵ *Id.* at 3.

⁴⁶ *Id.*

⁴⁷ *Midcontinent Independent System Operator, Inc.*, 167 FERC ¶ 61,128, at P 12 (2019) (rejecting proposed revisions that were not necessary to comply with the remedy required by the underlying proceeding); *PJM Interconnection, L.L.C.*, 155 FERC

May 2020 Order to revise its Tariff to contain clear provisions on resource classes that PJM has designated as incapable of providing reserves, for each reserve product. Specifically, PJM has described which resources may provide Synchronized Reserves, Non-Synchronized Reserves, and Secondary Reserves. PJM also has established a default rule that nuclear, wind or solar units are ineligible to provide these reserve products.

32. In addition, we find that PJM has complied with the directives of the May 2020 Order to revise its Tariff to contain clear provisions on the exemption process that PJM will use to determine reserve eligibility if a resource is automatically deselected from providing reserves and the process by which PJM will communicate this information and determination to the Market Seller.⁴⁸

33. We reject as beyond the scope of the compliance filing the IMM's request to require PJM to include additional information in the Tariff to specify automatic or manual deselection of resources from providing reserves due to testing, shutdown, or providing Regulation.⁴⁹ We did not require PJM to modify its existing Tariff to address all bases for deselection. Rather, the May 2020 Order directed PJM to establish categorical exclusions for certain resource types that, historically, have not provided reserves due to the inflexible nature of their operating limitations, which PJM has done on compliance.

c. Exemption Process and the IMM's Role

i. PJM's Compliance Filing

34. Recognizing that in some circumstances nuclear, wind, and solar resources may be able to provide reserves, PJM has developed an exemption process by which such

¶ 61,157, at PP 303-304 (2016) (rejecting arguments as beyond the scope of the compliance filing, "which is limited to whether PJM complied with the directives in the" underlying order); *Midwest Indep. Transmission Sys. Operator, Inc.*, 125 FERC ¶ 61,156, at P 57 n.51 (2008) ("The Commission has previously held that compliance filings must be limited to the specific directives order by the Commission. The purpose of the compliance filing is to make the directed changes and the Commission's focus in reviewing them is whether or not they comply with the Commission's previously-stated directives.").

⁴⁸ See May 2020 Order, 171 FERC ¶ 61,153 at P 272.

⁴⁹ See *supra* note 47.

resources may obtain written approval from PJM to provide reserves. The Tariff and Operating Agreement have been revised, as follows:

To obtain such approval, the Market Seller must submit to the Office of the Interconnection and the Market Monitoring Unit a written request for exemption The Office of the Interconnection and the Market Monitoring Unit shall review, in an open and transparent manner as between the Market Seller, the Market Monitoring Unit, and the Office of the Interconnection, the information and documentation in support of the request for approval to provide reserves [T]he Office of the Interconnection shall determine, with the advice and input of the Marketing Monitoring Unit, whether the resource will be permitted to provide reserves and provide written notification to the Market Seller of such determination.⁵⁰

35. As a result, the written request must be submitted to PJM and the IMM and include documentation to support the resource's ability to follow PJM's dispatch directions in order to provide reserves to meet system demand. PJM explains that supporting documentation includes historical operating data showing voluntary response to reserve events and/or technical information about the resource that demonstrates the resource is capable of adjusting its energy output upon instruction from PJM — i.e., ramp down output to provide reserves or ramp up output to provide energy.⁵¹

36. PJM states that the IMM also will be a part of the review process as the Market Seller will submit information to both PJM and the IMM in order to keep the review process "open and transparent" as between the IMM, PJM and the Market Seller, to allow PJM and the IMM to be apprised of each other's review and to maximize the sharing of information, analysis and dialogue between PJM, the IMM and the Market Seller.⁵²

⁵⁰ See Proposed Operating Agreement, sched. 1, §§ 1.7.19A(a), 1.7.19A.01(a), & 1.7.19A.02(a).

⁵¹ PJM First Compliance Transmittal at 4-6. PJM states that additional technical information will be included in PJM Manuals regarding a resource's ability to provide reserves. PJM First Compliance Transmittal at 5; *see also* Proposed Operating Agreement, sched. 1, §§ 1.7.19A(a), 1.7.19A.01(a), & 1.7.19A.02(a).

⁵² PJM First Compliance Transmittal at 6; *see also* Proposed Operating Agreement, sched. 1, §§ 1.7.19A(a), 1.7.19A.01(a), & 1.7.19A.02(a).

37. PJM states that, after consulting with the IMM, it will respond to the Market Seller in writing within 30 days of receiving the request for reserve eligibility. According to PJM, if it denies the request, it will provide a written notice of explanation.⁵³

ii. Comments, Protests, and Answers

38. The IMM states that the First Compliance Filing imposes inappropriate limitations on its role as the market monitor. First, the IMM objects to the extent PJM is seeking to be included in written and oral communications between the IMM and market participants. Second, the IMM states that it is inappropriate to constrain the communications of PJM or the IMM as proposed, as there may be a need to engage in confidential communications with market participants or each other. Third, the IMM states that it already has a defined role and responsibility to reach and explain its decisions and will do so without PJM's proposed language. Fourth, the IMM argues the rules should not "suggest that PJM monitors communications between [the IMM] and market participants" and that it is "not PJM's role to shield participants from oversight or arbitrate disputes over [the IMM] information requests." The IMM states that if it or a participant has a complaint about a request or response in the review process, it can raise the complaint with the Commission. Finally, the IMM notes that it has exclusive authority to implement the Market Monitoring Plan, Attachment M to the Tariff, which consolidates all core functions of the IMM. The IMM asserts the proposed revisions violate Commission rules that require consolidation of all core market functions for which the IMM is responsible on one place.⁵⁴ According to the IMM, PJM did not explain the need for this language and did not discuss it with the IMM.⁵⁵

39. PJM states that the IMM misinterprets the proposed Tariff language related to the reserve eligibility review process by characterizing the language as an attempt for PJM to monitor communications between the IMM and the Market Seller. PJM contends that the IMM asserts, without evidence, that the language would somehow constrain communication of PJM or the IMM. PJM contends that the IMM's assertion is not a reasonable reading of the proposed Tariff language. Rather, PJM states, it is proposing Tariff language in order for PJM and the IMM to keep each other apprised of its respective review. PJM explains this is intended to ensure transparency between PJM,

⁵³ *Id.*

⁵⁴ IMM Protest of First Compliance Filing at 13-14, referencing 18 C.F.R. § 35.28(g)(3)(i)(F); *see also* Proposed Operating Agreement, sched. 1, §§ 1.7.19A(a), 1.7.19A.01(a), & 1.7.19A.02(a).

⁵⁵ IMM Protest of First Compliance Filing at 13; *see also* Proposed Operating Agreement, sched. 1, §§ 1.7.19A(a), 1.7.19A.01(a), & 1.7.19A.02(a).

the IMM, and the Market Seller and is appropriate coordination and communication between parties.⁵⁶

40. PJM further notes that the IMM's contention⁵⁷ that all the Tariff rules pertaining to the IMM should be located in Attachment M ignores the numerous places throughout the Tariff in which the IMM is called upon to play a role. PJM states that it modeled the reserve exemption process, including the IMM's role, on the process for obtaining an exception to an approved parameter limited schedule detailed in Operating Agreement, schedule 1, section 6.6(h), which specifies the IMM's role in the process.⁵⁸

41. The IMM states that it independently performs its functions to review a resource's ability to provide reserves, as well as the technical capabilities of a resource or offer behavior of a resource.⁵⁹ The IMM argues that PJM's proposal to mandate communications between PJM and the IMM would impede the independence of the market monitoring function and should not be permitted. The IMM urges the Commission to reject PJM's proposed "open and transparent" manner of interaction among PJM, the IMM, and Market Sellers, included in the First Compliance Filing.⁶⁰

iii. Commission Determination

42. We disagree with the IMM's argument that PJM's proposed Tariff language requiring open and transparent communication among the IMM, PJM, and the Market Seller violates the Commission's regulations. The Commission's regulations require that the IMM's core functions be consolidated into one section of PJM's Tariff.⁶¹ The core functions are defined in the Commission's regulations as: (a) evaluating existing and proposed market rules, Tariff provisions and design elements, (b) reviewing and reporting on wholesale markets, and (c) identifying and notifying the Office of Enforcement staff of behavior warranting investigation, none of which are at issue in PJM's revisions.⁶² Those functions remain in Attachment M of PJM's Tariff. By

⁵⁶ PJM Answer to First Compliance Filing at 10-11.

⁵⁷ IMM Protest at 14.

⁵⁸ PJM Answer to First Compliance Filing at 11 & n.48.

⁵⁹ IMM Answer to First Compliance Filing at 3-4.

⁶⁰ *Id.*

⁶¹ 18 C.F.R. § 35.28(g)(3)(i)(F) (2020).

⁶² *Id.* § 35.28(g)(3)(ii)(A)-(C).

contrast, we find that the language at issue, which addresses the reserve eligibility exemption process described above, is not a core function of the IMM as defined by the Commission's regulations and, therefore, is not required to be included in Attachment M.

43. As PJM notes, other language in the PJM Tariff (not contained in Attachment M of the Tariff) also sets forth a role of the IMM that does not involve a core function of its market monitoring role.⁶³ As a result, we disagree with the IMM's argument that it is inappropriate to have this Tariff language outside of Attachment M. For example, language governing the role of the IMM in evaluating resource-specific offers exists in Attachment DD, section 5.14(h)(5).⁶⁴ We find PJM's proposed Tariff language is a clarification of, and not a change in, the IMM's role. Therefore, it is appropriate to include it in Attachment K-Appendix, section 1.7.⁶⁵

44. We also disagree with the IMM's argument that PJM's proposed Tariff language interferes with or constrains the IMM's independence or monitoring responsibilities. We agree with PJM that it is appropriate to include Tariff language to memorialize a review process that includes PJM, the IMM, and the relevant Market Seller of any analysis or decision to be able to provide reserves. We do not view PJM's proposed Tariff language as limiting communication between the IMM and a Market Seller. The Tariff language merely requires that the IMM be open and transparent about its findings and methodology with the Market Seller and PJM. This neither changes the IMM's role nor exceeds the scope of the compliance directive. The IMM generally should be open and transparent with the Market Seller and PJM regarding the IMM's evaluation of the resource's eligibility to provide reserves. The proposed Tariff language merely clarifies this role, which is squarely within the scope of the May 2020 Order compliance directive.

⁶³ While PJM cites Operating Agreement, schedule 1, section 6.6(h) as containing the process for obtaining an exception to an approved parameter limited schedule, the exception process is set forth in Operating Agreement, schedule 1, section 6.6(i). *See* PJM Answer to First Compliance Filing at 11 & n.48.

⁶⁴ *See, e.g.*, Attach. DD, § 5.14(h)(5)(iv) (“The Market Monitoring Unit shall review the information and documentation in support of the request and shall provide its findings whether the proposed Sell Offer is acceptable, in accordance with the standards and criteria hereunder, in writing, to the Capacity Market Seller and the Office of the Interconnection by no later than ninety (90) days prior to the commencement of the offer period for such auction.”).

⁶⁵ Proposed Operating Agreement, sched. 1, §§ 1.7.19A(a), 1.7.19A.01(a), and 1.7.19A.02(a).

2. Reserve Capability Determination

a. Compliance Directives

45. Recognizing the difficulties in predicting reserve capability “for certain resource types, based on configurations or whether they contain duct burners,” the Commission determined that “Market Sellers should work with PJM to determine how these values should be submitted, given current software limitations.”⁶⁶ The Commission directed PJM to “provide a mechanism, within the Tariff, to help guide the determination of reserve capability that PJM will use as an input when determining the Synchronized Reserve maximum” and “a process whereby Market Sellers can work with PJM to establish reserve capability for resources” for which reserve capability is not easily measured.⁶⁷

b. Reserve Capability Updates

i. PJM’s Compliance Filing

46. PJM explains that, since its original proposal submitted on March 29, 2019, PJM and its stakeholders have developed a means to address, through a Tariff mechanism, the difficulty associated with predicting reserve capability for resources with unique configurations or that rely on duct burners.⁶⁸ PJM explains that the Commission has accepted its filing in Docket No. ER20-1414,⁶⁹ which allows Market Sellers to specify hourly differentiated segmented ramp rates in both the day-ahead and real-time markets, which will allow resources to describe more accurately their capability and performance in energy offers (Segmented Ramp Rate Order).⁷⁰ PJM states that the exception process it has proposed and the Segmented Ramp Rate process will allow PJM and Market

⁶⁶ May 2020 Order, 171 FERC ¶ 61,153 at P 273.

⁶⁷ *Id.*

⁶⁸ PJM First Compliance Transmittal at 7-8.

⁶⁹ *Id.* PJM Interconnection, L.L.C., Inclusion of Hourly Differentiated Segmented Ramp Rates in Resource Offers Transmittal, Docket No. ER20-1414-000 (filed Mar. 27, 2020).

⁷⁰ PJM First Compliance Transmittal at 7-8; *see also* PJM Interconnection, L.L.C., 172 FERC ¶ 61,055, at PP 11, 13 (2020).

Sellers to accurately determine the reserve capability for resources with unique configurations or that rely on duct burners.⁷¹

47. PJM states that resources transitioning to a different state would be able to reflect any changes in energy and reserve capability in energy offer updates.⁷² PJM also states that the ability to update the ramp rates intraday allows certain resource types, such as combined cycles, to account for the effects that changing ambient temperature may have on their duct burner transition point.⁷³ In light of the revisions accepted in Docket No. ER20-1414, PJM requests that the Commission consider these revisions to comply with the directives in the May 2020 Order.⁷⁴

ii. Comments, Protests, and Answers

48. The IMM argues that the Segmented Ramp Rates Order does not resolve the issues that the IMM has identified.⁷⁵ The IMM generally argues that the First Compliance Filing does not define clear and accurate calculations of reserve capability. The IMM explains most resources in PJM use a change-of-equipment configuration to produce additional power which the PJM software used to dispatch energy and reserves does not explicitly model. According to the IMM, combined-cycle plants use multiple combustion turbines (CTs), steam turbines, duct burners, and power augmentation. CTs use over-firing and fuel switching. Coal-fired resources use varying mill configuration and oil topping. Hydroelectric and reciprocating engine generators combine multiple generation units into one market resource. The IMM states that the real-world ramping capability is discontinuous, and that resource-submitted ramp rate curves fail to capture the timing required to transition between configurations. The IMM states that transition timing cannot be adequately modeled using ramp rates alone. The IMM asserts that, as a result, resources cannot and do not follow PJM dispatch instructions to provide energy and reserves.⁷⁶

⁷¹ PJM First Compliance Transmittal at 7.

⁷² *Id.* at 8 and nn.25-26.

⁷³ *Id.* at 8.

⁷⁴ *Id.* at 7-11.

⁷⁵ IMM Protest to First Compliance Filing at 1-2.

⁷⁶ *Id.* at 2. The IMM provides an example of a low Area Control Error (ACE) during October 2019 when PJM declared a synchronized event resulting from the failure of 79 units to achieve the output level that PJM dispatched them; collectively, they failed, on average, to produce 872 MW and together failed to produce 1,184 MW due to ambient

49. The IMM argues that PJM fails to address real-world discontinuities in ramping capabilities and argues that correctly measuring reserve capability and joint optimization with energy dispatch requires software changes, which the IMM argues must be developed and implemented in order for PJM to comply with the applicable directives in the May 2020 Order.⁷⁷

50. The IMM explains some of the challenges with modeling transitions, including potential inaccuracies with different ramp rates at different transition points and how RT SCED uses different ramp rates. The IMM argues that if expected LMPs are high enough to cover the cost of running a resource at a high output, the resource will ramp up beyond the slower ramp rate but will not respond if LMPs are not high enough. The IMM argues that resource owners face weak or nonexistent incentives to increase output into the next configuration, which are further attenuated by the fact that the transition is not smoothly bidirectional. The IMM states that, as a result, resource operators frequently do not have an incentive to shift the plant to a higher output configuration and the only accurate way to dispatch energy and reserves is explicitly to model the configuration transition.⁷⁸

51. In its answer, PJM argues that it has satisfied the Commission's directive in the May 2020 Order because Segmented Ramp Rate Order,⁷⁹ allows PJM to better determine the resource's reserve capability and assign an accurate reserve commitment. PJM explains that the resource's ability to provide hourly differentiated segmented ramp rates and to update those ramp rates intra-day in its energy offer would address the difficulty associated with predicting reserve capability for resources with unique configurations or that rely on duct burners. According to PJM, these changes enable resources to more accurately describe their capability and performance in their offers.⁸⁰

52. In its answer, PJM argues that the IMM's request for additional software changes is beyond the scope of the Commission's compliance directive in the May 2020 Order. PJM asserts that the Commission directed it to make revisions that took into account current software limitations. PJM notes that the IMM does not show that PJM's proposal

conditions and power augmentation issues. *Id.* at 2-3. The IMM notes that another low ACE event that involved similar circumstances occurred on February 7, 2020. *Id.* at 4 & n.6 (citing IMM Report, IMM presentation to the Members Committee Webinar (May 26, 2020)).

⁷⁷ *Id.* at 4.

⁷⁸ *Id.* at 5.

⁷⁹ *See supra* note 69.

⁸⁰ PJM Answer to First Compliance Filing at 3.

of relying on hourly differentiated segmented ramp rates and associated intraday updates is not a just and reasonable means for meeting the compliance directive.⁸¹

53. PJM explains that it had considered modifying the existing system to include transitional modeling, but decided that spending the time and money developing, testing, and implementing the software upgrades would be unnecessary and wasteful given that the Next Generation Markets (nGEM) project would render it obsolete. PJM states that even with nGEM, transitional modeling will need hourly differentiated segmented ramp rates to determine reserve capability. Therefore, PJM argues that this software will not significantly improve PJM's ability to determine reserve capability over hourly differentiated segmented rate rates.⁸²

54. In its answer to PJM's answer, the IMM notes that PJM's nGEM and long-term RT SCED changes are ongoing, but argues that these efforts do not resolve the issues that the IMM has identified.⁸³ The IMM responds that PJM's answer asserts an unreasonably limited scope of compliance.⁸⁴ The IMM reiterates that an accurate "calculation of reserves for determining energy and reserve prices resulting from the introduction of the extended [ORDC]" is "within the scope of compliance."⁸⁵ The IMM states that because the extended ORDC will not be implemented until May 2022, PJM should not plan "to implement it incorrectly when correct implementation is feasible."⁸⁶ The IMM concludes that the costs to consumers of the higher prices associated with PJM's ORDC implementation are substantial, and that those costs should not be defined or imposed based on PJM's proposed models if better models and processes are available.⁸⁷

iii. Commission Determination

55. We find that PJM's proposals regarding reserve capability establish a just and reasonable rate and comply with the May 2020 Order as discussed below. While the IMM criticizes aspects of these proposals, the IMM's assertions and requests are beyond

⁸¹ *Id.* at 5.

⁸² *Id.* at 5-6.

⁸³ IMM Answer to First Compliance Filing at 1-2.

⁸⁴ *Id.* at 1.

⁸⁵ *Id.*

⁸⁶ *Id.* at 2.

⁸⁷ *Id.*

the scope of this proceeding, which is limited to complying with the May 2020 Order to establish a just and reasonable reserve rate to replace the one found unjust and unreasonable.⁸⁸ Recognizing some of the challenges associated with measuring reserve capability given current software limitations, we find PJM's proposals provide a just and reasonable method of measuring such capability.⁸⁹

56. We find that PJM's First Compliance Filing, along with the Commission's acceptance of PJM's Segmented Ramp Rate proposal in Docket No. ER20-1414⁹⁰ establish a just and reasonable measurement of reserve capability. As PJM notes, the Commission accepted as just and reasonable its proposal to allow for hourly differentiated segmented ramp rates to better capture the unique challenges associated with resources that use different configuration types or duct burners.⁹¹ This filing was intended to, and did, correct the deficiencies with the pre-existing Tariff identified in the May 2020 Order to help guide the determination of reserve capability.

57. Under the new reserve market rules, PJM will rely on submitted offer data from Market Sellers in order to determine reserves capability. A key factor in this determination is the resource's ramping capability, which is reflected in the ramp rate submitted to PJM. By allowing resources to include hourly differentiated segmented ramp rates and to update those ramp rates intra-day, PJM will have the necessary visibility to determine the reserve capability of resources, including operating limitations such as duct-firing, peaking modes and changing mill configurations.⁹² Currently, the

⁸⁸ See *supra* note 47. Moreover, the IMM does not suggest a just and reasonable alternative means of addressing the problems it raises, consistent with the directives in the May 2020 Order.

⁸⁹ *Colo. Interstate Gas Co. v. FPC*, 324 U.S. 581, 589 (1945) (“Allocation of costs is not a matter for the slide-rule. It involves judgment on a myriad of facts. It has no claim to an exact science;” *United Distrib. Cos. v. FERC*, 88 F.3d 1105, 1171 (D.C. Cir. 1996) (“There is no ‘neutral’ or inherently ‘fair’ allocation of fixed costs, as the history of rate design amply demonstrates.”) (unattributed quotations in original).

⁹⁰ See *supra* note 69.

⁹¹ *Id.*

⁹² PJM Interconnection, L.L.C., Inclusion of Hourly Differentiated Segmented Ramp Rates in Resource Offers, Docket No. ER20-1414-000 (filed Mar. 27, 2020), Transmittal at 5. PJM states that “[t]he proposed revisions will also allow Market Sellers with combined cycle units to better describe to PJM the point at which they enter duct firing or other peaking modes, and how those points can change intraday with changes in ambient temperature. Similarly, Market Sellers with coal-fired units will be better able to describe hold points for putting mills into and out of service. More broadly, the proposed

PJM Tariff permits Market Sellers to submit price-quantity pairings to PJM which, taken together, represent a resource's Incremental Offer curve.⁹³ Each of these price-quantity pairings may have a different ramp rate, which in turn communicates to PJM the resource's capabilities. Resources run the risk of nonperformance penalties if submitted offer data misrepresents their ramping capability.⁹⁴ We find that this approach creates a just and reasonable method of determining reserve capability under the reserve construct adopted in the May 2020 Order.⁹⁵

58. We find that PJM complied with the May 2020 Order, which required PJM to act within the current software limitations. The IMM requests that PJM implement new modeling and software changes, even though it recognizes that PJM's long-term RT SCED and nGEM efforts are ongoing. We find that the IMM's arguments as to modeling and software changes are beyond the scope of the Commission's compliance directives in this proceeding.⁹⁶

59. We also disagree with the IMM that the ramp rate method, which it recently supported,⁹⁷ is unjust and unreasonable under the new reserve construct. To the extent that Market Sellers believe that this existing provision, which allows submission of offers consisting of price-quantity pairs, limits or otherwise fails to reflect the different ramp rates associated with different MW output levels, PJM and stakeholders should discuss in the stakeholder process and consider any necessary revisions.

revisions give Market Sellers greater flexibility in describing any operational limitations they have to PJM." *Id.*

⁹³ See Tariff, Definitions I-J-K.

⁹⁴ The ability to provide hourly differentiated segmented ramp rates and update those ramp rates intra-day that were accepted July 16, 2020, along with the ability to impose penalties for non-performance will address the concerns the IMM identified in the low ACE events of October 1, 2019 and February 7, 2020 discussed by the IMM. See *supra* note 69.

⁹⁵ May 2020 Order, 171 FERC ¶ 61,153 at P 320.

⁹⁶ See *supra* note 47.

⁹⁷ PJM Interconnection, L.L.C., Comments of the Independent Market Monitor for PJM, Docket No. ER20-1414-000 (filed Apr. 20, 2020) (“[a]pproving the . . . filing will allow PJM to dispatch generating units, and model units, based on more accurate information, improving the efficiency of PJM markets”).

c. **Synchronized Reserve Maximum Parameter**

i. **PJM's Compliance Filing**

60. PJM asserts that the implementation of hourly differentiated segmented ramp rates generally will avoid the need for the Synchronized Reserve Maximum MW offer parameter; however, it will remain a usable parameter for Market Sellers and will provide an additional means for them to communicate to PJM when they cannot provide any additional reserves.⁹⁸ In light of the revisions accepted in Docket No. ER20-1414, PJM requests that the Commission consider these revisions to sufficiently comply with the directives in the May 2020 Order.⁹⁹

ii. **Comments, Protests, and Answers**

61. The IMM argues that the First Compliance Filing does not provide rules for the determination of Synchronized Reserve Maximum. The IMM argues that the Synchronized Reserve Maximum parameter is not an acceptable substitute for modeling configuration transitions. According to the IMM, use of this parameter ignores actual capability of units and their must-offer MW, allows resources to withhold capacity from the reserve market, and incorrectly represents the actual reserve capability of resources. The IMM argues that PJM has failed to explain how the hourly differential segmented ramp rates obviate the need for the Synchronized Reserve Maximum.¹⁰⁰

62. The IMM further states that PJM has failed to explain how it solves the issues of (1) understating reserve capability for resources, and (2) failing to require outages when resources cannot meet their ICAP output levels.¹⁰¹ The IMM argues that PJM did not provide any mechanism for the determination of Synchronized Reserve Maximum or Secondary Reserve Maximum, as required by the May 2020 Order directive that PJM “provide a mechanism, within the Tariff, to help guide the determination of reserve capability that PJM will use as an input when determining the Synchronized Reserve maximum.”¹⁰²

⁹⁸ PJM First Compliance Transmittal at 8-9.

⁹⁹ *Id.* at 7-9.

¹⁰⁰ IMM Protest of First Compliance Filing at 5-6.

¹⁰¹ *Id.*

¹⁰² *Id.* at 6.

63. PJM states that, as a result of its implementation of hourly differentiated segmented ramp rates, the need for the Synchronized Reserve Maximum offer parameter will be generally obviated and thus used in limited circumstances. PJM explains that it will only allow use of this offer parameter when the Market Seller submits a justification to the Office of the Interconnection that the resource has an operating configuration that prevents it from reliably providing Synchronized Reserves above the Synchronized Reserve Maximum MW level.¹⁰³

64. PJM further states that the IMM ignores the fact that it did provide a Tariff mechanism, which the IMM supported, that provides for hourly differentiated segment ramp rates.¹⁰⁴

iii. Commission Determination

65. We disagree with the IMM's argument that PJM's First Compliance Filing does not provide just and reasonable rules for the determination of Synchronized Reserve Maximum. The hourly differentiated segmented ramp rate filing largely obviates the need for this parameter. However, PJM still will allow use of this offer parameter when the Market Seller submits a justification to the Office of the Interconnection that the resource has an operating configuration that prevents it from reliably providing Synchronized Reserves above the Synchronized Reserve maximum MW level. The submission and approval of the Office of Interconnection provides sufficient review in the few cases in which this parameter is used. Therefore, we find that PJM's proposal is just and reasonable and complies with the May 2020 Order.¹⁰⁵

d. Timing of PJM's Dispatch Process

i. Comments, Protests, and Answers

66. The IMM states that PJM uses the RT SCED software to clear reserves, which determines the optimal clearing of both energy and reserves for a target point in time that is 14 minutes in the future, based on a 10-minute resource ramp time. The IMM argues that it is rare that a resource is dispatched based on the dispatch signal for the full 10 minutes, which results in PJM overriding the dispatch signal before the ramping is complete. The IMM argues that this process does not ensure that resources following dispatch will ever achieve the cleared reserve target. As a result of recently approved stakeholder changes, the IMM states that PJM would settle reserves from five to 10

¹⁰³ PJM Answer to First Compliance Filing at 4.

¹⁰⁴ See *supra* note 97.

¹⁰⁵ See May 2020 Order, 171 FERC ¶ 61,153 at P 320.

minutes after sending the dispatch instruction. The IMM argues that PJM would pay a resource that cleared reserves while that resource follows a new dispatch signal in which it may not have cleared reserves or cleared a different quantity of reserves. The IMM argues that the incorrect compensation extends to the five-minute uplift payments that PJM will pay under the new reserve market rules. The IMM states that it is not clear which resources PJM expects to perform: (1) those cleared by the new dispatch case that are following the dispatch signal that indicates reserves at the time of a Synchronized Reserve Event, or (2) those cleared on the previous dispatch case that is priced and settled at the time of the event. The IMM proposes that PJM's dispatch timeframe should be reduced from 10 minutes to five minutes to prevent unmatched dispatch and pricing signals. The IMM argues that a correct five-minute market timeline, with a reduced ramp time of five minutes, would eliminate the overlapping dispatch periods. Noting that PJM has identified this as a long-term issue, the IMM states PJM must resolve this issue in order for the reserve market changes to work as intended.¹⁰⁶

67. PJM argues that these changes are beyond the scope of this proceeding and states that the Commission should avoid expanding the scope of this proceeding to adjudicate other issues that should be raised with PJM and/or the Commission more directly.¹⁰⁷

ii. Commission Determination

68. We disagree with the IMM's arguments that PJM did not comply with the Commission's directives in the May 2020 Order because PJM did not change the timing of its dispatch process. The Commission's directives in the May 2020 Order did not require PJM to make this change. Therefore, we find that the IMM's arguments are beyond the scope of the Commission's compliance directives in this proceeding.¹⁰⁸ In addition, the Commission recently accepted Tariff revisions submitted by PJM under FPA section 205 to address the mismatch between dispatch and pricing.¹⁰⁹

¹⁰⁶ IMM Protest of First Compliance Filing at 7-10.

¹⁰⁷ PJM Answer to First Compliance Filing at 12 & n.52.

¹⁰⁸ See *supra* note 47.

¹⁰⁹ *PJM Interconnection, L.L.C.*, 173 FERC ¶ 61,028 (2020); see also *PJM Interconnection, L.L.C.*, Errata to Fast-Start Compliance Filing, Docket No. ER19-2722-001 (filed May 28, 2020).

e. **Degree of Generator Performance**

i. **Comments, Protests, and Answers**

69. The IMM states that PJM has not proposed to eliminate the use of degree of generator performance (DGP) for calculating dispatchable energy and reserves. According to the IMM, the continued use of DGP will alter the real-time submitted ramp rates from the values submitted by Market Sellers. The IMM states this is inconsistent with (1) Operating Agreement requirements that unit owners are exclusively responsible for their own offers, and (2) the goal to use the most current ramp rate information to model resources.¹¹⁰

70. In its answer, PJM responds that the IMM request to direct the use of the DGP are beyond the scope of this proceeding. PJM argues that the IMM's concerns do not relate to PJM's compliance filing proposal, and the IMM has not made a claim that they are related. PJM states that the Commission should avoid expanding the scope of this proceeding to adjudicate other issues that should be raised with PJM and/or the Commission more directly.¹¹¹

ii. **Commission Determination**

71. We disagree with the IMM's arguments that PJM failed to comply with the May 2020 Order because PJM did not clarify how it will use the DGP for calculating dispatchable energy and reserves in RT SCED. The Commission's directives in the May 2020 Order did not require further clarifications from PJM on the use of DGP. In fact, in the May 2020 Order, the Commission found that "the consolidation of the Tier 1 and Tier 2 reserve products into a single product eliminates the need to adjust market data. Based on the record, and our acceptance of PJM's proposed replacement rate noted above, we reject the IMM's concern as moot."¹¹² In addition, we dismiss the IMM's argument as an

¹¹⁰ IMM Protest of First Compliance Filing at 11.

¹¹¹ PJM Answer to First Compliance Filing at 12 & n.52.

¹¹² May 2020 Order, 171 FERC ¶ 61,153 at P 275.

impermissible request for rehearing of the May 2020 Order¹¹³ and beyond the scope of the Commission's compliance directives in this proceeding.¹¹⁴

f. Multi-unit Modeling

i. Comments, Protests, and Answers

72. The IMM argues that generator modeling results in inaccurate reserve assignments when multiple physical units are aggregated as one resource in the energy and reserve market, such as aggregate hydro units, multiple CTs, or multiple diesel engines at a single location, which will cause PJM to “over calculate Synchronized Reserves and under count NonSynchronized Reserves by treating offline units as if they were online units.” The IMM argues that PJM should eliminate multi-unit modeling when the operation of each unit is physically independent.¹¹⁵

73. In its answer, PJM responds that the IMM request to change multi-unit modeling when the operation of each unit is physically independent is beyond the scope of this proceeding. PJM argues that the IMM's concerns related to multi-unit modeling do not relate to PJM's compliance filing proposal, and the IMM has not made a claim that they are related. PJM states that the Commission should avoid expanding the scope of this proceeding to adjudicate other issues that should be raised with PJM and/or the Commission more directly.¹¹⁶

ii. Commission Determination

74. We disagree with the IMM's arguments that PJM did not comply with the Commission's directives in the May 2020 Order because PJM does not include or address multi-unit modeling concerns when multi-units are located at the same physical location but are modeled by PJM as a single resource. The Commission's directives in the May

¹¹³ May 2020 Order, 171 FERC ¶ 61,153 at P 275; *see also PJM Interconnection, L.L.C.*, 158 FERC ¶ 61,124, at P18 (2017); *PJM Interconnection, L.L.C.*, 133 FERC ¶ 61,277, at P 34 (2010) (“Protests to compliance filings are limited to whether the filing meets the Commission's compliance directive and cannot properly function as late rehearings of the initial order.”); *Cal. Indep. Sys. Operator Corp.*, 120 FERC ¶61,147, at P 15 (2007) (rejecting certain protests to a compliance filing that should have been raised as a request for rehearing).

¹¹⁴ *See supra* note 47.

¹¹⁵ IMM Protest of First Compliance Filing at 10-11.

¹¹⁶ PJM Answer to First Compliance Filing at 12 & n.52.

2020 Order did not require PJM to make this change to PJM's existing practice. Therefore, we find that the IMM's arguments are beyond the scope of the Commission's compliance directives in this proceeding.¹¹⁷

g. Offline Reserve Capability

i. Comments, Protests, and Answers

75. The IMM states that PJM's First Compliance Filing does not clarify how PJM will choose a schedule to calculate offline reserve capability.¹¹⁸

76. In its answer, PJM responds that the IMM's request to make changes regarding offline reserve capability is beyond the scope of this proceeding. PJM argues that the IMM's concerns do not relate to PJM's compliance filing proposal, and the IMM has not made a claim that they are related. PJM states that the Commission should avoid expanding the scope of this proceeding to adjudicate other issues that should be raised with PJM and/or the Commission more directly.¹¹⁹

ii. Commission Determination

77. We disagree with the IMM's arguments that PJM did not comply with the Commission's directives in the May 2020 Order because PJM did not clarify how it will choose a schedule to calculate offline reserve capability. The Commission's directives in the May 2020 Order did not require PJM to specify how PJM selects an offer for calculating offline reserve capability. Therefore, we find that the IMM's arguments are beyond the scope of the Commission's compliance directives in this proceeding.¹²⁰

h. VACAR Reserves

i. Comments, Protests, and Answers

78. The IMM states that PJM's First Compliance Filing fails to account for reserves dedicated to VACAR,¹²¹ under the VACAR reserve sharing agreement. The IMM contends that PJM should be required to revisit the arrangements with Dominion and

¹¹⁷ See *supra* note 47.

¹¹⁸ IMM Protest of First Compliance Filing at 11-12.

¹¹⁹ PJM Answer to First Compliance Filing at 12 & n.52.

¹²⁰ See *supra* note 47.

¹²¹ VACAR is the Virginia-Carolinas subregion of SERC Reliability Corporation.

VACAR to determine whether Dominion is able to provide reserves to both entities from the same resources and to address issues if Dominion cannot do so. The IMM argues that explicit and enforceable rules are needed to make clear that PJM capacity resources are reserves for PJM and not for any other area.¹²²

79. In its answer, PJM responds that the IMM request to make changes regarding the VACAR reserve sharing agreement is beyond the scope of this proceeding. PJM argues that the IMM's concerns do not relate to PJM's compliance filing proposal, and the IMM has not made a claim that they are related. PJM states that the Commission should avoid expanding the scope of this proceeding to adjudicate other issues that should be raised with PJM and/or the Commission more directly.¹²³

ii. Commission Determination

80. We disagree with the IMM's arguments that PJM should revisit the arrangements it has with Dominion and VACAR to determine whether Dominion is able to provide reserves to PJM and VACAR from the same resource. We also dismiss the IMM's argument that PJM capacity resources are reserves for PJM and no other area. First, the Dominion Zone is subject to the SERC requirements based on the VACAR Reserve Sharing Agreement; the May 2020 Order did not amend any provisions within that agreement. Second, the Commission's compliance directives in the May 2020 Order did not require further specification in the PJM Tariff of whether Dominion is able to provide reserves to both PJM and VACAR from the same resource. Thus, we find these requests are beyond the scope of the Commission's compliance directives in this proceeding.¹²⁴

3. Removal of Caps on Demand Response Participation in Reserve Markets

a. Compliance Directives

81. In the May 2020 Order, the Commission directed PJM to remove the caps on the percentage of MRRs that can be met by demand response resources.¹²⁵

¹²² IMM Protest of First Compliance Filing at 12.

¹²³ PJM Answer to First Compliance Filing at 12 & n.52.

¹²⁴ See *supra* note 47.

¹²⁵ May 2020 Order, 171 FERC ¶ 61,153 at P 278.

b. PJM's Compliance Filing

82. In compliance with the May 2020 Order's directives, PJM proposes revisions to its Operating Agreement to remove any written limitation on the amount of demand response resources that may be counted toward meeting reserve requirements. PJM explains that, with this language, Economic Load Response Participant resources may comprise up to 100% of the minimum Synchronized Reserve Requirement or minimum 30-Minute Reserve Requirement. In addition, PJM is removing the limitation that Batch Load Economic Load Response Participant resources may only provide certain percentages of total system-wide reserves requirements.¹²⁶

c. Comments, Protests, and Answers

83. The IMM argues that, by removing the cap on demand response resources clearing as Synchronized Reserve, PJM creates an inconsistent use of emergency resources because PJM did not remove the prohibition on 30-minute pre-emergency and emergency demand response resources' clearing as Secondary (30-minute) Reserve. The IMM argues that PJM should clarify and document whether emergency capacity can clear in the reserve markets and apply the same standard to all resources.¹²⁷

84. PJM notes that the prohibition on 30-minute pre-emergency and emergency demand response resources' clearing in the Secondary Reserve market does not relate to PJM's compliance filing, and the IMM has not made a claim that the prohibition is related. PJM argues that these changes are beyond the scope of this proceeding and requests that the Commission avoid expanding the scope of this proceeding to adjudicate other issues that should be raised with PJM and/or the Commission more directly.¹²⁸

d. Commission Determination

85. We find that PJM has complied with the May 2020 Order by removing the caps on the percentage of MRRs that can be met by demand response resources.¹²⁹

86. We reject the IMM's arguments that PJM should be required to allow pre-emergency and emergency demand response resources to provide 30-minute Reserves

¹²⁶ PJM First Compliance Transmittal at 12-13. PJM notes that with these revisions, PJM is renumbering Operating Agreement, sched. 1, § 1.5A.8(c) as 1.5A.8(b); *see* Proposed Operating Agreement, sched. 1, §§ 1.5A.8, 1.11.4A, & 1.11.4C.

¹²⁷ IMM Protest of First Compliance Filing at 12.

¹²⁸ PJM Answer to First Compliance Filing at 12.

¹²⁹ May 2020 Order, 171 FERC ¶ 61,153 at P 278.

because such arguments re-litigate issues already determined by the Commission. In the May 2020 Order, the Commission found that PJM cannot rely on pre-emergency and emergency demand response resources to maintain reserves outside of PJM-declared pre-emergency events and emergency events because those are the periods in which these resources are available for dispatch. However, sellers of demand response resources that wish to participate in PJM reserve markets can do so through PJM's economic program.¹³⁰ We therefore dismiss the IMM's argument as an impermissible request for rehearing of the May 2020 Order¹³¹ and as beyond the scope of this proceeding.¹³²

4. Energy and Ancillary Services Offset Data Inputs

a. Compliance Directives

87. The Commission ordered PJM to propose modifications to its Tariff to implement a forward-looking E&AS Offset that reasonably estimates expected future energy and ancillary services revenues for all Tariff provisions that rely on a determination of the E&AS Offset. The Commission found that a forward-looking methodology would allow changes to energy and ancillary services revenues stemming from energy market design modifications to be more readily incorporated into capacity market parameters and prices.¹³³

88. The May 2020 Order also found unjust and unreasonable provisions of the Tariff governing the determination of the E&AS Offset used in PJM's capacity market, established a forward-looking E&AS Offset as the just and reasonable replacement rate, and directed PJM to make a compliance filing to implement that replacement rate.¹³⁴

b. Proposal Overview

89. To meet the Commission's compliance directive, PJM proposes to estimate net energy and ancillary services revenue based on forward-looking electricity and fuel prices at liquid trading hubs for the subject delivery year. PJM argues that the use of forward prices is appropriate because at any point in time they will reflect anticipated changes in market design. PJM proposes to use these prices in a Projected E&AS

¹³⁰ *Id.* P 255.

¹³¹ *Id.*; *see also supra* note 113.

¹³² *See supra* note 47.

¹³³ May 2020 Order, 171 FERC ¶ 61,153 at P 320.

¹³⁴ *Id.*

Dispatch Model to estimate the energy and ancillary services net revenue earned by resources.¹³⁵

i. Commission Determination

90. Subject to a compliance filing as discussed below, we find that PJM has complied with the Commission's directive to implement a forward-looking E&AS Offset in accordance with the May 2020 Order.¹³⁶ Specifically, PJM has submitted a compliance filing, PJM's Second Compliance Filing, containing revisions to its Tariff to incorporate a forward-looking E&AS Offset beginning with the BRA for the delivery year that commences June 1, 2022.¹³⁷ We accept PJM's Second Compliance Filing, to be effective as of the date of this order, and require PJM to file, within 15 days of the date of this order, a revised tariff to include the changes regarding the nuclear refueling issue in Appendix B of this order.¹³⁸

91. We address contested issues as to PJM's Second Compliance Filing, below.

c. Number of Electricity Futures Trading Hubs

i. PJM's Compliance Filing

92. PJM proposes that the E&AS Offset methodology rely on futures markets prices from established futures markets. PJM asserts that liquid futures markets (i.e., those with many buyers and sellers) produce forward prices that better reflect expectations about future conditions. Therefore, PJM states that its affiants, The Brattle Group (Brattle) and Sargent & Lundy (S&L), recommend that PJM rely on electricity market hubs and products that trade with sufficient liquidity.¹³⁹

93. PJM states that Brattle and S&L considered the liquidity at each of the trading hubs and transmission Zones in PJM that are reported by Intercontinental Exchange, Inc. (ICE). PJM states that the consultants used "open interest" to gauge liquidity. PJM explains that open interest in a futures market trading contract (i.e., a particular product for delivery at a particular place and time) reflects the cumulative number of contracts

¹³⁵ PJM Second Compliance Transmittal at 4-5.

¹³⁶ May 2020 Order, 171 FERC ¶ 61,153 at P 320; *see also* PJM Second Compliance Transmittal at 4-5.

¹³⁷ *See* Second Compliance Transmittal at 1.

¹³⁸ *See infra* Appendix B.

¹³⁹ PJM Second Compliance Transmittal at 9-11.

that have been opened but not yet closed out or offset. PJM states that Brattle reviewed prices for 2024 because PJM typically will undertake its pre-auction analyses roughly four years before the relevant delivery year. PJM states that the liquidity for these PJM energy products in 2024 is substantial for the three traded PJM Region hubs but minimal to non-existent for the 20 traded PJM Region Zones. PJM also states that liquidity at the 20 traded PJM Region Zones is inconsistent from year to year.¹⁴⁰ Thus, PJM states that Brattle and S&L recommend using electric futures settlement prices at the three traded PJM Region hubs: PJM Western Hub, AEP-Dayton Hub, and Northern Illinois Hub (Selected Hubs).¹⁴¹

94. PJM also proposes to use the day-ahead product's futures prices at the Selected Hubs. PJM states that, according to Brattle and S&L, the day-ahead and real-time futures prices "are nearly equivalent, such that relying on either will have little to no impact on the estimated [energy and ancillary services] net revenues."¹⁴² PJM states that the end result of this step of the analysis is forward day-ahead energy prices for each of the Selected Hubs, and for each month, on-peak period, and off-peak period in the delivery year.¹⁴³

95. PJM states that high correlations in historic prices between each hub and specific PJM Zones enable the ready mapping of Zones to hubs. PJM states that Brattle and S&L analyzed the correlation of historical prices between the three PJM hubs and the 20 PJM Zones, using monthly average peak and off-peak data for 2015 to 2019, and found that for each Zone, the hub with highest price correlation is that which is geographically closest. PJM states that this correlation persisted for both peak and off-peak prices.¹⁴⁴

ii. Comments, Protests, and Answers

96. P3 asserts that PJM's proposed Tariff provisions related to the E&AS Offset meet the just and reasonable standard and requests that the Commission approve PJM's

¹⁴⁰ *Id.* at 12-13 (citing Attach. C, Aff. of Samuel A. Newell, James A. Read Jr., and Sang H. Gang on behalf of PJM (Brattle Aff.) ¶¶ 47-48, 51).

¹⁴¹ *Id.* at 13-14 (citing Brattle Aff. ¶ 14).

¹⁴² *Id.* (citing Brattle Aff. ¶ 16; proposed Tariff, Attach. DD, § 5.10(a)(v-1)(C)(2)).

¹⁴³ *Id.* at 14.

¹⁴⁴ *Id.* at 15 (citing Brattle Aff. ¶ 53 & tbl. 5).

proposal as submitted.¹⁴⁵ P3 argues that PJM's approach to estimating energy revenues, including the use of publicly available forward energy price projections at liquid trading hubs, represents a reasonable framework for using the best available information at the time of the BRA to project energy prices three years in advance.¹⁴⁶

97. The IMM protests PJM's proposed Selected Hubs. The IMM argues that PJM instead should use only the most liquid hub, the PJM Western Hub, because it is the most reflective of market fundamentals and is the least likely to be subject to manipulation. The IMM explains that in a well-functioning market, the price differentials between any liquid trading hub and a generator Zone should result in the same forward price at the Zone. The IMM argues that there is no reason for PJM to use multiple hubs.¹⁴⁷ The IMM contends that PJM's Zone-to-hub correlation analysis is not enough to support the choice of significantly less-liquid hubs. The IMM notes that the analysis is missing the statistical significance of correlation differences and missing a comparison for all hub-to-Zone combinations.¹⁴⁸

98. The IMM also argues that PJM should use real-time futures instead of day-ahead futures. The IMM states that the data presented by Brattle shows that liquidity for real-time futures at the PJM Western Hub is about twice that of comparable measures, real-time or day-ahead, at the next most liquid hub, and that liquidity at the PJM Western Hub for real-time prices is about five times higher than the liquidity for day-ahead prices at that hub.¹⁴⁹ The IMM contends that the liquidity for the PJM Western Hub real-time products, peak and off-peak, significantly exceeds the liquidity for all day-ahead products at all hubs. The IMM claims that the liquidity for day-ahead futures prices at the AEP

¹⁴⁵ PJM Interconnection, L.L.C., Comments of the PJM Power Providers Group, Docket No. EL19-58-003, at 4 (filed Sept. 2, 2020) (P3 Comments on Second Compliance Filing).

¹⁴⁶ P3 Comments on Second Compliance Filing at 5.

¹⁴⁷ *PJM Interconnection, L.L.C.*, Comments of the Independent Market Monitor for PJM, Docket No. EL19-58-003, at 8 (filed Sept. 2, 2020) (IMM Protest of Second Compliance Filing).

¹⁴⁸ IMM Protest of Second Compliance Filing at 17 (citing PJM Second Compliance Transmittal at 17, tbl. 5).

¹⁴⁹ *Id.* at 9 (citing PJM Second Compliance Transmittal, Brattle Aff., Attach. C).

Dayton Hub, the hub with the most day-ahead activity, is approximately one-third the liquidity for the real-time futures prices at the PJM Western Hub.¹⁵⁰

99. In its answer, PJM disputes the IMM's contention that only futures prices from the PJM Western Hub should be used. PJM argues that given that sufficient liquidity is also observed in the AEP Dayton and Northern Illinois hubs, it is appropriate to include futures prices from these hubs to better align the electricity and natural gas prices and avoid potential errors in forecasting the E&AS margins.¹⁵¹

100. In its answer, Exelon contends that PJM's use of the Selected Hubs is in line with Exelon's real-world market experience of systemic differences in price correlations between ComEd nodal prices and Northern Illinois and PJM Western Hub prices, respectively. Specifically, in its answer, Exelon states that it analyzed recent weighted-average day-ahead hourly price correlations involving the ComEd bus used by 10 nuclear units over the past five years. Exelon states that the results show a 96% correlation between the movement of the Northern Illinois Hub prices and the nodal unit prices, and a 76% correlation between the PJM Western Hub prices and the nodal prices. Exelon states that ComEd prices thus are more closely correlated to the proximate Northern Illinois Hub than to the distant PJM Western Hub, demonstrating that the Northern Illinois Hub is a better reflection of market fundamentals.¹⁵²

101. Exelon also argues that IMM's argument for use of only the most liquid trading hub (i.e., the PJM Western Hub) is premised on the assumption of perfect market efficiency where there are no systematic price differentials between trading hubs. Exelon

¹⁵⁰ *Id.* The IMM also states that for the 2023/2024 Delivery Year, the total open interest for the PJM Western Hub contracts exceeds the open interest for the AEP Dayton and Northern Illinois hubs by 80% and 146.9%, respectively. *Id.* at 15 (citing ICE End of Day report).

¹⁵¹ PJM Interconnection, L.L.C., Motion for Leave to Answer and Answer of PJM, Docket No. EL19-58-003, at 12 (Sept. 17, 2020) (PJM Answer to Second Compliance Filing) (citing Attach. A, Supp. Aff. of Samuel A. Newell and James A. Read Jr. on behalf of PJM (Brattle Supp. Aff.) ¶ 19).

¹⁵² PJM Interconnection, L.L.C., Motion for Leave to Answer and Answer of Exelon Corporation, Docket No. EL19-58-003, at 11-12 (Sept. 17, 2020) (Exelon Answer to Second Compliance Filing). Using average daily prices instead, Exelon states that the results show a 93% correlation between Northern Illinois Hub price and the ComEd nodal unit prices, and a 76% correction between the PJM Western Hub prices and the ComEd nodal unit prices. Exelon states this demonstrates the Northern Illinois Hub is a better reflection of market fundamentals affecting estimation of forward energy prices for generators in ComEd. *Id.* at 13.

argues that the IMM fails to provide any evidence of such market efficiency and does not demonstrate that PJM's proposal is unjust and unreasonable.¹⁵³ Exelon states that the IMM's proposal to use the PJM Western Hub would result in a forward E&AS Offset that is not accurate for units in the ComEd Zone. Because PJM has committed to update the trading hubs it uses, Exelon urges the Commission to accept its proposal as just and reasonable.¹⁵⁴

iii. Commission Determination

102. We find PJM's proposal to use in its E&AS Offset methodology publicly available futures prices from liquid trading hubs to be just and reasonable and compliant with the May 2020 Order.¹⁵⁵ Prices from liquid futures markets (i.e., those with many buyers and sellers, as determined by open interest) produce forward prices that reflect expectations about future conditions. We find that PJM's proposal to use day-ahead futures prices just and reasonable as the day-ahead and real-time futures prices are nearly equivalent, so using one or the other will have little to no impact on the estimated energy and ancillary services net revenues. We also find PJM's proposal to map the liquid trading hubs to specific PJM Zones to be just and reasonable due to the high correlations in historic prices between each hub and specific PJM Zones, and find that it complies with the Commission's May 2020 Order.¹⁵⁶

103. We disagree with the IMM's argument that PJM has not sufficiently supported its proposal to use the Selected Hubs and day-ahead futures at those hubs. The IMM argues that PJM should instead use only the PJM Western Hub and real-time futures because of the greater liquidity in the PJM Western Hub and real-time futures in comparison with other hubs and day-ahead prices. The IMM argues that PJM's Zone-to-hub correlation analysis does not support the use of less liquid hubs because PJM does not report whether the correlation differences are statistically significant. Even without this information, we find it reasonable for PJM to assume that the geographical distance between a hub and Zone could affect the correlation between prices at the hub and Zone. We disagree with the IMM's argument that in a well-functioning market, the price differentials between any liquid trading hub and Zone should result in the same forward price at the Zone. Rather, we agree with Exelon that the IMM's argument is premised on the unreasonable assumption of perfect market efficiency.

¹⁵³ Exelon Answer to Second Compliance Filing at 11.

¹⁵⁴ *Id.* at 14.

¹⁵⁵ *See* May 2020 Order, 171 FERC ¶ 61,153 at P 320.

¹⁵⁶ *Id.*

104. We find PJM’s proposal to use day-ahead prices instead of real-time prices is just and reasonable and complies with the May 2020 Order.¹⁵⁷ We agree with Brattle and S&L that the day-ahead and real-time futures prices “are nearly equivalent, such that relying on either will have little to no impact on the estimated [energy and ancillary services] net revenues.”¹⁵⁸

105. Based on the record, we find PJM’s proposal to use the Selected Hubs and day-ahead futures at those hubs is just and reasonable and complies with the May 2020 Order.¹⁵⁹

d. Use of ICE Data

i. PJM’s Compliance Filing

106. With respect to the electricity futures trading hubs, PJM proposes to rely on ICE pricing data.¹⁶⁰

ii. Comments, Protests, and Answers

107. The IMM argues that PJM already calculates the pricing data needed to implement a forward-looking EA&S Offset. The IMM explains that the IMM and PJM for years have used such data in the calculation of certain opportunity costs. The IMM explains that the opportunity cost calculator uses Platts’ data on the prices associated with the PJM Western Hub real-time futures to develop hourly bus LMPs.¹⁶¹ The IMM argues that PJM should explain why it no longer will use Platts’ data but rather will use ICE data, and the IMM states PJM must show it is making an explicit choice between the two data sources based on rational criteria. The IMM recommends use of Platts’ data until a better option can be established.¹⁶²

¹⁵⁷ *Id.*

¹⁵⁸ PJM Second Compliance Transmittal at 14 (citing Brattle Aff. ¶ 16; proposed Tariff, Attach. DD, sec. 5.10(a)(v-1)(C)(2)).

¹⁵⁹ May 2020 Order, 171 FERC ¶ 61,153 at P 320.

¹⁶⁰ PJM Second Compliance Transmittal at 12 (citing Brattle Aff. ¶ 50).

¹⁶¹ IMM Protest of Second Compliance Filing at 6-7 (citing PJM Manual 15: Cost Development Guidelines, Rev. 35 (April 24, 2020), § 12.7).

¹⁶² *Id.* at 4. The IMM also suggests that PJM should explain why it relies on ICE’s shaping of prices for some purposes but not for other purposes. *Id.*

108. In its answer, PJM responds to the IMM by arguing that according to Brattle, ICE pricing data is more transparent because ICE makes settlement prices for recent trading days publicly available, whereas Platts' pricing data is available only to subscribers. In addition, PJM argues, Platts uses ICE pricing data as the starting point for its determination of forward price curves, and thus both companies rely on the same underlying data sets. According to PJM, Brattle has concluded that "Platts-reported forward prices and ICE futures settlement prices are virtually identical for the relevant delivery points and delivery months."¹⁶³ PJM argues that based on the foregoing, PJM's proposed use of ICE pricing data is reasonable.¹⁶⁴

iii. Commission Determination

109. We find PJM's proposal to use ICE pricing data to be just and reasonable and compliant with the May 2020 Order.¹⁶⁵ While PJM uses Platts' data when calculating certain opportunity costs, we find nevertheless that PJM's decision to use ICE pricing data on electricity futures is reasonable, contrary to the IMM's arguments. PJM explains that both Platts and ICE use the same underlying data sets; that is, "Platts-reported forward prices and ICE futures settlement prices are virtually identical for the relevant delivery points and delivery months."¹⁶⁶ As PJM also explains, ICE data, unlike Platts' data, makes settlement prices for recent trading days publicly available, which provides additional transparency into prices at electricity futures trading hubs. We therefore conclude that PJM's proposal, which provides reasonably equivalent pricing data with greater transparency, is just and reasonable.

e. Time Window for Averaging

i. PJM's Compliance Filing

110. PJM proposes to average the forward settlement prices reported for the 30 most recent trading days. PJM states that this approach balances the benefit of the most recent market information with potential vulnerability to market manipulation from indexing to

¹⁶³ PJM Answer to Second Compliance Filing at 17-18 (citing Brattle Supp. Aff. ¶¶ 8-9).

¹⁶⁴ *Id.* at 18.

¹⁶⁵ See May 2020 Order, 171 FERC ¶ 61,153 at P 320.

¹⁶⁶ PJM Answer to Second Compliance Filing at 17-18 (citing Brattle Supp. Aff. ¶¶ 8-9).

a single day.¹⁶⁷ To implement the 30-day averaging, PJM plans to retrieve, 180 days before the start of each BRA, forward pricing data for each month of the future delivery year, and average the daily settlement data from the 30 trading days prior to that date. PJM states that this will provide it enough time to calculate the E&AS Offsets for the CT Reference Resources prior to having to post the preliminary default Minimum Offer Price Rule (MOPR) Floor Offer Prices at 150 days prior to the auction.¹⁶⁸

ii. Comments, Protests, and Answer

111. The IMM protests PJM's proposal to use forward prices averaged over the 30-day period that ends 180 days before the BRA, arguing that there is no reason to average the results over 30 days. The IMM contends that PJM should instead calculate the forward prices as close as possible to the auction date and over as short a period as possible to reduce the possibility of manipulation. The IMM argues that PJM's goal should be to ensure the use of the most current forward information about market prices. The IMM therefore recommends use of forward prices averaged over the week that ends 134 days prior to the BRA.¹⁶⁹ Noting that offers are due 120 days prior to the BRA, the IMM contends that 14 days gives auction participants time to include the latest offset results in offers. The IMM argues that the same timing should apply to natural gas forward data.¹⁷⁰

112. PJM responds to the IMM by arguing that price averages using fewer than 30 days results in a smaller sample size of the settlement data and could be more susceptible to market manipulation. Nevertheless, PJM states that it would not object to shortening the window to a one-week period if the Commission finds a shorter window to be appropriate.¹⁷¹

113. PJM, however, objects to retrieving such data 134 days prior to the BRA. PJM states that the proposed language in Tariff, Attachment DD, section 5.14(h-1)(3)(A), requires PJM to "post, by no later than one hundred fifty (150) days prior to the commencement of the offer period for the relevant RPM Auction, a preliminary estimate

¹⁶⁷ PJM Second Compliance Transmittal at 14 (citing Brattle Aff. ¶ 16; proposed Tariff, Attach. DD, § 5.10(a)(v-1)(C)(2)). PJM notes that the daily interval here refers to settlement price updating. The underlying product is monthly (e.g., delivering energy at the specified location every day for the month of July 2024). *Id.* at 14 n.38.

¹⁶⁸ *Id.* at 14 n.40.

¹⁶⁹ IMM Protest of Second Compliance Filing at 14.

¹⁷⁰ *Id.*

¹⁷¹ PJM Answer to Second Compliance Filing at 8-9.

for the relevant delivery year of the default Minimum Floor Offer Prices.” To accomplish this, PJM states it will need to obtain data sufficiently in advance of 150 days prior to the BRA; thus it would be impossible to use data from 134 days prior to the BRA. In addition, PJM states that using data from 134 days prior to the BRA would provide only two weeks for the calculation and posting of the E&AS Offsets, as well as the market participants’ review of such values. PJM states that the various simulation runs take several days to complete before the standard E&AS Offset values can be posted. In turn, PJM states, Capacity Market Sellers also need time to review and determine whether to seek a resource-specific exception upon reviewing the E&AS Offset values. Finally, PJM states that in the event a Capacity Market Seller decides that it needs to seek a resource-specific MOPR exception request, sufficient time must be afforded for the seller to submit the necessary documentation used to demonstrate the resource-specific values no later than 120 days prior to the BRA.¹⁷²

iii. Commission Determination

114. Under FPA section 206, whether initiated by a complaint or sua sponte, the Commission has the burden to establish a just and reasonable rate to replace the rate it has found unjust and unreasonable.¹⁷³ We find PJM’s proposal to use forward prices averaged over the 30-day period that ends 180 days before the BRA to be just and reasonable.

115. The IMM argues that PJM’s proposal is not just and reasonable because it averages futures prices over 30 days and thus, the IMM asserts, does not use sufficiently current data. We disagree. Averaging futures prices over 30 days provides a larger sample size of futures prices that is likely both to be influenced less by any short-term price volatility and to make the futures price average less susceptible to manipulation.¹⁷⁴

¹⁷² *Id.*

¹⁷³ *FirstEnergy Serv. Co. v. FERC*, 758 F.3d 346, 353 (D.C. Cir. 2014); *Md. Pub. Serv. Comm’n v. FERC*, 632 F.3d 1283, 1285 n.1 (D.C. Cir. 2011).

¹⁷⁴ *ExxonMobil Oil Corp. v. FERC*, 487 F.3d 945, 955 (D.C. Cir. 2007) (finding, in a complaint under the ICA, that “[w]e need not decide whether the Commission has adopted the best possible policy as long as the agency has acted within the scope of its discretion and reasonably explained its actions.”); *Cities of Batavia v. FERC*, 672 F.2d 64, 84 (D.C. Cir.1982) (“[T]he billing design need only be reasonable, not theoretically perfect.”); *PJM Interconnection, L.L.C.*, 142 FERC ¶ 61,216, at P 34 n.48 (2013) (in a section 206 complaint case, finding that “that there may be many just and reasonable methods of cost allocation that the Commission could adopt . . . [however] we need only select a just and reasonable methodology and we find that the postage-stamp methodology is just and reasonable.”).

We recognize that the IMM's proposal could account for real shifts in market expectations that may occur closer to when an auction is run. However, we find that the asserted benefit of capturing these effects is outweighed by the benefit of PJM's approach. We think that PJM's approach will better represent longer-term trends for forward energy prices and provide a more robust average because it is less susceptible to being skewed by potential random price volatility that may occur within a shorter time period.

116. The IMM also proposes an alternative to use forward prices averaged over the week that ends 134 days prior to the BRA because, the IMM asserts, that still provides participants time to include the latest offset results in offers, which are due 120 days prior to the auction. We do not find the difference between 134 and 180 days to be particularly meaningful and, as discussed above, find that PJM's month-long average as compared to a weeks-long average does provide the benefit of a larger sample size. PJM also points out difficulties it and the auction participants would encounter if the Commission required a shorter period.

117. For these reasons, we adopt PJM's proposal and find it to be just and reasonable and compliant with the May 2020 Order.¹⁷⁵

f. Mapping from Electricity Futures Trading Hubs to Zones

i. PJM's Compliance Filing

118. PJM asserts that high correlations in historic prices between each of the Selected Hubs and specific PJM Zones enable ready mapping of Zones to hubs. PJM states that this mapping defines the appropriate sources and sinks for determining locational basis differentials between each of the Zones and its mapped hub. PJM explains that adding these differentials to the mapped hub price determines the corresponding Zone price.¹⁷⁶ PJM proposes to use long-term FTR auction results, along with historic data on marginal losses, to calculate forward monthly peak and off-peak prices for each Zone. PJM explains that this approach is not novel because Brattle and S&L's standard practice for

¹⁷⁵ See *United Distrib. Cos. v. FERC*, 88 F.3d 1105, 1169 (D.C. Cir. 1996) (per curiam) ("FERC correctly counters that the fact that AEPCO may have proposed a reasonable alternative to SFV rate design is not compelling. The existence of a second reasonable course of action does not invalidate an agency's determination."); see also May 2020 Order, 171 FERC ¶ 61,153 at P 320. Because PJM may make a section 205 filing to revise these Tariff provisions, we find it reasonable to accept PJM's proposal over alternatives if PJM's proposal is just and reasonable.

¹⁷⁶ PJM Second Compliance Transmittal at 15-16 (citing Brattle Aff. ¶¶ 51, 53 & tbl. 5).

estimating future congestion differentials a few years out is to use differences in congestion prices between each Zone and the hub, from the latest long-term FTR auction.¹⁷⁷ PJM explains that the longest-term FTRs traded in PJM's auctions are three years forward. PJM states that even allowing for the fact that the latest long-term FTR auction results available at the time of PJM's E&AS Offset calculations will be for the delivery year prior to that for which the BRA is being run, the long-term FTRs are a reasonable indicator of the market's view of future congestion applicable in the delivery year and will reflect shifting patterns much more quickly than, for example, relying on historical congestion differentials from four to six years before the delivery year.¹⁷⁸

119. To support its decision to use FTR data, PJM states that Brattle and S&L found the long-term FTR auctions to be competitive, with ownership unconcentrated.¹⁷⁹ PJM states that the consultants also analyzed how well historical long-term FTR prices align with realized congestion in the day-ahead market between the trading hubs and Zones during the same time period for the 2011/2012 to 2019/2020 Delivery Years. PJM states that the consultants concluded that, although long-term FTRs do not accurately predict the realized congestion in the delivery year, FTR prices do incorporate trends; therefore, using FTR prices to forecast basis differentials incorporates such shifts sooner than using trailing historical prices to forecast basis differentials.¹⁸⁰

120. PJM states that it must adjust the long-term annual FTR prices to obtain monthly values for the E&AS Offset estimates. PJM proposes to shape the annual FTR prices by month using the congestion component of monthly average day-ahead price differentials between the Zone and relevant hub from the past three years.¹⁸¹

121. PJM states that, in addition to the congestion differences, zonal prices also need to incorporate the marginal losses expected between the hub and its mapped Zones. PJM proposes to perform this adjustment using historical zonal day-ahead loss prices scaled by

¹⁷⁷ *Id.* at 16 (citing Brattle Aff. ¶ 17; proposed Tariff, Attach. DD, § 5.10(a)(v-1)(C)(3)).

¹⁷⁸ *Id.* at 16 (citing Brattle Aff. ¶ 17).

¹⁷⁹ *Id.* at 16-17 (citing Brattle Aff. ¶ 54).

¹⁸⁰ *Id.* at 17 (citing Brattle Aff. ¶ 55).

¹⁸¹ *Id.* (citing Brattle Aff. ¶ 17). PJM proposes to add “for each month of the year, the difference between (a) the historical monthly average day-ahead congestion price differentials between the Zone and relevant hub and (b) the historical annual average day-ahead congestion price differentials between the Zone and hub.” *Id.* at 17 n.54 (citing proposed Tariff, Attach. DD, sec. 5.10(a)(v-1)(C)(3)).

the relationship between the forward price at the hub and the historic day-ahead LMPs for the hub.¹⁸² PJM states that the end result of this step of the analysis is forward day-ahead energy prices for each of the 20 PJM Zones, and for each month, on-peak period, and off-peak period in the delivery year.¹⁸³

ii. Comments, Protests, and Answers

122. The IMM argues that PJM does not provide a substantive reason why it proposes to use long-term FTR prices to estimate part of the locational differences to apply to the forward prices at the Selected Hubs. The IMM argues that PJM should instead shape forward prices using the historical distribution of LMPs by hour and location, consistent with opportunity cost calculations. The IMM explains that the long-term FTR auction prices will not be available for two years after they are needed due to a mismatch between the timings of the FTR auction and the BRA.¹⁸⁴ In addition, the IMM states, because the FTR data are reflective of congestion but not losses and do not capture monthly and hourly price variation, this approach requires additional adjustments based on historical LMPs.¹⁸⁵ The IMM contends that a simpler process would be to shape the forward energy prices using only historical LMPs, which are a more reliable and more transparent method of calculating locational price differences.¹⁸⁶

123. In its answer, PJM recognizes the timing mismatch between FTR and capacity auctions¹⁸⁷ but finds that any detriment is well outweighed by the facts that (1) long-term

¹⁸² *Id.* at 17-18 (citing Brattle Aff. ¶ 18). PJM proposes to calculate the added loss differential “as the average of the difference between the loss components of the historical on peak or off peak day-ahead LMPs for the Zone and relevant hub in that month across the three year period scaled by the ratio of the forward monthly average on-peak or off-peak day-ahead LMP at such hub to the average of the historical on-peak or off-peak day-ahead LMPs for such hub in that month across the three year period.” *Id.* at 18 n.56 (citing Brattle Aff. ¶ 18 and proposed Tariff, Attach. DD, § 5.10(a)(v-1)(C)(4)).

¹⁸³ *Id.* at 18.

¹⁸⁴ IMM Protest of Second Compliance Filing at 10-12. The IMM argues that both Brattle and PJM ignore this timing mismatch. IMM Protest of Second Compliance Filing at 12-13.

¹⁸⁵ *Id.* at 10.

¹⁸⁶ *Id.* at 10-11.

¹⁸⁷ PJM Answer to Second Compliance Filing at 6. PJM notes that the IMM contends that the timing mismatch is two years, not one year as Brattle recognized. PJM states that the difference appears to be due to the IMM’s implicit assertion that only the

FTR auction results reflect the market's expectation of future conditions; and (2) it is "standard practice" for market participants to rely on the "differences in congestion prices between each [Z]one and the hub, from the latest long-term FTR auction."¹⁸⁸ PJM states its approach is thus consistent with the Commission's directives in the May 2020 Order.¹⁸⁹

124. PJM argues that the IMM's alternative of using historical LMPs exacerbates the timing mismatch, does not reflect the market's expectation of future conditions, and would unnecessarily make this component of the forward-looking analysis backward-looking. PJM argues that the timing mismatch between long-term FTR auction data and the applicable delivery year is one to two years, while the mismatch in using historical data is no less than three years (given that the delivery year generally is three years in the future) and would extend to six years if three years of historical data were used. Furthermore, PJM notes that the IMM does not provide any analysis to support its argument that historical LMPs yield a more accurate basis differential than long-term FTR auction data.¹⁹⁰ Making similar arguments, Exelon also argues that IMM's approach, unlike PJM's, does not account for material topology changes that will impact congestion in forward delivery years.¹⁹¹

125. PICO's argue that the data provided by PJM shows that the monthly pattern in the FTR data does not align with the pattern in forward prices.¹⁹²

prices determined in the fifth and final round of a long-term FTR auction for a given year are useful. PJM contends that prices need not be set in stone for them to reflect participants' expectations. PJM argues that the FTR prices at the time closest to the capacity auction are appropriate to use even if they are not final because they represent current expectations of future congestion. *Id.* at 6 n.25 (citing IMM Protest to Second Compliance Filing at 12; PJM Second Compliance Filing, Brattle Aff. ¶ 17).

¹⁸⁸ *Id.* at 6-7 (citing Second Compliance Filing, Brattle Aff. ¶ 17).

¹⁸⁹ *Id.* at 7 (citing May 2020 Order, 171 FERC ¶ 61,153 at P 320).

¹⁹⁰ PJM Answer to Second Compliance Filing at 7.

¹⁹¹ Exelon Answer to Second Compliance Filing at 14-16.

¹⁹² PJM Interconnection, L.L.C., the Public Interest and Customer Organizations' Partial Protest of and Comments on Second Compliance Filing, Docket No. EL19-58-003, at 18 (filed Sept. 2, 2020) (citing Ex. A, Aff. of James F. Wilson on behalf of PICO's (Wilson Aff.) ¶¶ 39-42) (PICO's' Partial Protest of Second Compliance Filing).

126. PJM responds to PICO's claim by arguing that PICO's affiant, James F. Wilson, uses a false comparison and flawed analysis.¹⁹³ PJM states that after correcting for these errors, Brattle shows that the basis differentials using the proposed approach closely align with the forward pricing data.¹⁹⁴ Moreover, Brattle states, "[i]t is the delivered price at any given location, not the basis differential, that determines the net energy revenues of a resource."¹⁹⁵ Thus, PJM argues, the proposed methodology to use congestion expectations from FTR data is a just and reasonable approach for constructing zonal price forecasts.¹⁹⁶

127. The IMM argues that annual prices from the long-term FTR auction are not a reasonable substitute for the actual distribution of LMPs in the calculation of the E&AS Offset. The IMM claims that participation levels of the long-term FTR auctions are about half the participation levels of the annual FTR auctions. The IMM states that the long-term FTRs involving the Selected Hubs are less than 10% of all long-term FTRs for the 2017/2020 through 2020/2023 auctions, so broad assertions about the nature of the FTR market are irrelevant. The IMM states that the long-term FTR auction was moderately concentrated at two of the Selected Hubs and highly concentrated at the remaining Selected Hub for at least one of the last four auction planning years.¹⁹⁷ In addition, the IMM notes that even Brattle acknowledges that long-term FTR prices are a demonstrably poor estimate of actual congestion.¹⁹⁸

¹⁹³ PJM Answer to Second Compliance Filing at 13. Specifically, Brattle states that "the Wilson affidavit compares the basis differentials from PJM Western Hub to PJM Eastern Hub implied by forward prices, to the basis differentials from PJM Western hub to PSEG, based on shaped FTR prices. However, PSEG and PJM Eastern Hub are not equivalent; they represent electrically different locations. Further, PJM states it appears that PICO's affiant, Mr. Wilson, neglected to include losses in the calculation of the basis from 'shaped FTR prices,' even though our recommended approach for forecasting zonal prices includes both an FTR component and a historical losses component." PJM Answer Second Compliance Filing at 13 (citing Brattle Supp. Aff. ¶ 21).

¹⁹⁴ *Id.* (citing Brattle Supp. Aff., fig. 2).

¹⁹⁵ *Id.* (citing Brattle Supp. Aff. ¶ 22).

¹⁹⁶ PJM Answer to Second Compliance Filing at 13.

¹⁹⁷ IMM Protest of Second Compliance at 11.

¹⁹⁸ *Id.* (citing 2020 Q. *State of the Mkt. Rep. for PJM: Jan. through Jun.*, § 13: FTRs and ARRs, fig. 13-33, at 683; Brattle Aff. ¶ 55 ("Long-term FTRs of course do not

128. In regard only to PJM's derivation of unit-specific forward energy revenue, Exelon takes issue with PJM's proposed two-step calculation of the basis differential between futures trading hubs and generator busses: (1) using FTR data to perform hub-to-Zone adjustments and then (2) using historical price correlations to perform Zone-to-bus adjustments. Exelon states that although PJM's approach is appropriate for calculating forward prices at the CT Reference Resource node due to the lack of market information regarding the relationship between prices at the hypothetical CT Reference Resource's location and the hub, the same does not hold true for existing units because FTR market data exists for every bus. Exelon argues that each step of PJM's proposed two-step process introduces potential error and inaccuracy, so PJM should instead use only FTR auction results to derive unit-specific forward energy revenue.¹⁹⁹

129. Exelon also argues that PJM's adoption of a one-step approach would resolve another problem with PJM's proposal. Exelon notes that PJM's two-step approach assumes that the appropriate Zone for an existing unit is the Zone in which it is located.²⁰⁰ Exelon argues that this assumption is wrong if a unit has an electrical tie to a neighboring Zone that is stronger. Exelon claims that PJM's assumption does not hold true for at least one major generation station, the Salem Nuclear Station, which is in the Atlantic City Electric Zone but is electrically closest to the PSEG Zone. Exelon argues that PJM should revise the proposed Tariff to state that it will map generator busses to Zones not based on geographic proximity, as the proposed Tariff suggests, but based on electrical proximity, i.e., the distribution factor (DFAX). Alternatively, Exelon argues that adoption of the one-step method for calculating hub-to-bus basis differentials would eliminate the need for Market Sellers to correct PJM's erroneous correlation assumptions on a piecemeal basis. Thus, Exelon requests that the Commission should require PJM to expand its use of FTR auction results to estimate hub-to-bus basis differentials for existing units.²⁰¹

130. Exelon contends that Market Sellers would be at a distinct disadvantage trying to correct PJM's assumptions after the fact, as they do not possess PJM's DFAX values or model. Exelon states that PJM could effectuate the change to a one-step approach by

accurately predict the realized congestion in the delivery year due to the uncertainty of the market conditions they serve to hedge.”)).

¹⁹⁹ PJM Interconnection, L.L.C., Limited Protest of Exelon Corporation, Docket No. EL19-58-003, at 4-5, 15-18 (Sept. 2, 2020) (Exelon Limited Protest of Second Compliance Filing).

²⁰⁰ Exelon Limited Protest of Second Compliance Filing at 16 (citing proposed Tariff sec. 5.10(a)(v-1)(C)(6); PJM Second Compliance Filing at 21-22).

²⁰¹ *Id.* at 15-18.

amending proposed Tariff section 5.10(a)(v-1)(3) through (5) to include references to “unit-specific node” in each instance in which a “Zone” is referenced, with appropriate language limiting such calculations to the development of unit-specific MOPR Floor Offer Prices and Market Seller Offer Caps, and eliminating proposed Tariff section 5.10(a)(v-1)(6).²⁰²

131. Exelon also states that the IMM’s one-step, historical approach proposal for PJM to use historical price relationships fails to comply with the mandate for PJM’s E&AS Offset be forward-looking. Exelon also argues that the Commission should endorse the use of forward FTR auction results to inform forward projections of the E&AS Offset, both at the zonal and nodal level.²⁰³

132. In its answer, PJM agrees with Exelon that the use of hub-to-node FTR auction values is a reasonable means to estimate the basis differential for projecting forward prices of existing resources that seek a resource-specific E&AS Offset.²⁰⁴ PJM also agrees with Exelon that a one-step approach would increase measurement precision. Thus, while PJM continues to find that its two-step approach is reasonable, PJM states that it would be willing to implement a one-step approach on compliance, if directed by the Commission.²⁰⁵

iii. Commission Determination

133. We find that PJM’s proposal to use long-term FTR prices to estimate part of the locational differences to apply to the forward prices at the futures trading hubs is just and reasonable, and it complies with the May 2020 Order.²⁰⁶ We are unpersuaded by the arguments of the IMM and PICO. The IMM argues that the proposal is unreasonable due to the mismatch between the timing of the FTR auction and the BRA, which is a mismatch that PJM acknowledges.²⁰⁷ We agree with PJM’s argument that the harm caused by the timing mismatch is outweighed by the facts that (1) long-term FTR auction

²⁰² *Id.* at 17-18.

²⁰³ *Id.* at 15-16.

²⁰⁴ PJM Answer to Second Compliance Filing at 5.

²⁰⁵ *Id.* at 5-6 (citing Exelon Limited Protest of Second Compliance Filing at 15, 17).

²⁰⁶ *See* May 2020 Order, 171 FERC ¶ 61,153 at P 320.

²⁰⁷ We recognize that PJM and IMM disagree on the precise magnitude of the mismatch, but that disagreement does not affect our reasoning here.

results reflect the market's expectation of future conditions; and (2) it is standard practice among market participants to rely on prices from long-term FTR auctions when conducting their own forecasts. Further, as to the second point, one reason the Commission directed PJM to adopt a forward-looking methodology was to be consistent with project valuation methods used by market participants.²⁰⁸

134. We also are unpersuaded by PICO's argument about whether the data provided by PJM shows that the monthly pattern in the FTR data aligns with the pattern in forward prices. We are persuaded by statements of PJM's affiant, Brattle, that "[i]t is the delivered price at any given location, not the basis differential, that determines the net energy revenues of a resource."²⁰⁹ We agree with PJM that the proposed methodology to use congestion expectations from FTR data is a just and reasonable approach for constructing zonal price forecasts.

135. The IMM argues that the participation levels of the long-term FTR auctions are much lower than the participation levels of the annual FTR auctions, and that long-term-auction participation at the three relevant hubs is a small fraction of total participation. Based on these facts, the IMM concludes that "broad assertions about the nature of the FTR market are irrelevant."²¹⁰ We disagree that assertions about the whole FTR market cannot also apply to a subset of the market. The IMM's observation that participation at the Selected Hubs is lower in comparison with broader participation levels does not necessarily mean that participation is too low to reflect trends.

136. Similarly, we do not find persuasive the IMM's reliance on the assertion that long-term FTR prices poorly predict actual congestion. As PJM explains, the purpose of using FTR data is to capture congestion trends, not to calculate accurate estimates of congestion.²¹¹ Finally, the IMM states that the long-term FTR auction was moderately concentrated at two of the three hubs and highly concentrated at one of the hubs for at least one of the last four auction planning years.²¹² Brattle and S&L, on the other hand, claim that the long-term FTR auctions have been found competitive, with ownership

²⁰⁸ May 2020 Order, 171 FERC ¶ 61,153 at P 320.

²⁰⁹ PJM Answer to Second Compliance Filing at 13 (citing Brattle Supp. Aff. ¶ 22).

²¹⁰ IMM Protest of Second Compliance at 11.

²¹¹ PJM Second Compliance Transmittal, Brattle Aff. ¶ 55.

²¹² IMM Protest of Second Compliance Filing at 11.

unconcentrated.²¹³ Based on the record, we find there is insufficient evidence to find that the level of competitiveness of the auctions renders PJM's proposal unjust and unreasonable.

137. The IMM argues that PJM should adopt the IMM's preferred approach for shaping forward prices—by using the historical distribution of LMPs—because this approach is consistent with PJM's opportunity cost calculator. As we found regarding PJM's use of ICE data instead of Platts' data, we find that PJM is not bound to the methods already used by its opportunity cost calculator. Furthermore, we find that PJM has supported its proposed use of FTR auction data as just and reasonable, and it complies with the May 2020 Order.²¹⁴ As PJM argues, the IMM's alternative of using historical LMPs exacerbates the timing mismatch discussed above, does not reflect the market's expectation of future conditions, and would unnecessarily make this component of the analysis backward-looking. As PJM also notes, the IMM does not provide analysis showing that historical LMPs yield a more accurate basis differential than FTR auction data.²¹⁵ Therefore, we decline to require PJM to use historical LMPs instead of FTR data.

138. Exelon argues that PJM unnecessarily uses two steps to derive the basis differential between hubs and busses for unit-specific forward energy revenue: (1) using FTR data to perform hub-to-Zone adjustments and then (2) using historical price correlations to perform Zone-to-bus adjustments. Exelon argues that PJM instead could perform hub-to-bus adjustments directly because FTR market data exists at every hub. PJM agrees with Exelon that a one-step method would increase accuracy and, while continuing to find its two-step approach reasonable, states that it is willing to implement a one-step approach. We agree with PJM that its two-step approach is reasonable. We find that PJM does not need to change its approach and find PJM's proposal is compliant with the May 2020 Order.²¹⁶

139. We also are unpersuaded by Exelon's argument against PJM's assumption that the appropriate Zone for an existing unit is the Zone in which it is located. Exelon argues that because some units have an electrical tie to a neighboring Zone that is stronger, PJM should map generator busses to Zones based on electrical proximity as measured by the

²¹³ PJM Second Compliance Transmittal at 16-17 (citing Brattle Aff. ¶ 54).

²¹⁴ See May 2020 Order, 171 FERC ¶ 61,153 at P 320; *see also supra* notes 173-174.

²¹⁵ PJM Answer to Second Compliance Filing at 7.

²¹⁶ See May 2020 Order, 171 FERC ¶ 61,153 at P 320; *see also supra* notes 173-174.

DFAX. We find, however, that PJM's simplifying assumption is reasonable. Further, as Exelon recognizes, Market Sellers can correct any correlation assumptions they suspect are erroneous, even if such corrections may be challenging due to Market Sellers' lack of access to DFAX values or PJM's model, as Exelon suggests.

g. Natural Gas Futures Trading Hubs

i. PJM's Compliance Filing

140. PJM states that fuel costs are a critical input to the energy and ancillary services net revenue estimates because they are the principal cost incurred by most resources to provide energy. PJM proposes to use fuel futures market prices in a similar manner to the way it proposes to use electricity futures market prices. PJM states that there are multiple futures markets for natural gas deliveries to PJM Region locations, but the liquidity of those markets varies for the 2024 time period used to match the energy futures prices.²¹⁷ PJM states that Brattle and S&L found six natural gas hubs with sufficient liquidity.²¹⁸ PJM states that the PJM Region also is served by three illiquid natural gas hubs.²¹⁹ PJM states that based on historical price correlations, each of these illiquid hubs can be mapped to one of the six liquid hubs; once mapped, forward prices for these illiquid hubs can be derived by multiplying the forward price of the liquid hub by the average ratio of the monthly price at the illiquid hub to the monthly price at the liquid hub over the most recent three years.²²⁰ PJM states that the three illiquid hubs were actively traded in the historic period, permitting a reasonable assessment of price

²¹⁷ PJM states that this discussion focuses on natural gas prices because natural gas is the fuel of the CT Reference Resource assumed for setting the VRR Curve. PJM proposes to adjust the approach for other fuels as necessary. PJM Second Compliance Transmittal at 18.

²¹⁸ *Id.* at 18-19 (citing Brattle Aff. ¶¶ 29, 66 & fig. 4). The six hubs are Chicago, Transco Zone 6 (non-NY), Dominion South, Michcon, TETCO M3, and Columbia-Appalachia TCO.

²¹⁹ The three hubs are Transco Zone 6 (NY), TGP LA 500 Leg, and Transco Zone 5 Delivered. *Id.* at 19.

²²⁰ *Id.* (citing Brattle Aff. ¶ 30).

correlations.²²¹ Thus, PJM proposes to use nine natural gas trading hubs—these three illiquid hubs as well as the six liquid hubs—to calculate gas costs.²²²

141. PJM proposes to use a simple average of natural gas settlement prices for the most recent 30 trading days, for the same reasons it noted for the forward energy prices.²²³ PJM states that it will assign prices from the nine natural gas futures trading hubs to the 20 PJM Zones using the hub-Zone mapping previously developed and recorded in PJM Manual 18.²²⁴

ii. Comments and Protest

142. The IMM describes its own criteria for selecting the relevant natural gas pricing hubs for each Zone and lists those hubs.²²⁵ The IMM states that PJM did not follow the same criteria, and neither PJM nor Brattle defined criteria and applied them. The IMM states that it uses the same hub mapping as PJM for all but three Zones: AEP, PPL, and PSEG. The IMM states that PJM uses forward prices from a different hub to calculate forward gas prices for the three Zones. The IMM argues that there is no reason for PJM to estimate forward prices for these three Zones because Platts and ICE provide the data.²²⁶ The IMM argues that PJM is inconsistent in its use of forward data because it uses settlement prices calculated by ICE for some hubs, but not for all hubs. Effectively, the IMM contends, PJM is substituting Brattle’s judgment about prices at these three pricing points for the judgment of Platts or ICE. The IMM argues that because natural gas pricing is Platts’ core business and the markets use Platts’ data, the mapping should use Platts’ data.²²⁷

²²¹ *Id.*

²²² *Id.* at 20.

²²³ PJM Second Compliance Transmittal at 20 (citing Brattle Aff. ¶ 16). PJM states that it will retrieve the forward gas price data 180 days before the relevant BRA and use data from the 30 preceding trading days at that time. *Id.* at 20 n.61.

²²⁴ *Id.* at 20.

²²⁵ IMM Protest of Second Compliance Filing at 18, 23 tbl 3.

²²⁶ *Id.* at 18 & n.31 (citing S&P Global Platts, “Methodology and Specifications Guide M2MS—Gas Methodology”).

²²⁷ *Id.* at 18-19.

143. The IMM explains that its other protests regarding PJM's use of natural gas forward prices are similar to its protests related to the use of electricity forward prices (e.g., PJM's use of ICE prices instead of Platts' prices without explanation).²²⁸

144. In its answer, noting the IMM's objection to PJM's use of prices posted by ICE, PJM responds that Platts' prices use ICE pricing data as the starting point for its determination of forward price curves so both rely on the same underlying data sets. PJM further explains that ICE pricing data is more straightforward and more transparent because it makes settlement prices for recent trading days publicly available, whereas Platts' data are available only to subscribers.²²⁹

iii. Commission Determination

145. We find that PJM's proposal regarding the selection of natural gas pricing hubs is just and reasonable and complies with the May 2020 Order.²³⁰ The IMM argues that PJM did not explain its criteria and did not use the correct criteria for hub selection and pricing data; we disagree. We find that PJM reasonably relies on the analysis of Brattle and S&L, including on the consultants' explanation of their methodology included in their report, to identify six natural gas hubs with sufficient liquidity. We similarly find that PJM reasonably relies on the consultants' methodology for mapping three illiquid gas pricing hubs to one of the six liquid hubs based on historical price correlations. Regarding the IMM's claim that its concerns as to PJM's choice of natural gas hubs is analogous to its concerns regarding electricity hubs, we note that we have addressed the IMM's arguments as to the electricity hubs, above.²³¹

146. We also disagree with the IMM that PJM's proposal to use ICE data instead of Platts' data for all hubs is not reasonable. We find instead that PJM has supported its rationale for using ICE data over Platts', i.e. that its proposed use of ICE data has transparency benefits because ICE data is both publicly-available and underlies Platts' pricing data. For these reasons, we find that PJM's proposal regarding its choice of pricing data is just and reasonable and we adopt PJM's proposal.

²²⁸ *Id.* at 19-20.

²²⁹ PJM Answer to Second Compliance Filing at 17-18 (citing Brattle Supp. Aff. ¶¶ 8-9).

²³⁰ *See supra* notes 173-74; *see also* May 2020 Order, 171 FERC ¶ 61,153 at P 320.

²³¹ *See supra* PP 102-105.

h. Alignment of Electricity Hubs with Natural Gas Hubs

i. Comments, Protest, and Answer

147. PICOs argue that the energy and fuel prices that PJM proposes to use are mismatched. PICOs note that PJM proposes to have the energy and ancillary services revenues for PJM's mid-Atlantic and eastern regions be simulated based on forward natural gas prices from eastern PJM but forward electricity prices from western PJM as adjusted based on the adjusted FTR auction results. PICOs argue that as a result, should natural gas forward prices in eastern PJM reflect expectations of increasing pipeline constraints and higher prices during future winter months, the E&AS Offset would reflect such expectations for natural gas prices but likely would not reflect the corresponding expectation of higher electricity prices in those same areas. PICOs state that such a misalignment would result in an understatement of the likely net revenues for CTs located in eastern PJM.²³² To address this issue, PICOs contend that PJM should use additional, less liquid forward prices for the target year, subject to approval of the IMM. PICOs state that PICOs' affiant, Mr. Wilson, also recommends the use of prices for one or two years out when prices three years out are unavailable.²³³

148. In its answer, PJM asserts that its proposed use of certain hubs for forward prices for electricity and natural gas prices is appropriate and allows PJM to calculate a reasonable estimate of an E&AS Offset.²³⁴ PJM responds to PICOs' protest by stating that according to Brattle, use of data from illiquid PJM hubs "is not a viable option" because it "introduces the potential for manipulation of those zonal prices with relatively small transactions, causing large distortions in the forward markets and in the capacity market parameters and outcomes."²³⁵ In other words, PJM argues, the benefits of aligning the electric Selected Hubs with the natural gas hubs are outweighed by the risk of using illiquid hubs. PJM argues that because electricity prices in eastern PJM hubs have limited liquidity and are inconsistent year over year, it would be inappropriate to use these prices.²³⁶

²³² PICOs' Partial Protest of Second Compliance Filing at 18 (citing Wilson Aff. ¶¶ 40-44).

²³³ *Id.* at 19 (citing Wilson Aff. ¶¶ 45-47).

²³⁴ PJM Answer to Second Compliance Filing at 11.

²³⁵ *Id.* at 12 (citing Brattle Supp. Aff. ¶ 18).

²³⁶ *Id.* (citing Brattle Supp. Aff. ¶ 18).

149. In response to PICOs' contention that PJM and the IMM could monitor prices from illiquid hubs, PJM states that this approach ignores the advantage of relying on futures prices in the first instance, which is that the futures prices incorporate market participants' views of various market factors. PJM states that under PICOs' approach, PJM and the IMM would have to substitute their own subjective views.²³⁷

ii. Commission Determination

150. We find the PJM proposal to be just and reasonable and compliant with the May 2020 Order.²³⁸ PICOs take issue with PJM's proposal to have the energy and ancillary services revenues for PJM's mid-Atlantic and eastern regions be simulated based on forward natural gas prices from eastern PJM but forward electricity prices from western PJM. PICOs argue that this misalignment will result in an understatement of the likely net revenues for CTs located in eastern PJM. PICOs therefore contend that PJM should use additional, less liquid forward prices for the target year, subject to approval of the IMM. We disagree. As PJM's affiant, Brattle, explains, the use of data from illiquid PJM electricity hubs "is not a viable option" because it "introduces the potential for manipulation of those zonal prices with relatively small transactions, causing large distortions in the forward markets and in the capacity market parameters and outcomes."²³⁹ We agree with PJM that the benefits of aligning the electric Selected Hubs with the natural gas hubs are outweighed by the risk of using illiquid hubs. We also agree with PJM that mitigated prices from illiquid hubs would not reflect market participants' views on future conditions.

i. E&AS Offset for the PJM Region

i. PJM's Compliance Filing

151. PJM's proposed Tariff language describes how PJM will determine the E&AS Offset for the PJM Region.²⁴⁰ PJM proposes to use historic pricing patterns from each of the three most recent years to produce three years of shaped hourly energy forward prices and shaped daily natural gas forward prices, and then to run the proposed Projected

²³⁷ *Id.* at 13 (citing PJM Second Compliance Transmittal, Brattle Aff. ¶ 52).

²³⁸ *See supra* notes 173-74; *see also* May 2020 Order, 171 FERC ¶ 61,153 at P 320.

²³⁹ PJM Answer to Second Compliance Filing at 12 (citing Brattle Supp. Aff. ¶ 18).

²⁴⁰ Proposed Tariff, Attach. DD, sec. 5.10(a)(v-1)(A).

E&AS Dispatch Model separately for each of those years.²⁴¹ Each of the three simulations uses forward hourly LMPs for the PJM Region, which are calculated using a load-weighted average of Zonal LMPs.²⁴² PJM then proposes to average the revenues resulting for the three years to produce a single-year estimate that encompasses varying patterns in hourly energy prices and daily natural gas prices.²⁴³

ii. Comments and Protests

152. The IMM asserts that PJM should use the average Net CONE across all Zones for the Regional Transmission Organization (RTO) Net CONE for both the RTO Variable Resource Requirement (VRR) Curve and the Capacity Performance nonperformance charge rate. The IMM notes that PJM instead uses average RTO prices to define the dispatch of the CT Reference Resource used to define the RTO VRR Curve. The IMM argues that because no resource in PJM faces RTO average prices, and thus no resource receives revenue based on an RTO average, the PJM RTO calculation is an artifact that has no relevance to actual E&AS Offsets and should not be used for any purpose.²⁴⁴

153. The IMM argues that for cases in which the RTO Net CONE is used for external generation capacity resources, PJM should calculate net energy and ancillary services revenue based on the Zone where the resource is interconnected.²⁴⁵

iii. Commission Determination

154. We find PJM's proposal to use a forward-looking E&AS Offset to be just and reasonable and compliant with the May 2020 Order.²⁴⁶ We have considered the IMM's argument that PJM should not use RTO average prices to define the dispatch of the reference resource used to define the RTO VRR Curve. PJM's proposal to use RTO average prices is consistent with its prior approach and the existing Tariff.²⁴⁷ The IMM

²⁴¹ PJM Second Compliance Transmittal at 21.

²⁴² *Id.* at 21 n.65 (citing Proposed Tariff, Attach. DD, sec. 5.10(a)(v-1)(C)(7)).

²⁴³ *Id.* at 21.

²⁴⁴ IMM Protest of Second Compliance Filing at 25.

²⁴⁵ *Id.* at 25.

²⁴⁶ *See supra* notes 173-74.

²⁴⁷ Intra-PJM Tariff, Attach. DD, § 5.10 Auction Clearing Requirements (28.0.0), § 5.10(a)(v)(A) ("The Office of the Interconnection shall determine the Net Energy and Ancillary Services Revenue Offset each year for the PJM Region as (A) the annual

has not explained, nor can we deduce, why a change to the just and reasonable tariff on file is necessary to effectuate a forward-looking offset. This change also was not part of the Commission's compliance directives in the May 2020 Order, which did not require PJM to amend the use of RTO average prices in its methodology, and therefore is beyond the scope of this filing.²⁴⁸ Moreover, we find that the IMM has not shown that PJM's existing tariff is unjust and unreasonable or that the IMM's proposal would lead to more accurate results. While the IMM is correct that no resource faces RTO average prices, it also is true that no resource would face an RTO average Net CONE calculated as the IMM proposes. Thus, it is not clear that the IMM's proposed approach would lead to significantly more accurate results than PJM's proposed approach. We, therefore, find PJM's proposal to be just and reasonable.²⁴⁹

155. The IMM further argues that for cases in which the RTO Net CONE is used for external generation capacity resources, PJM should calculate net energy and ancillary services revenue based on the Zone where the resource is interconnected. For the same reasons discussed, above, we find that it is just and reasonable for PJM to use RTO average forward prices in calculating the RTO Net CONE applied to external generation capacity resources.

j. Transparency of the Filing

i. PJM's Compliance Filing

156. PJM states that because the liquidity of trading hubs may change over time, the proposed Tariff language states that PJM will specify the hubs in PJM Manuals. PJM states that its approach recognizes that activity at other trading hubs is evolving. Therefore, PJM is not embedding the specific products and hubs in its Tariff at this time so it does not lock in a fixed set of trading hubs. This will eliminate the need for the Commission to determine the liquidity of individual trading hubs on a hub-by-hub basis in future proceedings.²⁵⁰

average of the revenues that would have been received by the Reference Resource from the PJM energy markets during a period of three consecutive calendar years preceding the time of the determination.”); *see also PJM Interconnection, L.L.C.*, 167 FERC ¶ 61,029 (2019), *aff'd on reh'g*, 171 FERC ¶ 61,040 (2020).

²⁴⁸ The IMM should have raised such an argument on rehearing of the May 2020 order and therefore its argument here constitutes a late-filed rehearing of that order.

²⁴⁹ *See supra* notes 173-74.

²⁵⁰ PJM Second Compliance Transmittal at 11 & n.29 (citing Proposed Tariff, Attach. DD, sec. 5.10(a)(v-1)(C)(1)). PJM argues that under the Commission's “rule of

ii. Comments, Protests, and Answers

157. The IMM argues that PJM’s proposal for calculating forward electricity prices lacks transparency. The IMM argues specifically that PJM does not provide the details of the FTR calculations or the detailed results, nor does the filing specify the forward prices data points and source of such data points. The IMM states that PJM did not define criteria for selecting relevant natural gas pricing hubs for each Zone. The IMM also claims that it would not be possible to calculate the forward prices based on the Tariff language.²⁵¹ The IMM argues that proposed Tariff language is extremely vague and provides PJM with significant discretion over decisions that can significantly affect PJM markets. The IMM notes that PJM does not include the name of the Selected Hubs in the Tariff, referencing only the undefined term “liquid hubs,” without explaining how liquid electricity hubs will be selected in the future, how many liquid electricity hubs will be included, or how these hubs will be mapped to specific Zones. The IMM contends that identifying PJM’s Selected Hubs only in the PJM Manuals provides PJM with inappropriate discretion to affect the calculation in significant ways.²⁵²

iii. Commission Determination

158. We find that PJM’s filing is just and reasonable and complies with the May 2020 Order.²⁵³

159. The IMM argues that PJM’s filing lacks transparency because PJM fails to provide (1) the details of the FTR calculations or the detailed results, (2) specification of the forward prices data points and source of such data points, (3) PJM’s criteria for selecting the relevant natural gas pricing hubs. We note that, contrary to the IMM’s assertions,

reason,” only matters that significantly affect rates, terms, and conditions of service, or that are reasonably susceptible to specification, must be included in the Tariff. *City of Cleveland v. FERC*, 773 F.2d 1368, 1376 (D.C. Cir. 1985). For this reason, PJM continues, it is well understood that “study assumptions and parameters are likely to change over time as planners gain experience in implementing the new planning procedures. Thus, rigid specifications or formulas set out in the Tariff would likely lead to less reliable assessments due to the inability of planners to adapt to changing circumstances.” *Sw. Power Pool, Inc.*, 136 FERC ¶ 61,050, at P 37 (2011).

²⁵¹ IMM Protest of Second Compliance Filing at 3, 14.

²⁵² *Id.* at 8-10.

²⁵³ May 2020 Order, 171 FERC ¶ 61,153 at P 320.

PJM's filing does provide some of the details and calculations listed by the IMM.²⁵⁴ The IMM also claims that it would not be possible to calculate the forward electricity prices based on the Tariff language.²⁵⁵ The IMM notes that the proposed Tariff language does not name the Selected Hubs and does not provide other hub-related details. The IMM contends that having the hubs identified only in the PJM Manuals provides PJM with inappropriate discretion to affect the calculation.²⁵⁶ We disagree. PJM's compliance obligation is to describe adequately the methodology for calculating the forward-looking E&AS Offset in the Tariff. This need not include every implementation detail to be just and reasonable.²⁵⁷ Because details such as the liquidity of electricity hubs may change over time, it is reasonable for PJM to specify such details in PJM Manuals. As PJM points out, the Commission has long understood that "study assumptions and parameters are likely to change over time as planners gain experience in implementing the new planning procedures. Thus, rigid specifications or formulas set out in the Tariff would likely lead to less reliable assessments due to the inability of planners to adapt to changing circumstances."²⁵⁸

5. Energy and Ancillary Services Offset Modeling Assumptions

a. Proposal Overview

160. PJM proposes to replace the Peak-Hour Dispatch Model with the Projected E&AS Dispatch Model to simulate resource commitment and dispatch and settlement of resources' output schedules against shaped, forward-looking day-ahead and real-time energy and ancillary services prices.²⁵⁹ PJM proposes to use the Projected E&AS Dispatch Model to optimize schedules for dispatchable resources (e.g., CT, CC, coal, and storage), and proposes to assume a certain level of output for other resources (nuclear, wind, and solar) that typically are not dispatched by PJM.²⁶⁰

²⁵⁴ PJM Second Compliance Transmittal at 16-22 (citing Brattle Aff. ¶¶ 54-58 (FTRs), 59-65 (forward price data points and sources), and 66-68 (gas hub selection).

²⁵⁵ IMM Protest of Second Compliance Filing at 3, 14.

²⁵⁶ *Id.* at 8-10.

²⁵⁷ *See supra* notes 173-74.

²⁵⁸ *Sw. Power Pool, Inc.*, 136 FERC ¶ 61,050 at P 37.

²⁵⁹ PJM Second Compliance Transmittal at 28.

²⁶⁰ *Id.*

161. The Projected E&AS Dispatch Model simulates whether a dispatchable resource will run in any hour of the day and for any contiguous periods by optimizing its energy and ancillary services commitment and dispatch in order to maximize its profit based on the input forward energy and ancillary service prices and forward fuel prices, subject to the constraints of the resource's operating parameters.²⁶¹ To do so, the model compares a resource's energy offer against forward LMPs and ancillary services market-clearing prices. The resulting dispatch schedule for the resource is used to estimate its future revenues. PJM proposes to account for revenues from all market-based ancillary service products: Synchronized Reserves, Non-Synchronized Reserves, Secondary Reserves, and Regulation. PJM notes that the current, backward-looking E&AS Offset approach omits these ancillary services and considers only the cost-based revenues from providing reactive service.²⁶²

b. Use of Historic Versus Forward Reserve Prices

i. PJM's Compliance Filing

162. PJM states that because there are no observable forward markets for ancillary services, PJM must rely on historical market prices for ancillary services.²⁶³ Thus, for Synchronized and Non-Synchronized Reserves, PJM proposes to employ historical prices in the Projected E&AS Dispatch Model, in which reserve prices will interact with the forward hourly LMPs, and commitment and dispatch projections for the resource will be made accordingly.²⁶⁴

163. PJM states that PJM, Brattle, and S&L did begin to develop a process to estimate forward ancillary services prices. PJM states that the primary method discussed was to scale historic reserve prices by the ratio of the forward energy prices to the historic energy prices. PJM states that while in the long term such an approach may be suitable, under the current set of forward energy prices this approach would result in scaling down reserve prices by as much as 33%. PJM states that such an outcome would be contrary to the expected increase in ancillary services market revenues relative to their historic levels following implementation of the reserve market reforms. As a result, and in an effort to not introduce arbitrary bias into the new approach, PJM proposes to use unscaled, historic ancillary services market-clearing prices for the initial implementation. PJM states that, over time, implementation of the reserve pricing reforms will allow PJM and its

²⁶¹ *Id.* at 28-29.

²⁶² *Id.* at 22 & n.72 (citing Tariff, Attach. DD, sec. 5.10(a)(v-1)(A)(b)).

²⁶³ *Id.* at 23 & n.74 (citing Brattle Aff. ¶ 22).

²⁶⁴ *Id.* at 23.

stakeholders to observe the relationship between ancillary service prices and forward energy prices.²⁶⁵

164. PJM states that the forward price determination for ancillary services will, at a minimum, be re-evaluated in the next quadrennial review, which is slated to begin in spring 2021. PJM states that in the near term—i.e., before resources and the market have time to adjust to the new reserve market rules and observe implementation of the ORDCs—PJM’s approach provides a reasonable proxy for expected ancillary services revenues for the vast majority of resources, as it is expected that ancillary services will continue to comprise only a small fraction of a resource’s annual revenues from PJM’s energy and ancillary services markets.²⁶⁶

165. PJM states that consistent with the existing Tariff, Market Sellers that rely heavily on ancillary services for annual revenues may seek to use an alternate approach through a resource-specific MOPR Floor Offer Price determination. PJM explains that any Capacity Market Seller that wants a different ancillary services revenue estimate for its resource’s E&AS Offset can seek a resource-specific exception and establish the resource’s MOPR Floor Offer Price through that process. For example, PJM states that under the resource-specific exception process, Market Sellers may propose to use different forward prices for ancillary services, but such prices must be from a publicly available source or be otherwise readily available (like through a subscription service) and be demonstrated to be more appropriate for use on a resource-specific basis than the methodology set forth in the proposal and in the current Tariff.²⁶⁷

ii. Comments and Protests

166. CEA argues that PJM’s proposed method for calculating the E&AS Offset is not forward-looking partly because PJM does not propose to estimate future revenues for Synchronized and Non-Synchronized Reserves, choosing instead to rely on historical prices for these two products. More broadly, CEA argues that PJM’s proposed E&AS Offset does not comply with the Commission’s May 2020 Order.²⁶⁸ CEA contends that the lack of forward markets for ancillary services does not relieve PJM of its obligation to

²⁶⁵ *Id.* at 24-25.

²⁶⁶ *Id.* at 26-27.

²⁶⁷ *Id.* at 27 & nn.87-88 (citing proposed Tariff, Attach. DD, §§ 5.14(h-1)(2)(A) & (B)(ii) and 5.14(h-1)(3)).

²⁶⁸ PJM Interconnection, L.L.C., Comments of the Clean Energy Associations, Docket No. EL19-58-003, at 2-3 & n.11 (Sept. 2, 2020) (citing May 2020 Order, 171 FERC ¶ 61,153 at P 320) (CEA Protest of Second Compliance Filing).

develop the “forward-looking methodology” directed by the Commission to account for changes in ancillary services revenues stemming from market reforms.²⁶⁹ CEA argues that PJM’s proposal also contrasts with its proposed method for calculating Regulation prices. There, CEA notes, PJM proposes to “rely not only on historical Regulation prices but historical and projected energy prices as well to develop the forward [R]egulation prices.”²⁷⁰

167. PICOs argue that PJM’s proposal to use historical reserve prices will understate revenues from ancillary services both now and in the future.²⁷¹ PICOs’ affiant, Mr. Wilson, argues that the proposal will understate future reserve revenues especially if excess capacity declines and energy price expectations rise in future years because reserve prices rise faster than energy prices.²⁷² PICOs argue that Brattle’s own data suggests that ancillary services prices are increasing at roughly three to six times the rate of energy prices.²⁷³ In addition, PICOs note that PJM’s simulations show a tripling of annual average Synchronized and Non-Synchronized Reserve prices after implementation of the approved reserve market changes.²⁷⁴ To address the above issues, Mr. Wilson suggests that PJM “develop a functional relationship between energy price levels and operating reserve price levels for application within its simulation.” PICOs state that this functional relationship would recognize (1) that increases in energy prices result in

²⁶⁹ CEA Protest of Second Compliance Filing at 3.

²⁷⁰ *Id.* (citing Second Compliance Transmittal at 25).

²⁷¹ PICOs’ Partial Protest of Second Compliance Filing at 15.

²⁷² PICOs’ Partial Protest of Second Compliance Filing at 15 (citing Wilson Aff. ¶ 28). Mr. Wilson describes this market behavior as follows: “When energy prices are low, there are many resources whose incremental energy production is not economic, so the opportunity cost to provide reserves is zero. As energy prices rise, it becomes increasingly likely that reserve prices will reflect these opportunity costs. At very high energy prices, energy and reserve prices may be relatively close, differing only by the fuel cost of the marginal provider of operating reserves.” PICOs’ Partial Protest of Second Compliance Filing at 15 (citing Wilson Aff. ¶ 29).

²⁷³ PICOs’ Partial Protest of Second Compliance Filing at 15-16 (citing Wilson Aff. ¶ 42, fig. 2). PICOs claims that according to the Brattle data, when energy prices are \$20 to \$30/MWh, Synchronized Reserve prices have clustered around \$1/MWh, and as energy prices have increased to roughly \$30 to \$40/MWh (an increase of 66% to 75%), ancillary services rise to around \$2 to \$5/MWh, an increase of two to five times above the previous price. *Id.*

²⁷⁴ *Id.* at 16 (citing PJM Second Compliance Transmittal at 16, Brattle Aff. ¶ 23).

proportionately greater increases in operating reserve prices; and (2) that the reserve market changes will increase reserve prices.²⁷⁵

iii. Commission Determination

168. We find PJM's proposal to use historic prices for Synchronized Reserves and Non-Synchronized Reserves in its Projected E&AS Dispatch Model to be just and reasonable, and compliant with the May 2020 Order's directive that PJM "implement a forward-looking E&AS Offset that reasonably estimates expected future energy and ancillary services revenues."²⁷⁶ Parties argue that PJM's estimate of ancillary services revenues uses historical prices rather than future projections. However, the Commission's directives were to use a new method for calculating the E&AS Offset that would reasonably estimate the total expected revenues from both energy and ancillary services. PJM has proposed to use future energy price data available to project future energy revenues, which we accept as just and reasonable, as part of this order.²⁷⁷ We find that, given the lack of futures markets for reserves, or other means to reasonably estimate the actual reserve market impacts of PJM's reserve market reforms, PJM's proposed approach is a just and reasonable method to comply with the Commission's directive to reasonably estimate total expected future energy and ancillary services revenues. Though commenters urge the Commission to require PJM to adopt an alternative method to estimate future reserves revenues, we are not persuaded that, based on the record in this proceeding, there is a superior alternative to PJM's proposal. For example, applying a fixed scaling factor of some kind, like the one PJM considered and ultimately declined to adopt, would likely mischaracterize the hourly shape of future reserve prices and lead to poor estimates of resources' dispatch patterns.²⁷⁸ We also find merit in PJM's argument that scaling historical reserve prices by a ratio of forward energy prices to historical energy prices could lead to inaccurate reserve revenue estimates because the relationship between energy and reserve prices will likely change once the instant reserve market reforms are implemented.²⁷⁹

²⁷⁵ *Id.* at 16-17 (citing Wilson Aff. ¶ 33).

²⁷⁶ May 2020 Order, 171 FERC ¶ 61,153 at P 320.

²⁷⁷ *See supra* PP 102-105; 109.

²⁷⁸ *See* Keech Reply Aff. in Docket Nos. ER19-1486-000 and EL19-58-000 at ¶¶ 15-16.

²⁷⁹ Brattle Aff. ¶¶ 22-24. We also note that PJM proposes to use forward Regulation prices because of the linear relationship with energy prices, which is unchanged by the reforms in this proceeding. This contrasts with the reserve market

169. In contrast, we find that PJM's proposal to limit its projection of forward prices to energy, which has liquid futures markets, and Regulation, which is unchanged by the instant proceeding, will result in a just and reasonable estimate of cumulative future energy and ancillary services revenues. The simulations PJM conducted to support its reserve market reforms demonstrate that incremental energy revenues comprise the majority of revenue increases expected to result from the reforms.²⁸⁰

170. We note PJM's commitment to re-examine its approach to estimating future reserve market revenues in future quadrennial reviews.²⁸¹ We encourage PJM to work with its stakeholders to refine any methods to estimate future reserve market revenues after observing the actual effect of the pending reserve market reforms, as necessary.

171. However, we require PJM to submit an informational filing to the Commission by August 31, 2023²⁸² analyzing the impact of the reserve market reforms on reserve price formation. The report shall include: (1) an analysis of Net E&AS revenues further broken down by resource type over the course of the 2022/2023 Delivery Year, as well as a seasonal breakdown and a peak hour/off-peak hour breakdown of the same data; (2) what correlation, if any, PJM has observed between reserve revenues and energy revenues; (3) similarly, what correlation, if any, PJM has observed between Regulation revenues and energy revenues; (4) a comparison of actual fuel prices observed over the 2022/2023 Delivery Year to the fuel price projections used in PJM's Projected E&AS Dispatch model for that year; and (5) a discussion of any other relevant data that may be used to forecast future reserve market revenues.

changes, where PJM states it does not yet know the relationship between reserves prices and energy prices. PJM Second Compliance Transmittal at 25.

²⁸⁰ See PJM, Filing, Docket No. EL19-58-000, Affidavit of Adam Keech, at tbl. 4 (filed Mar. 29, 2019). PJM forecasts that total market-wide energy revenues will increase by \$366 million, and total market-wide reserve revenues will increase by \$189 million.

²⁸¹ PJM Answer to Second Compliance Filing at 2-3 n.12.

²⁸² Noting that PJM's proposed reserve market reforms will be used in the development of a forward-looking E&AS Offset beginning with the BRA for the delivery year that commences June 1, 2022 and concludes May 31, 2023, we direct PJM to use the reserve pricing data from the 2022/2023 Delivery Year to inform its informational report.

c. Use of the 10% Adder in Modeled Offers

i. PJM's Compliance Filing

172. Under PJM's proposal, the resource's modeled energy offer includes its marginal costs, the cost of a complete start and shutdown cycle, and, for CTs only, a 10% adder.²⁸³ PJM explains that its proposal to apply the 10% adder to CTs' modeled energy offers carries forward the current assumptions used to develop the E&AS Offset, which the Commission found just and reasonable in its order accepting the 2018 quadrennial review of PJM's Variable Resource Requirement (VRR) Curve.²⁸⁴ PJM's affiant, Brattle, supports applying the 10% adder to CTs' energy offers, arguing it is "appropriate for the CT to account for increased costs of matching gas supplies with flexible day-of changes in operations."²⁸⁵ PJM contends that it would not necessarily be appropriate to include the adder for other resource types, particularly given the fact that the E&AS Offset for other resource types is not used in the development of the VRR Curve, but rather for the development of the MOPR Floor Offer Prices and Market Seller Offer Caps.²⁸⁶ In its affidavit, the Brattle Group notes that CCs operate as baseload plants without substantially changing offer parameters for the real-time market, so applying an adder in this context would underestimate E&AS revenues and result in over-mitigation, with too high an offer floor.²⁸⁷

ii. Comments, Protests, and Answers

173. EPSA asserts that PJM's overall approach makes economic sense and represents a reasonable way to forecast future energy and ancillary services revenues.²⁸⁸ Regarding

²⁸³ PJM Second Compliance Transmittal at 29-30.

²⁸⁴ *Id.* at 30 (citing *PJM Interconnection, L.L.C.*, 167 FERC ¶ 61,029, at P 128 (2019), *aff'd on reh'g*, 171 FERC ¶ 61,040, at P 31 (2020) ("We conclude that the adder is reasonable because taking into account a significant energy offer component improves accuracy of the EAS net revenue estimate and therefore helps to ensure just and reasonable Net CONE values.")).

²⁸⁵ *Id.* at 30 (citing Brattle Aff. ¶ 35).

²⁸⁶ *Id.* at 30-31.

²⁸⁷ *Id.* at 31 (citing Brattle Aff. ¶ 35).

²⁸⁸ *PJM Interconnection, L.L.C., Comments of the Electric Power Supply Association*, Docket No. EL19-58-003, at 4 (Sept. 2, 2020) (EPSA Comments on Second Compliance Filing).

PJM's proposal to include the 10% cost adder in CTs' modeled energy offers, EPSA's affiant, Dr. Paul M. Sotkiewicz, contends that PJM's approach is reasonable because CTs that are committed day-ahead could procure gas that is not ultimately needed in real-time if conditions change, causing the CT to incur imbalance penalties from the pipeline which need to be covered.²⁸⁹ Dr. Sotkiewicz argues that these additional costs should be accounted for and are reasonable for CTs to include through the 10% adder.²⁹⁰

174. Exelon, the IMM, PICOs and PSEG all protest PJM's proposal to use the 10% adder, although they propose differing alternatives.²⁹¹ Exelon and PSEG argue that the 10% cost adder should be included for all resources, consistent with the longstanding practice of allowing all resources to include a 10% cost adder in their cost-based offers for the energy market.²⁹² PSEG contends that when PJM sought Commission approval for allowing generators to include a 10% adder in their energy market offers, PJM did not distinguish between technology types in applying the uncertainty principle, and the Commission should not allow PJM to do so here.²⁹³ Exelon further argues that PJM should include not only the overall 10% cost adder when modeling all resources' energy offers, but also the additional 10% fuel variance adder for all natural gas-fired resources, consistent with the existence of two separate adders in the Tariff.²⁹⁴

175. The IMM and PICOs argue that the 10% cost adder should not apply to any resource.²⁹⁵ Specifically, the IMM argues that the market rules permit, but do not

²⁸⁹ EPSA Comments on Second Compliance Filing, Attach. A, Aff. of Paul M. Sotkiewicz, Ph.D. (Sotkiewicz Aff.) ¶ 24.

²⁹⁰ *Id.*, Sotkiewicz Aff. ¶ 24.

²⁹¹ Exelon Limited Protest of Second Compliance Filing at 8-11. IMM Protest of Second Compliance Filing at 20-22. PICOs' Partial Protest of Second Compliance Filing at 7-15. PJM Interconnection, L.L.C., Protest of PSEG, Docket No. EL19-58-003, at 7-8 (Sept. 2, 2020) (PSEG Protest of Second Compliance Filing).

²⁹² PSEG Protest of Second Compliance Filing at 4, 7-8; Exelon Limited Protest of Second Compliance Filing at 8-11.

²⁹³ PSEG Protest of Second Compliance Filing at 7-8.

²⁹⁴ Exelon Limited Protest of Second Compliance Filing at 3, 11; Exelon Answer to Second Compliance Filing at 3-10 & n.9 (citing Operating Agreement, sched. 1, § 6.4.2; Operating Agreement, sched. 2, §§ 2.3(a)(iii), 6.4.2).

²⁹⁵ IMM Protest of Second Compliance Filing at 20; PICOs' Partial Protest of Second Compliance Filing at 7-15.

require, use of the 10% cost adder in formulating cost-based offers and states that data show that CTs do not uniformly include a 10% cost adder.²⁹⁶ The IMM argues that PJM's choice to use the 10% cost adder to CTs' short-run marginal costs artificially reduces their net revenues.²⁹⁷ Similarly, PICOs argue that the 10% cost adder would underestimate a CT's E&AS net revenues. PICOs submit evidence that PJM indicated, in the stakeholder process, that removal of the adder from the simulations increases dispatch of the CT Reference Resource by 40% and increases its net revenues by 43%. PICOs' affiant, Mr. Wilson, claims these numbers translate to an increase in Net CONE of \$30/MW-day (or 13% of PJM's indicative Net CONE under the proposal, \$226/MW-day). PICOs argue that without substantial evidence to justify the need for the 10% cost adder, its inclusion in the Tariff is unjust and unreasonable; thus, PICOs urge the Commission to reject PJM's blanket use of this adder for purposes of developing the E&AS Offset.²⁹⁸

176. In its answer, PJM maintains that the application of the 10% cost adder for CTs and exclusion of such adder for other resources is reasonable.²⁹⁹ PJM specifically asserts that inclusion of the 10% cost adder for CTs is appropriate to account for the additional costs and risks associated with operating the CT Reference Resource in a manner that makes full use of its flexibility.³⁰⁰ These costs and risks, PJM adds, may include (1) additional fuel procurement costs due to being dispatched in real-time and needing to purchase gas at a premium or (2) the risk of gas imbalance costs a resource may incur if it is not run in real-time consistent with its day-ahead schedule.³⁰¹

177. In its answer, Exelon asserts that the IMM and PICOs raise the same arguments against the 10% cost adder that they previously raised, and the Commission rejected, in

²⁹⁶ IMM Protest of Second Compliance Filing at 20-22. The IMM notes that of all the CTs that cleared in the energy market in 2019 and the first two quarters of 2020, 40-50% were offered with incremental price-based offers less than their incremental cost-based offers. *Id.* at 21.

²⁹⁷ *Id.* at 21-22.

²⁹⁸ PICOs' Partial Protest of Second Compliance Filing at 7-15 & n.28 (citing Wilson Aff. ¶ 26).

²⁹⁹ PJM Answer to Second Compliance Filing at 9.

³⁰⁰ *Id.* at 9-10.

³⁰¹ *Id.* at 10.

the most recent quadrennial review proceeding.³⁰² Exelon refutes the IMM's reliance on the recent past (i.e., in 2019 and first two quarters of 2020) for its position that between 40-50% of CTs have offered at levels that are less than the full offer cap allows, noting that the converse also is true—50-60% of offers from CTs in the 2019-2020 timeframe and 72% of CT offers in 2017 did reflect the 10% cost adder. Exelon states that, if the Commission were to direct PJM to model the Net E&AS Offset for the CT Reference Resource without the 10% cost adder, the Commission would have to distinguish precedent and disregard the offer behavior of the majority of CTs.³⁰³ Exelon contends this would be a major flaw in the E&AS Offset methodology and difficult to sustain on judicial review. Exelon notes that market conditions can change, and the trend to which IMM and PICO's point could reverse easily; thus, Exelon argues there is no basis for the Commission to deviate from its previous conclusion citing the Quadrennial Update Order.³⁰⁴

178. Exelon also refutes PICO's argument that disregarding the 10% cost adder is justified by PJM's shift from the Peak Hour Dispatch model (focused on 16 peak hours a day (8:00 a.m.-11:00 p.m.) which also were the hours most likely for a CT to be committed) to the Projected E&AS Dispatch Model (all 24 hours considered). According to Exelon, under the new methodology, CTs remain most likely to be committed during the 16 peak hours, so elimination of the adder would not make a difference as to whether they are dispatched in non-peak hours (11:00 p.m. to 7:00 a.m.).³⁰⁵

179. Exelon states that EPSA's affiant, Dr. Sotkiewicz, presents a compelling case for use of the 10% fuel variance adder, which applies to all natural gas-fired resources, not just CTs. Exelon asserts that, while the Tariff is silent with respect to the 10% fuel variance adder, it understands that PJM does not intend to reflect it in modeling. Exelon reiterates its argument that PJM should include both the 10% cost adder to total costs for all resources and the separate 10% fuel variance adder to fuel costs for natural gas resources.³⁰⁶

³⁰² Exelon Answer to Second Compliance Filing at 5.

³⁰³ *Id.* at 5-7 & n.19 (citing IMM to Protest Second Compliance Filing at 21).

³⁰⁴ *Id.* at 6-7 & n.20 (citing *PJM Interconnection, L.L.C.*, 167 FERC ¶ 61,029 at P 129).

³⁰⁵ *Id.* at 8.

³⁰⁶ *Id.* at 8-10.

iii. Commission Determination

180. We find that PJM's proposal to apply a 10% cost adder to the offers of only CT resources in the Projected E&AS Dispatch Model is just and reasonable, and complies with the May 2020 Order.³⁰⁷ We agree that this adder is reasonably applied for CTs because it accounts for the additional costs and risks that may be incurred by operating the CT Reference Resource in a manner that fully recognizes flexibility, which is not limited only to peak hours or times of system stress. Notably, parties disagree on whether the 10% cost adder should be applied to *all* resources because all resources are entitled to make use of the adder or to *no* resources because many resources do not always make use of the adder. We find that PJM has proposed a balanced approach. PJM explains that it excluded the 10% cost adder for CCs and other resources that do not significantly alter their operating schedules based on evolving conditions between the day-ahead and real-time markets. As PJM explains, the CT Reference Resource used in the development of the VRR Curve includes a 10% cost adder, which provides the cornerstone of the VRR Curve used to clear the capacity market.

181. PJM also explains that the MOPR Floor Offer Prices must be constructed by reasonably assuming that resources that are not facing the same costs and risks as the CT Reference Resource would offer at their marginal cost without the 10% cost adder. We agree that including the 10% cost adder for other resource types could result in over-mitigation and may not reflect the lower bound of a competitive offer. No party has made a showing that PJM's assumptions are inconsistent with how it operates its capacity market. We therefore decline to require PJM to make further modifications to the Projected E&AS Dispatch Model regarding the use of the 10% cost adder. Should PJM and interested stakeholders wish to examine these assumptions, the next quadrennial review process provides an appropriate forum to do so.

d. Accuracy of Modeled Regulation Revenues

i. PJM's Compliance Filing

182. PJM states that, because energy prices are highly correlated with Regulation prices and this relationship is not expected to change, PJM will use historical and projected energy prices to develop forward Regulation prices. Specifically, PJM proposes to derive the hourly forward Regulation prices by multiplying historical real-time prices for Regulation by the ratio of the future hourly real-time energy price to the historic hourly real-time energy price, using prices from the PJM Western Hub.³⁰⁸ PJM proposes to use

³⁰⁷ See May 2020 Order, 171 FERC ¶ 61,153 at P 320.

³⁰⁸ PJM Second Compliance Transmittal at 25-26 & nn.79-83 (citing Brattle Aff. ¶¶ 59-60, 64; proposed Tariff, Attach. DD, § 5.10(a)(v-1)(D)).

these Regulation prices in the Projected E&AS Dispatch Model Methodology to simulate whether a dispatchable resource would provide Regulation and how much Regulation revenue it would earn.³⁰⁹

ii. Comments and Protests

183. PSEG, Exelon, the IMM, and P3 contend that PJM's price-taker approach to modeling E&AS revenues unreasonably overestimates revenue from the Regulation market. Specifically, the IMM argues that PJM's assumptions about ancillary services revenues and costs are not adequately defined, raising concerns about how the Regulation market was modeled.³¹⁰ Similarly, Exelon requests that the Commission direct PJM to modify its estimate of Regulation revenues to account for the impact that resources' participation in the relatively small Regulation market will have on the market clearing price.³¹¹ Exelon also asks that the Commission require PJM to clarify the Tariff language specifying the modeling assumptions PJM will use to calculate Regulation revenues.³¹² PSEG similarly points out that PJM's model fails to account for the small size of the Regulation market, and adds that CTs would only offer into the RegA market, which is smaller than the total Regulation market. PSEG contends that PJM's assumption that the CT Reference Resource and CC units would capture large portions of the RegA market without affecting the market price is not realistic or supported by any real data.³¹³ P3 requests that the Commission approve PJM's proposal but also urges PJM to examine its assumptions around provision of regulation by CTs and the expected capacity factor of CT units, noting that PJM's estimated capacity factor of 27% for the CT Reference Resource greatly exceeds the average 6.4% capacity factor observed in reality.³¹⁴

³⁰⁹ *Id.* at 28-29.

³¹⁰ IMM Protest of Second Compliance Filing at 24-25.

³¹¹ Exelon Limited Protest of Second Compliance Filing at 4, 11-13. Exelon notes that the Regulation market has a total demand of just 525 MW in non-ramp hours and 800 MW in ramp hours, and PJM estimates that the CT Reference Resource would supply approximately 120 MW, or 10-15% of the entire market's supply. *Id.* at 12.

³¹² Exelon Limited Protest of Second Compliance Filing at 14-15.

³¹³ PSEG Protest of Second Compliance Filing at 9.

³¹⁴ P3 Comments on Second Compliance Filing at 6-7.

184. In its answer, PJM argues that its approach for estimating regulation revenues earned by the CT Reference Resource is reasonable.³¹⁵ PJM clarifies that, in developing its model, it reviewed how CT resources actually participated in the Regulation market and found that participating CT resources offered up to 90% of their dispatchable range into the Regulation market.³¹⁶ PJM also clarifies that, in determining the Regulation offer price of the CT Reference Resource, it strictly followed the guidelines set forth in PJM Manual 15 and set the Margin Adder, an adder onto the cost-based Regulation offer of up to \$12/MWh, equal to \$0/MWh as there were not additional costs that PJM believed needed to be quantified.³¹⁷ PJM explains that even if it were to remove the ability of the CT Reference Resource to provide regulation, it would only increase Zonal Net CONE values by an average of 3.96%, demonstrating that “such a small effect is within the noise of so many other simplifications inherent in estimating Net CONE.”³¹⁸ Thus, PJM asserts that its proposed approach is just and reasonable. However, PJM commits to continue evaluating Regulation modeling for the CT Reference Resource in the next quadrennial review, if not sooner.³¹⁹ Lastly, PJM agrees that revenues from bilateral contracts can be a critical source of forward-looking net revenues, as the IMM asserts. PJM explains that the proposed language in Tariff, Attachment DD, section 5.14(h-1)(2)(B)(ii), which is incorporated in Tariff, Attachment DD, section 6.8(d-1), includes “any unit-specific bilateral contract” for this purpose.³²⁰

185. In its answer, Exelon alleges that PJM’s failure to reflect the impact that a new resource providing Regulation would have on future prices in the relatively small Regulation market violates the Commission’s directive that PJM’s E&AS Offset be “forward looking.”³²¹ Exelon requests that the Commission direct PJM to take a two-step approach to revising its Regulation methodology: include the full \$12/MWh adder to the cost-based Regulation offer in the near term for the purposes of the next BRA without an assumption that the offer is that of a price-taker, and pursue longer-term model revisions to reflect how new Regulation supply would affect Regulation clearing prices on a

³¹⁵ PJM Answer to Second Compliance Filing at 18.

³¹⁶ *Id.* at 18-19.

³¹⁷ *Id.* at 19.

³¹⁸ *Id.* at 19-21.

³¹⁹ *Id.* at 22.

³²⁰ *Id.*

³²¹ Exelon Answer to Second Compliance Filing at 16.

prospective basis.³²² Exelon proposes specific Tariff revisions to implement its requested short-term change, and requests that the Commission direct PJM to submit a compliance filing within 120 days proposing Exelon's requested long-term change.³²³

186. In a subsequent answer, PSEG and Exelon reiterate their arguments that PJM's approach to modeling Regulation revenues is unjust and unreasonable, and jointly request that the Commission direct PJM to remove the Projected E&AS Dispatch Model's ability to optimize against the Regulation market. Exelon states that it still believes that the alternative remedy suggested in its answer would be just and reasonable, but states that it has become convinced of the merits of PSEG's approach.³²⁴

iii. Commission Determination

187. We find that PJM's approach to modeling regulation revenues is just and reasonable and complies with the May 2020 Order. For purposes of the forward-looking E&AS Offset, PJM crafted a methodology that reasonably estimates future values of the various inputs, including revenue from the Regulation market. Here, PJM states that energy prices and Regulation prices have historically been highly correlated, and it has no compelling evidence to suggest that relationship will change in the near future.³²⁵ PJM also reasonably assumes that a resource will offer its full capabilities, including its capability to provide Regulation service, into the markets in a way that maximizes its profit.³²⁶ Because the assumptions underlying PJM's estimate of future Regulation prices and how resources will respond to those prices are reasonable, we find PJM's approach to modeling Regulation revenues just and reasonable and complies with the May 2020 Order.³²⁷

188. We also decline to adopt Exelon's request that PJM rerun its modeling with the \$12/MWh adder included in the CT Reference Resource's Regulation offer, or the subsequent joint request of PSEG and Exelon that we direct PJM to remove the Projected

³²² *Id.* at 16-19.

³²³ *Id.* at 19-20.

³²⁴ PJM Interconnection, L.L.C., Motion for Leave to Answer and Answer of PSEG and Exelon, Docket No. EL19-58-003, at 1-5 (Oct. 2, 2020).

³²⁵ PJM Second Compliance Transmittal at 25; Brattle Aff. ¶¶ 22, 25, 59; PJM Answer to Second Compliance Filing at 18-19.

³²⁶ PJM Second Compliance Transmittal at 29-30.

³²⁷ *See* May 2020 Order, 171 FERC ¶ 61,153 at P 320.

E&AS Dispatch Model's ability to optimize against the Regulation market. We considered the alternatives proposed by Exelon and PSEG but decline to require PJM to adopt them. The alternative that PSEG offers, for example, proposes to ignore Regulation revenues for the CT Reference Resource entirely, an assumption that is unrealistic. We are unpersuaded by the alternatives that Exelon offers, such as including a \$12/MWh adder in the CT Reference Resource's Regulation offer in the Projected E&AS Dispatch Model. PJM notes that it will rely on historical Regulation data, which PJM states has had a linear correlation with energy prices. Given this correlation, we do not see a need to require PJM to make modifications to its assumptions regarding future projections on Regulation revenues for the CT Reference Resource. We acknowledge parties' concerns about the limitations of the Projected E&AS Dispatch Model's price-taker approach when applied to a small market such as Regulation, but the protestors have not persuaded us that PJM's straightforward approach of allowing resources to respond to reasonably estimated forward Regulation prices is unjust and unreasonable and requires revision. We note PJM's commitment to continue evaluating its regulation modeling for the CT Reference Resource in the next quadrennial review, if not sooner, and consider alternative approaches that may result in further refinements.³²⁸

e. **Treatment of Major Maintenance Costs in Modeled Offers**

i. **PJM's Compliance Filing**

189. PJM explains that, because a CT is assumed to start up and shut down much more often in the proposed Projected E&AS Dispatch Model than in the existing Peak-Hour Dispatch model, PJM proposes to amortize major maintenance costs across both start costs (expressed as \$/start) and incremental output costs (expressed as \$/MWh), resulting in the stated Variable Operation and Maintenance (VOM) cost being \$1.95 per MWh and \$11,732 per start.³²⁹

190. In its affidavit, Brattle explains that the VOM costs are all derived from the 2018 quadrennial review, which "reported major maintenance costs of \$23,464/start (in 2022 dollars)" and converted that cost per start figure "to \$5.83/MWh by assuming an average capacity of 366 MW across CONE Areas and an average runtime of 11 hours per start." Brattle explains that, in contrast to the Peak-Hour Dispatch's "limited ability . . . to directly account for start costs," which necessitated the \$/MWh value, the Projected E&AS Dispatch Model is "realistically flexible" and "showed very different dispatch patterns, with a range of duty-cycles averaging only half as many hours per start." Brattle explains that, as a result, it found that the Projected E&AS Dispatch Model

³²⁸ PJM Answer to Second Compliance Filing at 22.

³²⁹ PJM Second Compliance Filing at 34-35.

approach was “under-counting major maintenance costs” by using the \$/MWh value. Brattle states that, by contrast, accounting for major maintenance only in start costs and not in VOM “resulted in the opposite problem: units ran far more total hours and far more hours-per-start because the per-MWh cost was lower,” which Brattle found “unrealistic because running for so many hours causes additional wear and tear and incurs major maintenance costs that were not being recognized.” Accordingly, PJM states that Brattle concluded that it is appropriate to separate these costs with 50% of major maintenance costs apportioned to startup costs (in \$/start terms) and 50% apportioned to incremental energy costs (i.e., \$/MWh).³³⁰

ii. Comments, Protests, and Answers

191. The IMM asserts that major maintenance costs should not be in operating costs.³³¹ The IMM argues that such maintenance costs are not short-run marginal costs and that actual competitive offers in PJM therefore cannot be assumed to include major maintenance. The IMM also argues that PJM’s Second Compliance Filing “arbitrarily divides major maintenance between start costs and incremental costs in order to calibrate the impact on net revenues.”³³² The IMM specifically takes issue with PJM’s argument in its Second Compliance Filing that PJM’s analysis indicates that splitting the major maintenance costs between starts and run hours is suitable because it produces “a more reasonable dispatch simulation.”³³³ The IMM counters PJM’s argument by concluding that the correct method for considering major maintenance costs is not to include such costs in the cost-based energy offer, but instead to include them in the calculation of Gross CONE.³³⁴

192. In their respective answers in response to the IMM’s arguments about the treatment of major maintenance costs, PJM and Exelon assert that such costs should be included in a resource’s cost-based energy offer.³³⁵ PJM explains that the Commission has previously determined that major maintenance costs are short-run costs of electric production and therefore appropriately included in a resource’s cost-based energy

³³⁰ *Id.* at 35-36 & nn.109-112 (citing Brattle Aff. ¶¶ 70-71).

³³¹ IMM Protest of Second Compliance Filing at 22.

³³² *Id.* at 22 & n.39 (citing PJM Second Compliance Filing at 34-36).

³³³ *Id.* at 23 & n.40 (citing PJM Second Compliance Filing at 73).

³³⁴ *Id.* at 23.

³³⁵ PJM Answer to Second Compliance Filing at 16; Exelon Answer to Second Compliance Filing at 20.

offer.³³⁶ PJM also explains that the Second Compliance Filing justifiably splits major maintenance costs between start costs and incremental costs, arguing that PJM's proposed approach is reasonable given that both starts and run hours cause wear-and-tear that accelerates the need for major maintenance.³³⁷ PJM further explains that even long-term service agreements for major maintenance with original equipment manufacturers demonstrate that such costs are appropriately split between starts and run hours.³³⁸ PJM concludes, as explained in the Second Compliance Filing, that Brattle's analysis indicates that splitting major maintenance costs between starts and run hours produces more reasonable dispatch simulations compared to the alternative methodologies of using either a pure hours-based approach or a pure starts-based approach.³³⁹

iii. Commission Determination

193. We find that PJM's treatment of major maintenance costs is just and reasonable and complies with the May 2020 Order,³⁴⁰ and we decline to direct any modifications to this component of PJM's methodology. Specifically, we reject the IMM's assertions that major maintenance costs may not appropriately be included in a resource's cost-based offer because they do not represent a resource's short-run marginal costs. To the contrary, the Commission has previously determined, as PJM notes in its answer, that major maintenance costs are appropriate to be considered as short-run costs due to the impact of both starts and run hours on maintenance needs.³⁴¹ Consistent with that prior finding, we find that PJM's proposal to split major maintenance costs between start and run hours when calculating a forward-looking E&AS Offset represents a reasonable treatment of major maintenance costs.

³³⁶ *Id.* at 16 & n.57 (citing *PJM Interconnection, L.L.C.*, 167 FERC ¶ 61,030, at P 42 (2019)).

³³⁷ *Id.* at 16 & n.59 (citing PJM Second Compliance Filing at 34-36).

³³⁸ *Id.* at 16 & n.60 (citing PJM Second Compliance Filing, Brattle Aff. ¶ 72).

³³⁹ *Id.* at 16-17.

³⁴⁰ May 2020 Order, 171 FERC ¶ 61,153 at P 320.

³⁴¹ *See PJM Interconnection, L.L.C.*, 167 FERC ¶ 61,030 at P 43.

6. MOPR Floor Offer Prices and Resource Outages

a. Calculating E&AS Offset for Use in Determining MOPR Floor Offer Prices

i. PJM's Compliance Filing

194. In its Second Compliance Filing, PJM proposes Tariff revisions related to determining MOPR Floor Offer Prices for Cleared Capacity Resources with a State Subsidy.³⁴² PJM also specifies a few common, resource-specific default inputs and lists additional resource type-specific operating parameters required to properly perform each forward-looking E&AS Offset estimation. PJM states that when developing the forward E&AS Offset for nuclear, wind, and solar resources it will use an assumed output model, which will also use forward energy and fuel prices, as applicable.³⁴³ PJM explains that use of the assumed output model for these resources is appropriate because PJM typically does not dispatch such resource types, and they generally do not ramp up or down their energy production in response to energy prices.³⁴⁴ PJM also specifies how the maximum output of resource types will be determined in the assumed output model. For nuclear resource types, PJM will consider the resource's anticipated refueling schedule when determining availability.³⁴⁵ For solar and wind resource types, PJM will use the output profiles for the most recent three calendar years, as available,³⁴⁶ and for battery storage resources, PJM will use the resource's nameplate capacity rating (on a MW/MWh basis).³⁴⁷

ii. Comments, Protests, and Answers

195. CEA argues that PJM's proposed E&AS Offset results in unjust, unreasonable, and unduly discriminatory MOPR Floor Offer Prices for wind and solar resources in part because of PJM's proposal to use historical prices for Synchronized and Non-

³⁴² PJM Second Compliance Transmittal at 41.

³⁴³ *Id.* at 5.

³⁴⁴ *Id.* at 28.

³⁴⁵ *Id.* at 43 (citing proposed Tariff, Attach. DD, § 5.14(h-1)(2)(B)(ii)(g)).

³⁴⁶ *Id.* (citing proposed Tariff, Attach. DD, § 5.14(h-1)(2)(B)(ii)(h)).

³⁴⁷ *Id.* (citing proposed Tariff, Attach. DD, § 5.14(h-1)(2)(B)(ii)(i)).

Synchronized Reserves.³⁴⁸ CEA argues that historically natural gas resources have earned a substantial portion of their revenues from these two reserve products. Therefore, CEA argues, PJM's proposed E&AS Offset calculation, by using historical prices, is improperly weighted heavily in favor of natural gas resources in comparison with other resources, which will earn a greater share of future energy and ancillary service revenues after the reserve market reforms take effect.³⁴⁹ CEA argues that this unduly discriminatory treatment is shown by the changes in Net CONE values (which are the equivalent of default MOPR Floor Offer Prices proposed by PJM) by resource class from what PJM proposed in March 2020 compared to what PJM proposes in its compliance filing.³⁵⁰

196. CEA notes that PJM rejected scaling historic reserve market clearing prices by the ratio of the forward energy prices to the historic energy prices because, under the current set of forward energy prices, this would result in scaling down reserve market clearing prices. CEA notes that PJM concluded that “[s]uch an outcome would be contrary to the expected increase in ancillary services market revenues relative to their historic levels following implementation of the market reforms adopted in the [May 2020 Order].”³⁵¹ CEA argues that following the same rationale, the Commission should reject E&AS Offset values that significantly reduce the E&AS Offset (and raise default MOPR prices) for wind and solar resources because the co-optimization of PJM's energy and reserve markets is expected to result in increased E&AS Offset values and decreased default MOPR prices for wind and solar resources—the exact opposite result from what PJM has proposed.³⁵²

197. In general, CEA argues that until electricity futures prices fully reflect PJM's reserve market changes, PJM's proposed E&AS Offset methodology will underestimate

³⁴⁸ CEA Protest of Second Compliance Filing at 3-5.

³⁴⁹ *Id.* at 4-5. CEA suggests that the advantage of natural gas resources under the proposal is enhanced by the fact that the current E&AS Offset accounts for no ancillary services except for reactive service. CEA Protest at 4 & n.16 (citing Second Compliance Transmittal at 22).

³⁵⁰ *Id.* at 6 & tbl. 1 (showing that Net CONE for four types of solar and wind resources will increase under the proposal by 5.4% to 21.7%, while the Net CONE for combined-cycle resources will decrease by 23.7%); *id.* at 6 n.19 (citing PJM Interconnection, L.L.C., Compliance Filing, Docket Nos. EL16-49, et al., at tbl. 1 (Mar. 18, 2020); PJM Informational Filing at Attach. A (Default Net CONE Summary)).

³⁵¹ *Id.* at 6-7 (citing Second Compliance Transmittal at 24).

³⁵² *Id.* at 7.

future energy revenues of all resources, resulting in artificially higher default MOPR Floor Offer Prices for all resources. Thus, CEA contends, the Commission in the meantime should direct PJM to estimate the impact that the co-optimization between the energy and reserve markets will have on energy market prices and then calculate a forward-looking E&AS Offset by scaling the futures prices according to that estimation.³⁵³

198. In its answer to CEA's allegation that PJM's proposal unjustly favors natural gas resources, PJM argues that its approach merely recognizes inherent operating characteristics of each resource type. PJM states that natural-gas-fired and storage resource types will, by default, be credited with revenues for Synchronized Reserve, Non-Synchronized Reserve, and Regulation revenues, because such resources can provide these products upon request. By contrast, PJM states, solar and wind resources are ineligible to provide these reserve products by default and will only be allowed to offer them upon receiving resource-specific approval. PJM states that to the extent a solar or wind resource anticipates receiving revenues from market-based ancillary services in a respective delivery year, it may submit a request for a resource-specific MOPR exception.³⁵⁴

199. In response to CEA's view that PJM should scale electricity futures prices using simulated prices, PJM contends that because the liquid futures markets "determine a settlement price for each contract on each business day," the market-determined prices have had ample time to consider and internalize the effect on energy market prices of the reserve market changes approved in the May 2020 Order.³⁵⁵ PJM also argues that its approach is consistent with the May 2020 Order's guidance to use "project[ed] valuation methods used by market participants."³⁵⁶ PJM contends that market participants regularly use energy prices determined by liquid futures markets instead of an artificial

³⁵³ *Id.* at 7-8. CEA suggests that PJM could update the simulations it performed in support of its initial filing in this proceeding. CEA states that PJM could use its proposed E&AS Offset methodology but then scale the energy market revenue portion of the E&AS Offsets by the change estimated in the updated simulation results. *Id.*

³⁵⁴ PJM Answer to Second Compliance Filing at 15 n.53 (citing PJM First Compliance Transmittal at 3-6).

³⁵⁵ *Id.* at 14-15 (citing PJM Second Compliance Transmittal, Brattle Aff. ¶ 46).

³⁵⁶ *Id.* at 15 (citing May 2020 Order, 171 FERC ¶ 61,153 at P 320).

estimation of future energy prices. PJM notes, for example, that Brattle explained that it relied on market-based forward prices “in commercial application.”³⁵⁷

iii. Commission Determination

200. We disagree with CEA’s argument that PJM’s proposed E&AS Offset results in unjust, unreasonable, and unduly discriminatory MOPR Floor Offer Prices for wind and solar resources. While CEA argues that PJM’s proposed E&AS Offset calculation will favor natural gas resources until wind and solar resources begin earning a greater share of revenues under the reserve market reforms, we agree with PJM that its approach merely recognizes the different operating characteristics of the resource types, which are not similarly situated in this regard. Furthermore, as PJM notes, owners of solar and wind resources who do anticipate receiving ancillary services revenues can submit a request for a resource-specific MOPR exception.

201. We also reject CEA’s argument that the Commission should direct PJM to estimate the impact that the reforms will have on energy prices and then scale the futures prices according to that estimation. We agree with PJM and find that futures prices reflect the market’s incorporation of forthcoming market design changes, including those at issue in this proceeding, thereby obviating the need for adjustments. This finding is further supported by the fact that market participants regularly use futures prices instead of an artificial estimation of future energy prices in their own calculations. We find PJM’s justification for using futures prices to be reasonable and consistent with the May 2020 Order’s guidance to use methods employed by market participants.³⁵⁸

202. CEA notes that PJM chose not to scale historic reserve prices to create forward reserve prices partly because the adjustment would have resulted in lower reserve prices, contrary to the expected increase in reserve prices due to the reserve market reforms. CEA argues that following a similar rationale the Commission should reject calculations that reduce the E&AS Offset (and raise the default MOPR price) for wind and solar resources because, unlike other resources, wind and solar resources generally cannot participate in the reserve market. CEA therefore argues PJM should increase the energy prices for wind and solar resources because the reserve market reforms are expected to result in increased E&AS Offset values for these resources due to higher energy prices. We do not find CEA’s rationale persuasive. The reasoning we apply above in accepting PJM’s proposal to use historic reserve prices is not simply that scaling historic reserve prices would reduce the E&AS Offset. Rather, we find that PJM’s scaling methodology for energy prices, which is based on future prices, already takes into account the effect of

³⁵⁷ *Id.* at 16 (citing PJM Second Compliance Transmittal, Brattle Aff. ¶ 37).

³⁵⁸ May 2020 Order, 171 FERC ¶ 61,153 at P 320.

the reserve reforms on energy prices; any further adjustment would therefore bias the estimation of future ancillary services revenues.³⁵⁹

b. Modeling Resource Outages

i. PJM's Compliance Filing

203. PJM explains in its Second Compliance Filing that for nuclear resource types PJM will consider the resource's "anticipated refueling schedule" when determining resource availability for the purpose of estimating its E&AS Offset.³⁶⁰

ii. Comments, Protests, and Answers

204. Exelon and PSEG protest the assumptions on nuclear outages for the use of calculating the E&AS Offset for nuclear resources. Exelon requests that the Commission direct PJM to revise the nuclear resource's anticipated refueling schedule when determining availability for the purposes of estimating the E&AS Offset because failing to do so would inject excessive variability in Market Seller Offer Caps for a particular nuclear station from year to year depending on whether the facility has one or two units scheduled to be on outage. Exelon also requests that the Commission direct PJM to use the average projected number of days for refueling outages over a forward-looking three-year period and create an average number of outage days per year that can then be used in the projected E&AS dispatch methodology when calculating the E&AS Offset.³⁶¹ The IMM also supports using class average equivalent availability factors for nuclear resources to ensure that "lumpy" refueling outages do not skew the results.³⁶²

205. Similarly, PSEG requests that the Commission direct PJM to revise the proposed Tariff's default Avoidable Cost Rate (ACR) calculation and adjustment mechanism affecting nuclear resources.³⁶³ PSEG explains that directing PJM to use the class-average Equivalent Demand Forced Outage Rate (EFORD) in calculating the adjusted default ACR for a nuclear resource will be more closely representative of a generic nuclear unit and will also address a timing mismatch around expected refueling outages that could

³⁵⁹ See *supra* P 168.

³⁶⁰ PJM Second Compliance Transmittal at 43 (citing proposed Tariff, Attach. DD, §§ 5.14(h-1)(2)(B)(ii)(g)).

³⁶¹ Exelon Limited Protest of Second Compliance Filing at 5-6.

³⁶² IMM Protest of Second Compliance Filing at 6.

³⁶³ PSEG Protest of Second Compliance Filing at 1.

skew revenue expectations.³⁶⁴ PSEG argues that because nuclear resources do not have refueling outages every year, unit-specific data would produce significant year-on-year variations that are not representative of nuclear unit economics.³⁶⁵ PSEG asserts that the generic impact of refueling outages is more appropriately captured by the availability factor calculation found at proposed Tariff, Attachment DD, section 5.14(h-1)(2)(A)(i), which uses “the annual average equivalent availability factor of all PJM nuclear resources.”³⁶⁶

206. PSEG also proposes certain other changes to PJM’s proposed Tariff language that would remove consideration of: (1) offers submitted in the day-ahead and real-time markets by nuclear resources and (2) using resource-specific operating parameters for nuclear resources. PSEG explains that avoiding the use of offers submitted in the day-ahead energy market and real-time energy market as originally included in PJM’s proposed Tariff language reflects the fact that nuclear resources are price-takers.³⁶⁷ PSEG also explains that a number of the resource-specific operating parameters outlined to be considered by PJM in the ancillary services revenue determination methodology set forth in Tariff, Attachment DD, section 5.14(h-1)(2)(A)(i) through (ix), are ill-suited to represent nuclear resources.³⁶⁸ Lastly, PSEG requests that the Commission direct PJM to revise the proposed Tariff to provide for the use of EFORd by resource class—rather than on a unit-specific basis—to determine the E&AS Offset for all resource types.

207. In its answer, Exelon states that the Commission should address certain discrete corrections that are needed to PJM’s proposal, including the use of unit-specific or class-average outage rates for nuclear resources.³⁶⁹ Exelon reiterates that in its limited protest it demonstrated that the shift away from a rolling three-year historic average to a forward-looking E&AS Offset based on projected revenues accentuates the impact of the individual refueling outages and will lead to inaccurate Market Seller Offer Caps for nuclear resources, especially in light of the importance of energy market revenue to nuclear units.³⁷⁰ Exelon renews its earlier request that the Commission direct PJM to

³⁶⁴ *Id.* at 4-5.

³⁶⁵ *Id.* at 6.

³⁶⁶ *Id.*

³⁶⁷ *Id.* at 5.

³⁶⁸ *Id.* at 3.

³⁶⁹ Exelon Answer to Second Compliance Filing at 2.

³⁷⁰ *Id.* at 21.

average, on a unit-specific basis, the projected number of days for refueling outages over a forward-looking three-year period, and create an average number of days per year that will then be used to calculate the E&AS Offset using the Projected E&AS Dispatch Model methodology.³⁷¹ However, Exelon notes that PSEG's and the IMM's suggestion to use the class-average equivalent availability factor of all PJM resources would also remedy the flaw in PJM's proposal.³⁷²

208. In its answer, PJM explains that although it proposed initially to use a nuclear resource's "anticipated refueling schedule" when determining resource availability for the purposes of estimating a resource's E&AS Offset, PJM agrees with commenters that support an alternate methodology.³⁷³ PJM explains that using the anticipated refueling schedule for nuclear resources in a given year, as it initially proposed, may result in significant variations year-over-year.³⁷⁴ Instead, PJM supports commenters' proposal that PJM should use the average equivalent availability factor of all PJM nuclear resources to represent a resource's refueling outage. PJM agrees with commenters that using an average equivalent availability factor instead of a resource-specific anticipated refueling schedule can avoid yearly variations in expected energy and ancillary services revenues and may result in more accurate refueling outage projections.³⁷⁵

iii. Commission Determination

209. We agree with commenters that PJM should use the average equivalent availability factor of all PJM nuclear resources to represent a nuclear resource's projected refueling outage. Using an average equivalent availability factor instead of a resource-specific anticipated refueling schedule not only may avoid yearly variations in expected E&AS revenues, but also may result in more accurate refueling outage projections. We decline to grant Exelon's request that the Commission direct PJM to average, on a unit-specific basis, the number of refueling outage days per year to be used to calculate the E&AS Offset using the Projected E&AS Dispatch Model methodology. We find that using a nuclear class-average equivalent availability factor for all PJM nuclear resources will achieve the improvements in accuracy sought by commenters. We direct PJM to

³⁷¹ *Id.*

³⁷² *Id.* at 21-22.

³⁷³ PJM Answer to Second Compliance Filing at 4.

³⁷⁴ *Id.*

³⁷⁵ *Id.*

make a further compliance filing within 15 days of the date of this order to modify the Tariff, Attachment DD, section 5.14(h-1)(2)(B), as set forth in Appendix B.

210. We disagree with PSEG that PJM should be directed to make certain other changes to its proposed Tariff language to remove consideration either of offers submitted in the day-ahead and real-time energy market by nuclear resources or using resource-specific operating parameters for nuclear resources. Although nuclear resources typically operate as price-takers in PJM's energy markets, we find that PJM's proposed Tariff language, which includes consideration of offers submitted in the day-ahead and real-time markets for all resources, including nuclear resources, is reasonable. We also disagree with PSEG that PJM should be required to allow the use of EFORd by resource class—rather than on a unit-specific basis—to determine the E&AS Offset for all resource types. We find, for the reasons explained above, that the infrequent nature of nuclear refueling presents a unique challenge to estimating the forward-looking E&AS revenues for such resources. We therefore decline to require PJM to make further Tariff changes modifying the procedures by which it proposes to account for resource outage status.

c. Customized E&AS Offset Revenue Values

i. PJM's Compliance Filing

211. As noted above, PJM proposes a common forward-looking E&AS Offset estimating method, with three main components: using publicly available energy and fuel price data, modeling a resource's expected revenue based on runtime, and estimating revenues from both market-based and cost-based ancillary services.³⁷⁶ PJM explains in its compliance filing that it will adapt and apply that general method both to determine resource-type default MOPR Floor Offer Prices and resource-specific exemptions to the MOPR Floor Offer Prices.³⁷⁷ PJM also states that the resulting simulated generation pattern and the corresponding revenues net of operating costs for each day of the delivery year yield the projected energy revenue portion of the E&AS Offset for each resource type's reference resource.³⁷⁸

212. PJM's compliance filing proposes that a resource-specific E&AS Offset calculation will be required for any Capacity Market Seller that seeks to obtain a

³⁷⁶ PJM Second Compliance Filing at 7.

³⁷⁷ *Id.* at 7-8.

³⁷⁸ *Id.* at 33.

resource-specific exception from the default MOPR Floor Offer Price.³⁷⁹ PJM elaborates that the IMM will develop the default E&AS Offset values for all resources that seek a resource-specific exception and for cleared Capacity Resources with State Subsidy using a set of standard inputs based on resources' actual operating parameters, cost data, pricing points.³⁸⁰ PJM states that the Projected E&AS Dispatch Model or assumed output models, as applicable for the resource type, will be used as the standard model in developing the E&AS Offset values using these inputs.

213. PJM proposes a limit on the use of the resource-specific E&AS Offset calculation. PJM states that Capacity Market Sellers may only seek a customized E&AS Offset value under the resource-specific exception process if they are also seeking a resource-specific Gross CONE or ACR.³⁸¹ PJM clarifies that under this restriction Capacity Market Sellers may not rely on the default Gross CONE or ACR value and seek only a resource-specific E&AS Offset value (based on non-standard inputs) to arrive at the applicable MOPR Floor Offer Price. PJM asserts that this limit will ensure that Capacity Market Sellers "cannot pick and choose values that are most favorable in determining a MOPR [Floor Offer] Price."³⁸² PJM notes that if a Capacity Market Seller believes its resource-specific MOPR Floor Offer Price should be less than the applicable default value, then it must demonstrate the resource-specific actual costs and projected revenues to arrive at the resource-specific MOPR Floor Offer Price.³⁸³

ii. Comments and Protests

214. PSEG requests that the Commission direct PJM to revise the proposed Tariff to specify that electing to use a customized E&AS Offset value will not force the use of resource-specific Gross CONE or ACR.³⁸⁴ PSEG argues that the calculation of a unit-specific Gross CONE or ACR is a significant and time-consuming undertaking that requires consideration of many factors, whereas determining a unit-specific E&AS Offset normally should not be nearly as complex or time-consuming.³⁸⁵ PSEG also argues that

³⁷⁹ *Id.* at 44.

³⁸⁰ *Id.*

³⁸¹ *Id.*

³⁸² *Id.*

³⁸³ *Id.*

³⁸⁴ PSEG Protest of Second Compliance Filing at 1-2.

³⁸⁵ *Id.* at 11.

there is no reason why the cost calculation and revenue calculation should be linked. PSEG concludes that PJM's proposed limit on the use of resource-specific E&AS Offset determinations creates a significant and unjustified burden on a resource that is willing to accept the default Gross CONE or ACR value but believes that the default revenue calculation is not realistic.³⁸⁶ PSEG asserts that a resource owner may reasonably be willing to accept the Gross CONE or ACR value while wishing to seek a unit-specific determination for the E&AS Offset.³⁸⁷

iii. Commission Determination

215. We disagree with PSEG that PJM should be required to revise the proposed Tariff to specify that electing to use a customized E&AS Offset value will not force the use of a resource-specific Gross CONE or ACR. We find that PJM has explained clearly that the intent of its proposed limitation is to prevent Capacity Market Sellers from selectively using values that are most favorable in determining a MOPR Floor Offer Price.³⁸⁸

216. As PSEG notes, the calculation of a unit-specific Gross CONE or ACR value may be a more time-consuming undertaking than only the calculation of a unit-specific, forward-looking E&AS Offset. In addition, a resource owner may be willing to accept a default Gross CONE or ACR value while nevertheless having a legitimate reason, such as being party to a power purchase agreement, for requesting that PJM determine the resource's forward-looking E&AS Offset on a resource-specific basis. Nevertheless, we find that absent further documentation that PJM's proposed limit on the use of the resource-specific exception process presents an unreasonable barrier to market participation for any resource, we find that PJM's limit is both compliant with the Commission's directives in the May 2020 Order and represents a reasonable limit on the ability of Capacity Market Sellers to make use of the resource-specific exception process. We decline to require modifications to PJM's proposed Tariff revisions on this issue.

7. Effective Date and Implementation Schedule

a. Compliance Directives

217. In the May 2020 Order, the Commission directed PJM to propose an effective date for implementation of the reserve market replacement rate and the forward-looking

³⁸⁶ *Id.*

³⁸⁷ *Id.* at 11-12.

³⁸⁸ PJM Second Compliance Filing at 44.

E&AS Offset, as well as any necessary software changes, as early as practicable.³⁸⁹ PJM was further directed to harmonize the implementation schedule with other ongoing revisions in Docket Nos. EL16-49-000, et al., and to minimize any auction delays.³⁹⁰

b. PJM's Compliance Filing

218. PJM proposes an effective date of May 1, 2022, for the reserve market reforms accepted in the May 2020 Order and set forth in PJM's First Compliance Filing.³⁹¹

219. PJM proposes to implement the forward-looking E&AS Offset beginning in the BRA for the delivery year starting June 1, 2022.³⁹²

220. PJM requests that the Commission assign the same effective date to the Tariff revisions implementing the forward-looking E&AS Offset that are submitted in the PJM Second Compliance Filing and to the pending changes to the Minimum Offer Price Rule proceeding in Docket Nos. EL16-49, et al. According to PJM, the same effective date for both sets of revisions would allow the forward-looking E&AS Offset to be used for all capacity auctions for the 2022/2023 Delivery Year and subsequent delivery years.

221. PJM explains that it has complied with the May 2020 Order's directive to establish an effective date as early as practicable because "the reserve market changes are complex and will take significant effort for PJM to develop requirements, code the software changes, and conduct extensive testing and quality assurance, putting implementation likely sometime between January 1, 2022, and June 1, 2022."³⁹³

c. Comments, Protests, and Answers

222. Although it supports the May 2020 Order reforms and PJM's First Compliance Filing, PSEG opposes PJM's proposed May 1, 2022, effective date for the reserve market revisions.³⁹⁴ PSEG urges the Commission to "direct PJM to provide a detailed timeline

³⁸⁹ May 2020 Order, 171 FERC ¶ 61,153 at P 2.

³⁹⁰ *Id.*

³⁹¹ PJM First Compliance Transmittal at 1.

³⁹² *Id.*

³⁹³ *Id.* at 14.

³⁹⁴ PJM Interconnection, L.L.C., Comment and Limited Protest of PSEG, Docket No. EL19-58-002, at 1, 3 (Jul. 28, 2020) (PSEG Limited Protest of First Compliance Filing).

on each of the proposed reforms approved in the May 2020 Order and proposed in the [First Compliance Filing], including a reasonable implementation date for each.”³⁹⁵ PSEG requests that where faster implementation of any aspect of the May 2020 Order or First Compliance Filing incrementally relieves the current unjust and unreasonable market conditions, it should not be delayed.³⁹⁶

223. While noting that the substance of the Tariff changes proposed in PJM’s First Compliance Filing complies with the requirements of the Commission’s May 2020 Order, P3/EPSC object to PJM’s proposed delay in implementation of the reserve market reforms as inconsistent with the May 2020 Order directive for an implementation schedule as early as practicable.³⁹⁷ P3/EPSC request that the Commission direct PJM to implement the reserve market reforms by May 21, 2021, or, at the latest, October 15, 2021. P3/EPSC argue that delaying the reforms until May 1, 2022, will perpetuate continued application of market rules found unjust and unreasonable by the Commission in its May 2020 Order. P3/EPSC request that the Commission require PJM to submit a progress report on software implementation efforts by May 21, 2021, if PJM’s proposed implementation schedule is not rejected and revised. P3/EPSC state that PJM must explain in that progress report why implementation will continue to be delayed another year if PJM still proposes to delay implementation until May 1, 2022.³⁹⁸

224. OPSI urges the Commission to approve PJM’s May 1, 2022, effective date for the reforms accepted in the May 2020 Order and set forth in the First Compliance Filing, and PJM Load Coalition urges an effective date of June 1, 2022, over the objections of PSEG and P3/EPSC. According to OPSI, PSEG and P3/EPSC seek to replace PJM’s judgment as to the amount of time required for implementation of the proposed E&AS Offset.³⁹⁹

³⁹⁵ PSEG Limited Protest of First Compliance Filing at 6.

³⁹⁶ *Id.* at 5.

³⁹⁷ PJM Interconnection, L.L.C., Comments of the PJM Power Providers Group and the Electric Power Supply Association, Docket No. EL19-58-002, P3/EPSC Comments on First Compliance Filing at 1, 4-8 (Jul. 27, 2020) (P3/EPSC Comments on First Compliance Filing). They point to a survey that 63% of PJM stakeholders in the Market Implementation Committee supported implementation as soon as possible. *Id.* at 7.

³⁹⁸ P3/EPSC Comments on First Compliance Filing at 1-2, 4-9.

³⁹⁹ PJM Interconnection, L.L.C., Answer of The Organization of PJM States, Inc., Docket No. EL19-58-002, at 2-3, 5 (Aug. 10, 2020) (OPSI Answer to First Compliance Filing).

225. PJM urges the Commission to reject the request of P3/EP SA to implement the reserve market changes adopted by the May 2020 Order no later than October 15, 2021, because the alternative date would fall within the winter season, require PJM management to rebalance and reprioritize other projects, and would be inconsistent with the May 2020 Order to harmonize the date with the ongoing revisions in Docket Nos. EL16-49-000, et al.⁴⁰⁰ According to PJM, because the revisions are complex and extensive, requiring software coding and extensive testing and quality assurance performance, an effective date of May 1, 2022, is the optimal date for the reserve market changes to go into effect. PJM explains that the proposed effective date will allow PJM to go live during a shoulder period, which typically has milder weather and lower system strain. PJM states that the software implementation period is longer than the originally anticipated 14-month period due to its inability to start work in April 2019. As a result, PJM states it moved forward with implementing other priority projects, including its storage participation model and fast-start pricing changes. PJM explains that it must also conduct thorough testing, as the software and system changes in this proceeding are more complex than originally expected. Therefore, PJM states a May 1, 2022, effective date will provide time to address any unanticipated issues during implementation.⁴⁰¹

226. The IMM requests that the Commission approve implementation of certain reforms sooner than May 2022. According to the IMM, the removal of the \$7.50/MW margin and the unsupported Synchronized Reserve VOM cost require no implementation time and would provide immediate benefits. The IMM notes that real-time adjustments to ramp rates already are being implemented by PJM on a separate timeline. The IMM also argues that there is an immediate need to change the definition of the reserve sub-Zone due to dramatic changes in congestion patterns on the PJM system in recent years to support reliability.⁴⁰²

d. Commission Determination

227. We find that PJM's implementation schedule is compliant with the May 2020 Order.⁴⁰³ We accept PJM's reserve market reforms accepted in the May 2020 Order and as discussed herein, effective May 1, 2022. We find that PJM has complied with the May 2020 Order's directives to propose an effective date as early as practicable that would

⁴⁰⁰ PJM Answer to First Compliance Filing at 8-10.

⁴⁰¹ PJM First Compliance Transmittal at 13-15 & n.38.

⁴⁰² IMM Protest of First Compliance Filing at 14-15.

⁴⁰³ See May 2020 Order, 171 FERC ¶ 61,153 at P 2.

allow it sufficient time to implement the compliance revisions and to harmonize that date with the revisions in Docket No. EL16-49-000, et al.

228. Although the Commission has found PJM's current reserve market unjust and unreasonable, the Commission needs to be cognizant of the practical necessities of implementing such a complex reform of its market, as well as the computer software changes and testing needed to implement that reform, without market disruption.⁴⁰⁴ PJM has indicated that it requires sufficient time to develop, implement, test, and perform quality assurance for the required revisions. We agree with PJM that its proposal to use a shoulder period for its go-live date is reasonable in order to help minimize issues that may otherwise occur during more extreme conditions. For the reasons discussed above, we find PJM's proposed implementation schedule complies with the May 2020 Order and therefore accept it.

229. The Tariff revisions accepted in PJM's Second Compliance Filing herein, including the revision set forth in Appendix B, will be effective as of the date of this order.

8. Reporting Requirements and Future Refinements

a. PJM's Compliance Filing

230. In its Second Compliance Filing, PJM states that implementation of the reserve pricing reforms will allow PJM and its stakeholders to observe the relationship between ancillary service prices and forward energy prices. PJM states that its use of historic ancillary service revenues is a reasonable first step in implementing the Commission's requirements, subject to re-examination and refinements in future quadrennial review proceedings. PJM explains that, at a minimum, the forward price determination for ancillary services will be evaluated in the next quadrennial review that commences in the Spring of 2021.⁴⁰⁵

⁴⁰⁴ See *Aera Energy LLC v. FERC*, 789 F.3d 184 (D.C. Cir. 2015) (recognizing that the effective date of the replacement rate need not coincide with the finding that the prior rate is unjust and unreasonable under the parallel provision, section 5, of the Natural Gas Act).

⁴⁰⁵ PJM Second Compliance Transmittal at 25-26.

231. PJM states it will reevaluate and update, as necessary, the energy efficiency programs underlying its methodology of the energy savings component of Net CONE, as part of each quadrennial review.⁴⁰⁶

b. Comments, Protests, and Answers

232. EPSA urges the Commission to expeditiously accept PJM's Second Compliance Filing as compliant with the May 2020 Order, subject to the condition of an informational filing, as discussed below.⁴⁰⁷ EPSA explains that it will be essential for PJM to monitor the forward-looking E&AS Offset to ensure that it is performing as intended. In addition, EPSA urges the Commission to require PJM to conduct various near-term, medium-term, and long-term analyses, with information posted on PJM's website and included in future filings with the Commission.⁴⁰⁸

233. EPSA requests that the Commission condition its acceptance on PJM's submittal of an informational filing after conducting its first BRA with the forward-looking E&AS Offset.⁴⁰⁹ EPSA states this interim review will allow an opportunity to make corrections prior to the BRAs for the 2024/2025 and 2025/2026 Delivery Years, and possibly the BRA for the 2023/2024 Delivery Year.⁴¹⁰ EPSA notes that many of the implementation details are in manuals and not in the Tariff.⁴¹¹ EPSA argues that PJM, stakeholders, and the Commission must have an opportunity to timely assess whether the E&AS Offset approach is working or refinements are needed.⁴¹² EPSA contends that a review is consistent with long-standing Commission policy and in accord with the Commission's recognition of its responsibility to determine whether an RTO/ISO tariff interpretation is reasonable.⁴¹³

234. EPSA urges the Commission to make clear that PJM's review of the E&AS Offset in the quadrennial review should include all aspects of the approach and not limited

⁴⁰⁶ *Id.* at 50.

⁴⁰⁷ EPSA Comments on Second Compliance Filing at 2-3.

⁴⁰⁸ *Id.* at 2, 4, 6-11.

⁴⁰⁹ *Id.* at 2.

⁴¹⁰ *Id.* at 9.

⁴¹¹ *Id.* at 7.

⁴¹² *Id.* at 7-8.

⁴¹³ *Id.* at 8.

elements as identified in PJM's Second Compliance Filing, such as the shape of the VRR Curve.⁴¹⁴

235. EPSA's affiant, Dr. Sotkiewicz, describes the analyses that should be conducted on the operation of the E&AS Offset methodology and shared with PJM's stakeholders (e.g., through posting on PJM's website) and included in future filings with the Commission.⁴¹⁵

236. In the near term, EPSA also suggests that PJM run the new model for a CT using actual energy and fuel prices for the 2018/2019 and 2019/2020 Delivery Years and compare the results to actual run hours and net E&AS revenues to control for differences between forward prices and actual prices and isolate differences in modeled versus actual outcomes. EPSA suggests that PJM run the new model for the CT Reference Resource using realized power and fuel prices for the 2018/2019 and 2019/2020 Delivery Years to derive the net E&AS revenues, as well as the run hours and number of starts, and compare them to the existing CTs to provide a comparison of the effect of differences in efficiency, size, and operating characteristics of the reference unit and existing CT.⁴¹⁶

237. In the medium term, EPSA suggests that PJM calculate hypothetical forward-looking E&AS Offset values for the 2021/2022 Delivery Year using historic forward prices at different points in time in order to compare those values with each other and with actual, realized E&AS revenues.⁴¹⁷

238. In the longer term, EPSA suggests that PJM provide an examination of historic forward prices corresponding with the timing of past BRAs and delivery years and track the changes in those prices leading up to the delivery years.⁴¹⁸

239. EPSA also requests that the Commission make clear that future challenges to PJM's implementation of the proposed principles will not be deemed to be collateral attacks on its order accepting PJM's compliance filing.⁴¹⁹ Similarly, P3 requests that the Commission remain open to the further refinements for the E&AS Offset calculations and

⁴¹⁴ *Id.*

⁴¹⁵ *Id.* at 9-11; *see also* Sotkiewicz Aff. ¶¶ 25-36.

⁴¹⁶ *Id.* at 9-10; Sotkiewicz Aff. ¶¶ 26-28.

⁴¹⁷ *Id.* at 10-11; Sotkiewicz Aff. ¶¶ 32-33.

⁴¹⁸ *Id.* at 11; Sotkiewicz Aff. ¶¶ 35-36.

⁴¹⁹ *Id.* at 2.

not consider targeted refinements as collateral attacks on the Commission's order in this proceeding.⁴²⁰

240. P3 further asserts that greater transparency would benefit the unit-specific review process for E&AS revenues that is conducted for the purpose of calculating the forward-looking E&AS Offset. P3 states that the Commission should consider directing PJM to submit, in a separate proceeding, either an informational filing or Tariff revisions that seek to enhance transparency associated with the unit-specific review process.⁴²¹

241. In addition to the 120-day compliance filing Exelon proposes, as described above,⁴²² Exelon supports EPSA's request to direct PJM to make an informational filing after the auction for the 2022/2023 Delivery Year to facilitate a better understanding of how the new E&AS Offset methodology is functioning prior to the next quadrennial review.⁴²³

242. Similarly, Exelon requests that the Commission condition its acceptance on the use of the new E&AS Offset methodology for all pre-auction activities that require the E&AS Offset in order to harmonize implementation.⁴²⁴ Exelon explains that failure to align these two procedural schedules could result in PJM's using the existing, backward-looking E&AS Offset methodology to calculate and post auction-related information in violation of the Commission's findings in the May 2020 Order that continued use of the existing methodology would be unjust and unreasonable in light of the ORDC-related reforms.⁴²⁵

243. While they do not support delaying the BRA for the 2022/2023 Delivery Year, PICOs propose that certain aspects of the E&AS Offset are flawed and should be reviewed and revised in a compliance filing by January 31, 2021. PICOs state that the E&AS Offset underestimates revenues from ancillary services now and in the future. In addition, PICOs state that the E&AS Offset methodology is undermined by the misalignment of forward prices for natural gas and electric energy due to mismatched

⁴²⁰ P3 Comments on Second Compliance Filing at 8.

⁴²¹ *Id.* at 7-8.

⁴²² *See supra* PP 185-186.

⁴²³ Exelon Answer to Second Compliance Filing at 2, 22.

⁴²⁴ Exelon Limited Protest of Second Compliance Filing at 2-3, 6-8; *see also* Exelon Answer to Second Compliance Filing at 1-2 & n.3, 22.

⁴²⁵ Exelon Limited Protest of Second Compliance Filing at 3.

energy and fuel price information that can lead to estimates less accurate than the current historical average approach.⁴²⁶ They request that the Commission direct PJM and stakeholders to expeditiously develop and file no later than January 31, 2021, a proposal to reflect: (1) a functional relationship between energy price levels and operating reserve price levels, and (2) broader use of forward price information and improved alignment of gas and electric pricing. According to PICOs, corrections need to be made for the BRA for the 2023/2024 Delivery Year.⁴²⁷

244. In its answer, Exelon responds to PICOs' ancillary service revenue arguments and states that their predictions seem unfounded and should be rejected as unsubstantiated. Exelon states that there is the possibility of increases in excess capacity to the extent states will procure capacity to satisfy their clean energy policies that is not counted in the capacity market.⁴²⁸

245. PJM proposes to continue to review its E&AS Offset approach with stakeholders and submit proposed changes, if appropriate, for the Commission's consideration as part of the next quadrennial review.⁴²⁹ Acknowledging that there may be alternative methods to estimate the projected E&AS Offset that also may be just and reasonable, PJM submits that other potential approaches be reviewed as part of the next quadrennial review, which commences in the spring of 2021. PJM notes the PICOs' proposal that PJM revise the E&AS Offset in a compliance filing by January 31, 2021, is an unrealistic deadline as alternative approaches take time to be developed and for the Commission to review and accept.⁴³⁰ However, PJM states that reviewing any alternatives to its approach as part of the quadrennial review would provide sufficient time to work with its stakeholders to determine if changes are warranted. PJM further states this would allow PJM to gain experience with the current E&AS Offset while avoiding any further delay of the upcoming BRAs.⁴³¹

⁴²⁶ PICOs' Partial Protest of Second Compliance Filing at 3-4, 17-19.

⁴²⁷ *Id.* at 4, 19-20.

⁴²⁸ Exelon Answer to Second Compliance Filing at 20.

⁴²⁹ PJM Answer to Second Compliance Filing at 3 n.12.

⁴³⁰ *Id.*

⁴³¹ *Id.* at 2-3 & n.12.

c. **Commission Determination**

246. Except as noted above in section 5(b)(iii), we do not find it necessary at this time to direct PJM to provide, to the Commission and stakeholders on its website, in reports, or in additional filings, any other additional information on implementation of the reforms.⁴³² PJM has committed to evaluate implementation and other issues and identify any needed refinements as part of its next quadrennial review, which commences in the spring of 2021,⁴³³ and we encourage PJM and stakeholders to do so as part of that process. Similarly, we reject requests to require additional compliance filings, as requested by the PICOs, as we agree with PJM that the PICOs' proposed timeline is unrealistic and places an unnecessary burden on PJM mere months before the start of the next quadrennial review.

247. With respect to commenters' requests that future proposed refinements to the E&AS Offset should not be considered collateral attacks on the Commission's orders in this proceeding, we decline to pre-judge any such future filings.

The Commission orders:

(A) PJM's tariff records in the First Compliance Filing and the unchanged tariff records from the Docket No. EL19-58-000 are hereby accepted, effective as of May 1, 2022.

(B) PJM's Second Compliance Filing is accepted, to become effective the date of this order, subject to PJM making a compliance filing regarding the nuclear refueling issue, within 15 days of the date of this order, as discussed in the body of this order.

(C) PJM is hereby directed to submit a further compliance filing containing Appendix B to this order, within 15 days of the date of this order, as discussed in the body of this order.

⁴³² See *supra* PP 168-171.

⁴³³ PJM Second Compliance Transmittal at 25-26, 50; PJM Answer to Second Compliance Filing at 2-3 n.12.

(D) PJM is hereby directed to submit an informational report, as discussed in the body of this order.

By the Commission. Commissioner Glick is dissenting in part.

(S E A L)

Nathaniel J. Davis, Sr.,
Deputy Secretary.

Appendix A

Tariff Records Accepted PJM Interconnection, L.L.C. Intra-PJM Tariffs

Tariff Records Accepted Effective May 1, 2022

Docket No. ER19-1486-000

OATT Definitions – A - B, 14.0.0

OATT Definitions – C-D, 19.0.0

OATT Definitions – E - F, 23.0.0

OATT Definitions – L – M - N, 22.0.0

OATT Definitions – O – P - Q, 22.1.0

OATT Definitions – R - S, OATT Definitions – R - S, 19.0.0

OATT Attachment K Appendix Sec 1.5A Economic Load Resp, 10.0.0

OATT Attachment K Appendix Sec 1.7 General, 20.0.0

OATT Attachment K Appendix Sec 1.10 - Scheduling, 35.0.0

OATT Attachment K Appendix Sec 1.11 - Dispatch, 5.0.0

OATT Attachment K Appendix Sec 2.2 General, 10.0.0

OATT Attachment K Appendix Sec 2.5 Calculation of Real-time, 7.0.0

OATT Attachment K Appendix Sec 2.6 Calculation of Day-ahead, 3.0.0

OATT Attachment K Appendix Sec 3.2 - Market Buyers, 46.0.0

Docket No. EL19-58-000

OA Definitions A - B, 7.0.0

OA Definitions C - D, 21.0.0

OA Definitions E - F, 15.0.0

OA Definitions I - L, 15.0.0

OA Definitions M - N, 13.0.0

OA Definitions O - P, 18.0.0

OA Definitions Q - R, 12.0.0

OA Definitions S – T, 15.0.0

OA Schedule 1 Sec 1.5A Economic Load Response Participant, 10.0.0

OA Schedule 1 Sec 1.7 General, 20.0.0

OA Schedule 1 Sec 1.10 - Scheduling, 35.0.0

OA Schedule 1 Sec 1.11 - Dispatch, 5.0.0

OA Schedule 1 Sec 2.2 General, 10.0.0

OA Schedule 1 Sec 2.5 Calculation of Real-time Prices., 7.0.0

OA Schedule 1 Sec 2.6 Calculation of Day-ahead Prices., 3.0.0

OA Schedule 1 Sec 3.2 - Market Buyers, 44.0.0

Docket No. EL19-58-002

OATT Attachment K Appendix Sec 1.5A Economic Load Resp, 11.0.0

OATT Attachment K Appendix Sec 1.7 General, 22.0.0

OATT Attachment K Appendix Sec 1.10 - Scheduling, 37.0.0

OATT Attachment K Appendix Sec 1.11 - Dispatch, 6.0.0

OA Schedule 1 Sec 1.5A Economic Load Response Participant, 11.0.0

OA Schedule 1 Sec 1.7 General, 22.0.0

OA Schedule 1 Sec 1.10 - Scheduling, 37.0.0

OA Schedule 1 Sec 1.11 - Dispatch, 6.0.0

Tariff Records Accepted Effective the Date of This Order

Docket No. EL19-58-003

OATT Definitions – E - F, 29.0.0

OATT Definitions – O – P - Q, 25.0.0

OATT ATTACHMENT DD.5.10 Auction Clearing Requirements, 27.0.0

OATT ATTACHMENT DD.5.14 Clearing Prices and Charges, 28.0.0

OATT ATTACHMENT DD.6. MARKET POWER MITIGATION, 25.0.0

Appendix B

Revisions to Proposed Tariff, Attachment DD, section 5.14(h-1)(2)(B):

(ii) The net energy and ancillary services revenue is equal to forecasted net revenues which shall be determined in accordance with the applicable resource type net energy and ancillary services revenue determination methodology set forth in Tariff, Attachment DD, section 5.14(h-1)(2)(A)(i) through (ix) and using the subject resource's operating parameters as determined in accordance with the PJM Manuals based on (a) offers submitted in the Day-ahead Energy Market and Real-time Energy Market over the calendar year preceding the time of the determination for the RPM Auction; (b) the resource-specific operating parameters approved, as applicable, in accordance with Operating Agreement, Schedule 1, section 6.6(b) and Operating Agreement, Schedule 2 (including any Fuel Costs, emissions costs, Maintenance Adders, and Operating Costs); (c) the resource's EFORd; (d) Forward Hourly LMPs at the generation bus as determined in accordance with Tariff, Attachment DD, section 5.10(a)(v-1)(C)(6); and (e) the resource's stated annual revenue requirement for reactive services; plus any unit-specific bilateral contract. In addition, the following resource type-specific parameters shall be considered; (f) for combustion turbine, combined cycle, and coal resource types: the installed capacity rating, ramp rate (which shall be equal to the maximum ramp rate included in the resource's energy offers over the most recent previous calendar year preceding the determination for the RPM Auction), and the heat rate as determined as the resource's average heat rate at full load as submitted to the Market Monitoring Unit and the Office of the Interconnection, where for combined cycle resources heat rates will be determined at base load and at peak load (e.g., without duct burners and with duct burners), as applicable; (g) for nuclear resource type: ~~anticipated refueling schedule~~ an average equivalent availability factor of all PJM nuclear resources to account for refueling outages; (h) for solar and wind resource types: the resource's output profiles for the most recent three calendar years, as available; and (i) for battery storage resource type: the nameplate capacity rating (on a MW / MWh basis).

To the extent the resource has not achieved commercial operation, the operating parameters used in the simulation of the net energy and ancillary service revenues will be based on the manufacturer's specifications and/or from parameters used for other existing, comparable resources, as developed by the Market Monitoring Unit and the Capacity Market Seller, and accepted by the Office of the Interconnection.

A Capacity Market Seller intending to submit a Sell Offer in any RPM Auction for a Cleared Capacity Resource with State Subsidy based on a net energy and ancillary services revenue determination that does not use the foregoing methodology or parameter inputs stated for that resource type shall, at its election, submit a request for a resource-specific MOPR Floor Offer Price for such Capacity Resource pursuant to Tariff, Attachment DD, section 5.14(h-1)(3) below.

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

PJM Interconnection, L.L.C.

Docket Nos. EL19-58-002
EL19-58-003

(Issued November 12, 2020)

GLICK, Commissioner, *dissenting in part*:

1. I dissented from the underlying orders in this proceeding, which approved PJM’s proposal to execute a sweeping overhaul of its energy and ancillary services market.¹ Those orders abdicated the Commission’s responsibility to protect consumers from unjust and unreasonable rates and were fundamentally arbitrary and capricious.² Today we address PJM’s compliance filings implementing the Commission’s directives in those prior orders. Accordingly, I dissent in part from this order because, for the reasons supplied in my previous statements, it implements a rate that is unjust and unreasonable.³

2. While I disagreed with the Commission’s determinations in the underlying orders, I did note one lone bright spot: the decision to require PJM to move to a forward-looking energy and ancillary services offset (E&AS Offset) when calculating the net cost of new entry in the capacity market.⁴ Moving to a forward-looking E&AS Offset helps to ensure that PJM’s various markets work in concert and that expected increases in energy and ancillary services revenues are reflected in the capacity market.

¹ *PJM Interconnection, L.L.C.*, 171 FERC ¶ 61,153 (2020) (May 2020 Order) (Glick, Comm’r, dissenting at PP 1-2, 17, 29); *PJM Interconnection, L.L.C.*, 173 FERC ¶ 61,123 (2020) (Rehearing Order) (Glick, Comm’r, dissenting at PP 1-2) (stating that PJM’s proposal “abandons basic principles of competitive markets in favor of a byzantine administrative pricing regime”).

² May 2020 Order, 171 FERC ¶ 61,153 (Glick, Comm’r, dissenting at PP 2, 18, 30, & n.52) (explaining that the result of this proceeding is an unjustified windfall to inflexible generators); Rehearing Order, 173 FERC ¶ 61,123 (Glick, Comm’r, dissenting at PP 14-15, 24).

³ May 2020 Order, 171 FERC ¶ 61,153 (Glick, Comm’r, dissenting at PP 17-27); Rehearing Order, 173 FERC ¶ 61,123 (Glick, Comm’r, dissenting at PP 14-22).

⁴ Rehearing Order, 173 FERC ¶ 61,123 (Glick, Comm’r, dissenting at P 22).

3. The Commission, however, forced PJM to complete this unprecedented, highly technical exercise in an impossibly short period of time.⁵ The reason for that rush is readily apparent: Implementing the forward-looking E&AS Offset is a necessary prerequisite to running PJM's much-delayed capacity auction for the 2022-2023 delivery year. The responsibility for that delay lies squarely at the feet of this Commission and we owe it to all stakeholders to proceed with running that auction as soon as reasonably possible.⁶

4. Accordingly, while PJM's E&AS Offset is by no means perfect, I believe that it is good enough to remove this issue from the list of roadblocks standing between PJM and, finally, running its auction. In addition, PJM has pledged to revisit its new forward-looking E&AS Offset in its next quadrennial review, which begins this coming spring.⁷ During that review, I expect PJM, its consultants, and its stakeholders to take a hard look at the new E&AS Offset—especially in light of actual data from its implementation in the next auction—and to strive to fix any problems it uncovers.

For these reasons, I respectfully dissent in part.

Richard Glick
Commissioner

⁵ See PJM Interconnection, L.L.C., Motion for Extension of Time and Shortened Comment Period, Docket No. EL19-58-000, at 3 (filed June 25, 2020) (describing the Commission's compliance deadline as "ambitious" and explaining that more time allows for "detailed engagement with stakeholders and the Market Monitor, which . . . will translate into a better designed and better supported proposal being presented for Commission consideration").

⁶ *Calpine Corp. v. PJM Interconnection, L.L.C.*, 168 FERC ¶ 61,051 (2019) (Glick, Comm'r, concurring at PP 4-5); see *Calpine Corp. v. PJM Interconnection, L.L.C.*, 169 FERC ¶ 61,239 (2019) (Glick, Comm'r, dissenting); *Calpine Corp. v. PJM Interconnection, L.L.C.*, 171 FERC ¶ 61,034 (2020) (Glick, Comm'r, dissenting).

⁷ PJM Answer at 2-3 ("PJM acknowledges that there may be alternative methods to estimate the projected E&AS Offset that may also be just and reasonable, but submits that other potential approaches be reviewed as part of the next quadrennial review, which commences in the Spring of 2021. This will allow sufficient time to consider such alternative approaches with the benefit of experience with the current E&AS Offset, while avoiding any further delay of the upcoming Base Residual Auctions (BRAs).") (internal citations omitted).